**3GPP TSG-RAN WG4 Meeting #94-e R4-2002193**

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

**Agenda item:** 7.10.3

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for RAN4#94e\_#70\_ LTE\_eMTC5\_RRM

**Document for:** Information

# Introduction

The open issues of release 16 MTC RRM work item are addressed in this email discussions. In particular, following subtopics are addressed: PUR, RSS, DL quality reporting, MPDCCH improvement. First priority is given to the completing the open issues in the core part of the WI, and second priority is given to the discussions on performance requirements.

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

* 1st round: Collect companies view on the open issues for sub-features. If there are no open issues for the sub-features, collect comments for the CRs submitted
* 2nd round: Reach technical agreements on the open issues and assign CRs to companies. If possible, high-level agreement on performance requirements can be reached.

# Topic #1: WUS

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001750 | Ericsson | CR |
| R4-2001651 | Huawei, HiSilicon | CR |

## Open issues summary

All technical issues were resolved at last meeting. Only CR drafting work is remaining.

### Sub-topic 1-1: CR

There are two CRs with very little difference on how to capture the changes. No technical differences in the CRs.

**Issue 1-1: CR**

* Proposals
  + Option 1: Capture the changes as proposed in R4-2001750
  + Option 2: Capture the changes as proposed in CR from R4-2001651
* Recommended WF
  + Possible to approve one of the CRs unless any comments received on the CRs.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Qualcomm | Sub topic 1-1: We don’t have a strong preference on which CR is used. Our only suggestion is to follow the same wording and approach that was used in NB-IoT WUS CR that was approved in the last meeting.  Sub topic 1-2:  ….  Others: |
| Ericsson | Issue 1-1:  Editorial comments to R4-2001651: it is recommended to capture the changes in the beginning of the section where the applicability is stated. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| R4-2001750 (Ericsson) | Recommended for approval. |
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| R4-2001651 (Huawei, HiSilicon) | Recommended to note this CR. |
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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** | R4-2001750 was agreed. No open issue left on WUS.  *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| R4-2002268 | WF on Rel-16 MTC RRM Requirements | Ericsson |

*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** |
| 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*

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| **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: PUR

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001748 | Ericsson | CR |
| R4-2001652 | Huawei, HiSilicon | CR |

## Open issues summary

All technical issues were resolved at last meeting. Only CR drafting work is remaining.

### Sub-topic 2-1 CR

A lot of agreements have been made during the year on PUR topic which were all captured in different way forwards. The agreed CR should capture all those agreements.

**Issue 2-1: CR**

* Proposals
  + Option 1: CR in R4-2001748 contains all agreements collected in WFs since start of WI.
  + Option 2: CR in R4-2001652 contains only subset of the agreements.
* Recommended WF
  + It is recommended to revise CR in R4-2001748 as it is based on all earlier agreeements.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Qualcomm | Sub topic 2-1: We support option 2. In R4-2001748, there are a few clauses and sections that are not necessary. For instance, clause 4.7.2.2 on requirements for UE synchronization is not necessary. It was agreed in previous meetings that as long as UE meets the UL timing accuracy requirements, it can transmit on PUR occasion. That’s why PUR was added to the list of UL channels for transmit timing accuracy (R4-1910559). We also don’t think that the formulations for RSRP change using one or two thresholds are necessary as the current running CR in 36.331 adequately and accurately captures the specified UE behavior. Moreover, the RSRP formulation for two thresholds in R4-2001748 is not even correct.  One comment regarding R4-2001652, the last sentence refers to CONNECTED mode accuracy requirements. However, PUR operation is in idle mode. Idle mode accuracy requirements are implicitly captured in cell reselection requirements (e.g., clause 4.7.2.1.2 for normal coverage) so including the last sentence of R4-2001652 creates conflicting requirements. RAN4 should discuss this further.  [Additional comments]: same view as Huawei. There is no need to specify how/when UE should do synchronization. As long as UE meets the timing accuracy requirements, the requirements are fulfilled. Section 4.7.2.2. is redundant in the sense that is has captured in R4-1910559 in a much simpler and more efficient way.  Also, the formulation of RSRP is not necessary as RAN2 captures it even more precisely. Pasting the extract from running CR in 36.331:  1>  if *idleModeTAT* is configured:  2>  timing alignment timer for PUR is running as confirmed by lower layers;  1>  if *rsrp-ChangeThresh* is configured:  2>  since the last TA validation, the serving cell RSRP has not increased by more than *rsrp-IncreaseThresh*; and  2>  since the last TA validation, the serving cell RSRP has not decreased by more than *rsrp-DecreaseThresh*;  Sub topic 1-2:  ….  Others: |
| Huawei, HiSilicon | We have same comment as Qualcomm for R4-2001748.  - Section 4.7.2.2 is not needed – as long as the Tx timing requirements can be met, there is no need to limit when UE performs the synchronization before PUR.  - Section 4.7.2.3 also includes UE behavior on how to validate TA using the RSRP-change threshold, but in our view this should be captured in RAN2 specification. We also have other TA validation mechanism like TA timer based for which the UE behavior is captured in RAN2. What we should capture in RAN4 is the UE measurement requirements.  On above comment from Qualcomm on R4-2001652, the intention is that the RSRP measurement for TA validation should be not only timely but also accurate, otherwise the validation outcome may still be wrong. On the other hand, we understand the concern from Qualcomm is also valid, so one possible way is to update the last sentence using similar wording as in the cell reselection requirements (since in both cases the relative accuracy matters). An example is “UE shall be able to correct validate the TA provided the difference between the measured RSRP and the reference RSRP is larger than 4dB when UE is in normal coverage and 5dB when UE is in enhanced coverage”. We welcome more comments on this issue. |
| Ericsson | All these agreements captured in this CR are indeed coming from the agreed WFs in [R4-1907733, R4-1910107, R4-1912735, R4-1915889]. Agreements in section 4.7.2.2 are what has been agreed, and we need to make sure that it is properly captured in the specification. If there are any technical errors in the formulas, that could be discussed and fixed of course. How the TA validation using serving cell RSRP chagne is performed, and the validtity criteria, such as when a measurement is considered valid, time range etc. are no specified in RAN2 at all. They were agreed in RAN4 and hence we have proposed to capture them in RAN4 specification.  It was agreed in R4-1910559 at RAN4#92 meeting that the initial timign requirements defined in 7.1.2 shall apply to PUR. However, the change was captured in the wrong section. Section 7.1.2 applies to legacy UEs whereas timing requirements defined in section 7.24.1 are specific to cat-M. So we need to modify this change and also we need to refer to these agreed timing requirements from the PUR section in IDLE mode.  In brief, all agreements in the WFs have been reached after several meetings of discussions to ensure that the PUR works well both from the network and UE perspective. We need to make sure that they are captured properly in the CR. |
| Nokia | We propose to discuss both CRs further in the second round and that proponents provide links to agreed WF for each subclause. |

### 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** |
| R4-2001748  (Ericsson) | Postpone to 2nd round. |
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| R4-2001652  (Huawei, HiSilicon) | Postpone to 2nd round. |
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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** |
| Issue 2-1 | More discussions needed on how to capture the PUR agreements into CR. |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| R4-2002268 | WF on Rel-16 MTC RRM Requirements | Ericsson |

## Discussion on 2nd round (if applicable)

### Open issues

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| **Company** | **Comments** |
| Qualcomm | R4-2001748 and the approach it takes is not agreeable to us. As mentioned earlier, clause 4.7.2.2 is unnecessary and is already captured implicitly by an earlier CR. Ericsson mentioned in the 1st round that the CR in R4-1910559 captured PUR requirements in the wrong section. We agree however, this does not mean that we need clause 4.7.2.2. We had lengthy discussions in RAN4 (May 2019) meeting in which eventually, it was decided that all that needs to be captured is that UE meets the transmit timing accuracy. How and when UE performs the necessary tasks to reach this goal is UE implementation and should not be specified.  On formulation of RSRP change against the thresholds, we have pasted the text from RAN2 running CR and believe that is adequate and accurate. No need to specify in RAN4 spec. |
| Huawei, HiSilicon | We have same view as in 1st round, and our comment is similar to Qualcomm above. In our view, R4-1910559 already means UE shall get synchronized if it transmits on PUR, and additional requirements like in 4.7.2.2 of R4-2001748 is unnecessary and will limit the UE implementation.  At the same time, we would like to check if our CR R4-2001652 can be used for baseline for next step. We think it includes what is needed from RAN4 requirements pov. There was a comment from Qualcomm in the 1st round, and we have tried to address it in our 1st round comments. |
| Ericsson | The references for the agreements that are being captured in R4-2001748 can be found below. In fact, RAN4 has spent many meetings discussing PUR requirements and agreements have been made after many meetings and long discussions. It is important that they are also captured properly in the CR. We are not OK to use R4-2001652 as baseline as it does not contain the full agreements as shown below.  The text in clause 4.7.2.2 are capturing the agreements made in the agreed R4-1907733:   * + UE shall transmit in the PUR transmission opportunity using the obtained TA     - If UE is synchronized towards the serving cell before PUR opportunity     - Otherwise, UE may postpone the transmission to the next intended PUR transmission opportunity according to higher layer request of the UE or network configuration after UE has obtained the synchronization towards the serving cell within Tsearch, or it may drop the transmission.       * + Tsearch =the time required for PSS/SSS acquisition in eDRX. In DRX, Tsearch is the time required for performing tracking loop and exact duration is FFS.   The conditions for validating the first and second measurements used for validating TA was agreed in R4-1910107:   * + - The first measurement (RSRP1) shall be performed within following time range: *T1 – N ≤ T1’ ≤ T1 + N;*     - The second measurement (RSRP2) shall be performed within following time range: *T2 – M ≤ T2’<T2;*   It was agreed that M=N in R4-1912735.   * + - * M = min (Tmeasure\_intra\_UE cat M1 in nonDRX, DRX\_cycle length)       * N = min (Tmeasure\_intra\_UE cat M1 in nonDRX, DRX\_cycle length)   The values of M and N in the formula were revised and agreed in R4-1915889:  In normal coverage, the values of M and are derived as min(480, NxDRX cycle).  In enhanced coverage, the values of M and are derived as min(800, NxDRX cycle).  All these aspects are missing in the RAN2 running CR. Since these agreements were made in RAN4, we need to capture them also in RAN4 spec. RAN2 is not aware of all these agreements, and thus they are not captured in the RAN2 CR.  Moreover, it should be noted that the way RAN2 has captured the use of single and double thresholds is not correct. As agreed in R4-1910176, it is up to the eNB whether to signal 1 or 2 RSRP thresholds, the referred RAN2 changes are not correct in that sense. Also, in case 2 thresholds are used, the relative change between the first- and the second measurement should be in the between the first and the second threshold. This is not captured in the referred RAN2 changes.    When further checking the previous agreements, we noticed that following agreement from R4-1912735 is missing in the CR, and it has been included in the revised CR:   * + When TA is obtained in RRC\_CONNECTED mode: M=[TEvaluate\_Qin\_CatM1/2]   The changes agreed in R4-1910559 were made to the section 7.1.2 which applies to legacy UEs whereas timing requirements defined in section 7.24.1 are specific to cat-M. Therefore we need to revert the changes in section 7.1.2 and introce the same change in section 7.24.1 instead. Moreover, we also need to refer to this new timing requirements from the PUR section in IDLE mode. This change can be captured in the revised CR.  The fact that RAN4 agreed to introduce timing requirements for PUR transmission does not mean that all other PUR agreements are discarded. There were no such agreement. Therefore the final CR to specify the PUR requirements should contain all agreemetns that were made during the WI. |
| Nokia | Our view is that more discussion is needed and thus, none of the present CRs is agreeable for us.  We should rather change to the method of a running CR which is enhanced until the complete PUR functionality can be agreed. Thus, measurement requirements for RSRP change and TA validation are kept in the same CR.  R4-2001652 contains only a subset of agreements contained in previously agreed WFs. Especially the timing constraints for evaluating first and second RSRP are not specified accurately. Example: “what does T ms before PUR” mean ? What is the timing reference for the PUR transmission ? The reference to the TA validation procedure is provided as TBD only.  R4-2001748 provides more detail and is better aligned to previously agreed WFs and the idea of a running CR. Hence it should be used as baseline for further revisions. If there is description in other TS, such as TS 36.331 then this can be referred to; no need for duplication, we agree to the comment made by Qualcomm. On the other hand we cannot remember that the UE related requirements mentioned in sections 4.7.2.2 and 4.7.2.3 have been all liaised to RAN2, so there is a need to put all measurement related aspects including failure cases down in TS 36.133, as we don’t want the UE to transmit in those cases. Hence there is justification for this description. Regarding the 2-threshold option, we need to check this in more detail. It appears to us, that the delta RSRP condition may need a change (We determine that if RSRP1=RSRP2, delta RSRP = 0, it would be outside the allowed range, given both configured thresholds are positive). In addition, both sections on normal and enhanced coverage are almost identical, it could be useful to either merge them or avoid repetition in the second subclause by reference to keep the description concise. |

*Suggestion on WF/LS assignment*

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

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

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2001748 | Recommended to postpone this CR. |
| R4-2001652 | Recommended to postpone this CR. |

# Topic #3: RSS

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000728 | Qualcomm Incorporated | For a UE that supports RSS-based RSRP measurement, UE shall be required to use RSS for RSRP measurement of a serving or neighbour cell in RRC\_CONNECTED mode and meet the corresponding accuracy requirements only if:   1. RSS frequency location of the cell being measured occurs in the NB(s) that UE monitors for MPDDCH for the *N* number of samples, and 2. RSS time location of the cell being measured does not coincide with UE’s measurement gap (if configured), and 3. RSS power offset of the cell being measured is not smaller than 0 dB |
| R4-2001746 | Ericsson | RSS based RRM measurements are allowed in RRC\_CONNECTED state if they can be performed without using measurement gaps. |
| R4-2001653 | Huawei, HiSilicon | RAN4 to not define RSS based measurement requirements for Connected state.  For Idle state, RSS measurement requirement is not defined at least for neighbor cells whose RSS is not at the same time/frequency location as the serving cell.  For Idle state, RAN4 to further discuss the applicability of RSS measurement requirements for serving cell and neighbour cells whose RSS is at the same time/frequency location as the serving cell.   * + Additional simulation results presented     - 1.5dB without margin or 5.5dB with margin at -6dB for BL UE     - 1dB without margin or 3.5dB with margin at -6dB for non-BL UE     - 1.5dB without margin or 4dB with margin at -12dB for non-BL UE     - 2.5dB without margin or 5dB with margin at -12dB for non-BL UE |
| R4-2001747 | Ericsson | Changes to capture the accuracy requirements. |
| R4-2001749 | Ericsson | CR to introduce using of RSS for random access. |

## Open issues summary

The first open issue is related to CONNECTED mode measurements are open for which there are two open issues: 1) CONNECTED mode serving cell measurement, 2) CONNECTED mode neighbour cell measurements

The second open issue is related to accuracy requirements, for which there are new proposals from R4-2001653.

### Sub-topic 3-1 RSS based measurements

The first open issue is related to CONNECTED mode measurements are open for which there are two open issues: 1) CONNECTED mode serving cell measurement, 2) CONNECTED mode neighbour cell measurements

**Issue 3-1: CONNECTED mode measurements**

* Proposals 1:
  + Option 1 (R4-2000728):

For a UE that supports RSS-based RSRP measurement, UE shall be required to use RSS for RSRP measurement of a serving or neighbour cell in RRC\_CONNECTED mode and meet the corresponding accuracy requirements only if:

1. RSS frequency location of the cell being measured occurs in the NB(s) that UE monitors for MPDDCH for the *N* number of samples, and
2. RSS time location of the cell being measured does not coincide with UE’s measurement gap (if configured), and
3. RSS power offset of the cell being measured is not smaller than 0 dB
   * Option 2 (R4-2001746):

RSS based RRM measurements are allowed in RRC\_CONNECTED state if they can be performed without using measurement gaps.

* + Option 2 (R4-2001653):

RAN4 to not define RSS based measurement requirements for Connected state.

* Recommended WF
  + It seems proposals in R4-2000728 and R4-2001746 are similar to some extent. Try to agree on CONNECTED mode serving cell and neighbor cells measurement under certain conditions as proposed in option 1.

**Issue 3-2: IDLE mode measurements**

* Proposal 1 (R4-2001653):

For Idle state, RSS measurement requirement is not defined at least for neighbor cells whose RSS is not at the same time/frequency location as the serving cell.

* Proposal 2 (R4-2001653):

For Idle state, RAN4 to further discuss the applicability of RSS measurement requirements for serving cell and neighbour cells whose RSS is at the same time/frequency location as the serving cell.

* Recommended WF
  + RAN4 has so far focused on IDLE mode measurements, and good progress have been made for those. Only the CONNECTED mode measurements is an open issue. Difficult to agree on the above proposals.

### Sub-topic 1-2: Accuracy requirements

RAN4 has perofmed simulation campaign for deriving the RSS based RSRP measurement accuracy requirements. The accuracy requirements were agreed based on summary of results from interested companies, and they were summarized and agreed in R4-1915889.

*Open issues and candidate options before e-meeting:* No open issue

**Issue 3-3: Accuracy levels**

Proposals (R4-2001653):

* + Additional simulation results presented
    - 1.5dB without margin or 5.5dB with margin at -6dB for BL UE
    - 1dB without margin or 3.5dB with margin at -6dB for non-BL UE
    - 1.5dB without margin or 4dB with margin at -12dB for non-BL UE
    - 2.5dB without margin or 5dB with margin at -12dB for non-BL UE
* Recommended WF
  + Update the accuracy levels by taking into account the new results. The accuracy levels in the CR needs to be updated accordingly.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Qualcomm | Sub topic 3-1: We agree with the WF  Sub topic 3-2: We support Proposal 1. For proposal 2, serving and neighbor cell measurement using RSS can be done if conditions are aligned with simulation assumptions used in defining accuracy requirements.  Sub topic 3-3: We need to see how the average results change based on the new simulation results before agreeing to it. What is the new proposed table for accuracy requirements?  ….  Others: |
| Huawei, HiSilicon | Issue 3-1: We agree UE can measure RSS of serving and neighbor cells if RSS can be measured without measurement gaps. However, we are not sure how to define requirements for it, e.g. if during one RSS occasion UE is scheduled with PDSCH on another NB, how could UE perform RSS measurement and meet the requirements?  Issue 3-2: RAN4 has not really discussed the applicability of RSS requirements so far. Considering the importance of power saving in Idle mode, we think Proposal 1 is straightforward. For Proposal 2, the issue is not only related to accuracy but also the measurement time, e.g. depending on configuration the measurement delay for RSS can be longer than CRS. In this case, should the CRS requirements apply or RSS requirements apply? We think this needs to be further discussed.  Issue 3-3: Thanks for taking into our results into account. **However, it seems Proposal 3 and 4 in our paper R4-2001653 is not captured in the summary.** Basically, we suggest to take average of the baseband errors and add on top the same RF margin used for deriving existing eMTC accuracy requirements. This is common practice in RAN4 RRM. The reason is that in the summary of proposals from last meeting WF, some companies are assuming much better RF margin than the one used for deriving existing eMTC accuracy requirement especially for the BL UE (low cost). |
| Ericsson | Issue 3-1:  Recommended WF is fine.  Issue 3-2:  RAN4 shall agree on at least the serving cell measurements in IDLE mode.  Issue 3-3:  Recommended WF is fine. |
| Nokia | We propose to continue discussion on all three issues in the second round. |

### 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** |
| R4-2001747 (Ericsson) | Qualcomm:This clause is under CONNECTED mode measurements so the conditions that allows RSS-based measurement in connected mode (e.g, not requiring MG) should be reflected here once sub topic 3-1 is concluded. As it stands, this CR is not representing the whole picture. |
| Huawei, HiSilicon: The exact values for the accuracy requirements need to be based on the discussion of Issue 3-3. Also, the applicability of the requirements (currently defined for Connected) needs to be based on discussion of Issue 3-1.  Ericsson: If it is agreed to use RSS also the CONNECTED mode neighbor cell measurements under certain conditions, we agree that the CR needs to be revised accordingly. |
|  |
| R4-2001749 (Ericsson) | Qualcomm: Is the term R-RSRP defined somewhere? Also, the initial access coverage level selection should be excluded from using R-RSRP.  [response to Q below from Huawei: RSS parameters are not known in initial access. In addition, initial access is done using the center NB which has PSS/SSS and per RAN1 agreement, RSS is never mapped to center NB. |
| Huawei, HiSilicon: We prefer not to specifically mention any task that can be done with RSS measurement. It would be confusing whether RSS measurement can be used for other task e.g. cell reselection.  We have a question to above comment from Qualcomm, why RSS measurement cannot be used for initial access coverage level selection? |
| Ericsson: R-RSRP is much easier to use than “RSS based RSRP”. It is similar to NRSRP, NSSS etc. If agreed, we need to make sure that this term is also used in the definition in TS 36.214.  To Huawei, it seems the current wording in RA section is bit limited to CRS based measurements only. We want to extend it or clarify that RSS can be used at least for the enhanced coverage scenario. |

## 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** |
| **Topic#4** | *Following options are identified as tentative agreements, however they need to be discussed further in 2nd round.*  Issue 3-1:  *Option: RAN4 to define RSS based RSRP measurements in CONNECTED mode for serving cells and neighbor cells under certain conditions regarding placement of RSS resources in the cell bandwidth. How to capture the conditions are to be discussed further.*  Issue 3-2:  *Option: For Idle state, RSS measurement requirement is not defined at least for neighbor cells whose RSS is not at the same time/frequency location as the serving cell.*  *For Idle state, RSS measurement requirements are defined when the serving cell and neighbour cells whose RSS is at the same time/frequency location as the serving cell, how to define the measurement delay is to be discussed further.*  Issue 3-1:  *Option: Discuss how to capture the conditions regarding RSS resource placements in the cell bandwidth for serving cell and neighbor cell measurements in CONNECTED mode.*  Issue 3-2:  *Option: How to define measurement delay requirements when the serving cell and neighbour cells whose RSS is at the same time/frequency location as the serving cell.*  Issue 3-3:  *Option: More discussions needed on accuracy levels.*  ***Tentative agreements:***  *More discussions needed on the topics/options above in the 2nd round.* |

### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2001747 | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”*  CR to be revised based on the discussions in the second round. |
| R4-2001749 | CR to be revised based on the discussions in the second round. |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| R4-2002268 | WF on Rel-16 MTC RRM Requirements | Ericsson |

## Discussion on 2nd round (if applicable)

### 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** |
| Issue 3-1:  CONNECTED mode measurements | ***Possible agreeable option or topics to discuss:***  *RAN4 to define RSS based RSRP measurements in CONNECTED mode for serving cells and neighbor cells under certain conditions regarding placement of RSS resources in the cell bandwidth. How to capture the conditions are to be discussed further.* |
| Issue 3-2:  IDLE mode measurements | ***Possible agreeable option or topics to discuss:***  *For Idle state, RSS measurement requirement is not defined at least for neighbor cells whose RSS is not at the same time/frequency location as the serving cell.*  *For Idle state, RSS measurement requirements are defined when the serving cell and neighbour cells whose RSS is at the same time/frequency location as the serving cell, how to define the measurement delay is to be discussed further.* |
| Issue 3-1 and 3-2:  IDLE/CNNECTED mode measurements | ***Possible agreeable option or topics to discuss:***  *Discuss how to capture the conditions regarding RSS resource placements in the cell bandwidth for serving cell and neighbor cell measurements in CONNECTED mode.* |
| Issue 3-1 and 3-2:  IDLE/CNNECTED mode measurements | ***Possible agreeable option or topics to discuss:***  *How to define measurement delay requirements when the serving cell and neighbour cells whose RSS is at the same time/frequency location as the serving cell.* |
| Issue 3-3:  Accuracy Requirements | ***Possible agreeable option or topics to discuss:***  Update the accuracy levels by taking into account the new results. The accuracy levels in the CR needs to be updated accordingly. Continue the discussion from there. |

### Open issues - comments

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Issue 3-1: The conditions required for applicability of RSS-based requirements in connected mode is not just about the placement of RSS resources but also depends on the power offset with respect to CRS and whether the neighbor cells are in the neighbor cell list with signaled RSS parameters. The possible agreement in the table above needs to reflect these.  Issue 3-2: Why does RSS of neighbor cell have to be in the same frequency location of serving cell? Perhaps, it was meant to say in the same NB? In our understanding, there are 3 possibilities for RSS frequency location in each NB and as long as they are within the same NB, UE can process it. Also, the comment about RSS power offset in issue 3-1 applies here as well as another condition.  Regarding the 3rd and 4th rows in the table above, it is not clear whether the expectation is to discuss the topics in the 2nd round or is it going to be listed in the WF for further discussion in the next meeting? |
| Huawei, HiSilicon | Issue 3-1: we are fine with the proposals in principle, and the exact conditions for the requirements can be further discussed.  Issue 3-2: we are fine with the proposals in principle, and the delay requirements should be further discussed. To Qualcomm comments above, at this stage, we prefer to limit to same ‘place’, where ‘place’ means the same 2-PRB BW as the serving cell RSS. If it is extended to same ‘NB’, it would mean UE needs to in parallel process 3 RSS carriers, and we need more time check on this.  Issue 3-3: we are fine with the proposals in principle, but we still would like to clarify the plan from the moderator: are we going to average the results with or without RF margin? We suggest to average the results without RF margin, and then apply the same RF margin as used in Rel-14 eMTC discussion. We do not receive any feedback why a different RF margin should be assumed. |
| Ericsson | Issue 3-1:  We agree with the possible agreement listed in the open issue. In our understanding, RAN1 has made the agreement that UE shall assume that the power levels of RSS of the neighbor cells are the same as the serving cell.  Issue 3-2:  We agree with Qualcomm that measurements should not be limited to the case when the RSS are placed on the same time/frequency locations, this limits the benefit of this feature. We are also OK with Huawei to allow more time to check conditions for the next meeting.  Issue 3-3:  Our prefer is to stick to the method used for deriving the existing results, i.e. averaging including the RF margin. In our understanding, the reference to the Rel-14 MTC is not a formally agreed contribution. |
| Moderator view: | The last three rows are related to the conditions, and it is suggested to move these to the way forward document. Companies can look into the possible locations for RSS and provide views for the next meeting.  It is suggested to use the agreed method to derive the accuracy results. According to agreements in R4-1912735, the delta RSRP is derived using averaged measurements. The accuracy levels are including the RF margin. |
| Nokia | Regarding Issue 3-1 and 3-2, we agree more discussion is needed, but the proposed WF in section 4.5.1 can serve as baseline for the next meeting. Regarding Issue 3-3, we agree to the Moderator view.  Regarding normative work, a running CR, as for PUR, is suggested here also. We propose to name the new measurement “RSS-RSRP” (aligning to e.g. PRS-RSRP based on PRS or SRS-RSRP based on SRS). This will need to be added in the definitions section. |

## 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** |
| R4-2001747 | Recommended to postpone the CR. |
| R4-2001749 | Recommended to postpone the CR. |

*Suggestion on WF/LS assignment*

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

# Topic #4: DL Quality reporting

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001349 | Ericsson | Set -6 ≤ Es/Iot ≤ -3 dB as the side condition to report the repetition level with the fixed AL=24.  Set Es/Iot ≥ -3 dB as the side condition to report the aggregation level with the fixed RL=1.  Report level 7 (RL=1 and AL24) is also applicable for CE Mode B UE.  RAN4 wants for RAN2 decision whether 2-bit channel quality report is supported or not. |
| R4-2001651 | Huawei, HiSilicon | - use one (unified) side-conditions for all reporting  - Reportable values for 8-bit reporting is as specified in the RAN1 table  - Whether 2-bit reporting is supports depends on RAN2 outcome |
| R4-2001650 | Huawei, HiSilicon |  |

## Open issues summary

Following open issues are remaining:

* side conditions for measurement quality requirements
* reportable values for 8-bit reporting
* 2-bit channel quality reporting

### Sub-topic 4-1: Side conditions

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

The side conditions for the DL quality reporting accuracy is open.

**Issue 4-1: side conditions for accuracy requirements**

* Proposals
  + Option 1 (R4-2001349):
    - Separate accuracy requirements for fixed AL24 and fixed RL=1
      * Set -6 ≤ Es/Iot ≤ -3 dB as the side condition to report the repetition level with the fixed AL=24.
      * Set Es/Iot ≥ -3 dB as the side condition to report the aggregation level with the fixed RL=1.
  + Option 2 (R4-2001649):
    - Adopt Table 2 for defining accuracy requirements for quality reporting in Rel-16 eMTC.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| PDCCH Repetition | Pm-Dsg (%) | Conditions | | | | |
| Ês/Iot | Io NOTE 1 range | | | |
| E-UTRA operating band groups NOTE 2 | Minimum Io | | Maximum Io |
|  | dB |  | dBm/15kHz | dBm/BWChannel | dBm/BWChannel |
| L NOTE 1 | ≤1 | ≥ -6 dB | FDD-M1\_A, TDD-M1\_A | -121 | N/A | -70 |
| FDD-M1\_B | -120.5 | N/A | -70 |
| FDD-M1\_D | -119.5 | N/A | -70 |
| FDD-M1\_E, TDD-M1\_E | -119 | N/A | -70 |
| FDD-M1\_F | -118.5 | N/A | -70 |
| FDD-M1\_G | -118 | N/A | -70 |
| FDD-M1\_N | -114.5 | N/A | -70 |
| L-2 NOTE 1 | >1 | ≥ -6 dB | Note 4 | Note 4 | Note 4 | Note 4 |
| L NOTE 1 | ≤1 | -15 ≤ Ês/Iot ≤ -6 dB | Note 4 | Note 4 | Note 4 | Note 4 |
| L-3 NOTE 1 | >1 | -15 ≤ Ês/Iot ≤ -6 dB | Note 4 | Note 4 | Note 4 | Note 4 |
| NOTE 1: L is the level of DL channel quality that UE has reported.  NOTE 2: Io is assumed to have constant EPRE across the bandwidth.  NOTE 3: E-UTRA operating band groups are as defined in Section 3.5.  NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as L reported and Ês/Iot≥-6 dB. | | | | | | |

* Recommended WF
  + More discussions needed, input from other companies are encouraged.

### Sub-topic 4-2: 8-bit reporting

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

The reporting values for the 8-bit reporting table is open.

**Issue 4-2: Reportable values for 8-bit reporting**

* Proposals
  + Option 1 (R4-2001349):
    - Report level 7 (RL=1 and AL24) is also applicable for CE Mode B UE.

|  |  |  |  |
| --- | --- | --- | --- |
| Reported level | MPDCCH repetition level | MPDCCH aggregation level | CE mode |
| 0 | No measurement reporting | No measurement reporting | A, B |
| 1 | 1 | 1 | A |
| 2 | 1 | 2 | A |
| 3 | 1 | 4 | A |
| 4 | 1 | 8 | A |
| 5 | 1 | 12 | A |
| 6 | 1 | 16 | A |
| 7 | 1 | 24 | A, B |
| 8 | 2 | 24 | A, B |
| 9 | 4 | 24 | A, B |
| 10 | 8 | 24 | A, B |
| 11 | 16 | 24 | A, B |
| 12 | 32 | 24 | A, B |
| 13 | 64 | 24 | A, B |
| 14 | 128 | 24 | A, B |
| 15 | 256 | 24 | A, B |

* + Option 2 (R4-2001649):
    - Reportable values for 8-bit reporting is as specified in the RAN1 table

|  |  |  |  |
| --- | --- | --- | --- |
| **Reported level** | **MPDCCH repetition level** | **MPDCCH aggregation level** | **CE mode** |
| 0 | No measurement reporting | No measurement reporting | A, B |
| 1 | 1 | 1 | A |
| 2 | 1 | 2 | A |
| 3 | 1 | 4 | A |
| 4 | 1 | 8 | A |
| 5 | 1 | 12 | A |
| 6 | 1 | 16 | A |
| 7 | 1 | 24 | A |
| 8 | 2 | 24 | A, B |
| 9 | 4 | 24 | A, B |
| 10 | 8 | 24 | A, B |
| 11 | 16 | 24 | A, B |
| 12 | 32 | 24 | A, B |
| 13 | 64 | 24 | A, B |
| 14 | 128 | 24 | A, B |
| 15 | 256 | 24 | A, B |

* Recommended WF
  + More discussions needed.

### Sub-topic 4-3: 2-bit reporting

*Sub-topic description*

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

It is open whether 2-bit reporting can be supported for DL quality reporting.

**Issue 1-2: 2-bit reporting**

* Proposals
  + Option 1: (R4-2001349, R4-2001649)
    - Whether 2-bit reporting is supports depends on RAN2 outcome
  + Option 2:
* Recommended WF
  + RAN4 waits for RAN2 conclusion on this 2-bit reporting.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Sub topic 4-1: Our proposal is the same as in RAN4#93 meeting (R4-1915182) which is more aligned with Option 1. However, the side condition for report AL < 24 is very different in option 1 compared to our results (almost 9 dB difference). We prefer not to go with option 2. In the SNR range from -15 to -6 dB, known for CE mode B, AL = 24 so there is no need for to specify L in the table for this range.  [Additional comments]: our simulation results were based on ETU30. Ericsson’s simulation results are based on AWGN for the side condition. What channel is typically used for DL quality reporting accuracy requirements?  Sub topic 4-2: We prefer to stick with the table agreed in RAN1. Although the spec allows RL = 1 for CE mode A in MPDCCH, it does not make sense.  [Additional comments]: we just realized that AL=12 with repetition level = 1 is not allowed in TS 36.213 which means candidateRep-5 in the RAN1 report mapping table is not possible. We suggest to come back to this issue in the next meeting.  Sub topic 4-3: we agree with the WF.  ….  Others: |
| Huawei, HiSilicon | Issue 4-1: We have no strong view, but we would like to clarify that we made a mistake in our proposal (option 2). The left column should be “Reported level” instead of “PDCCH Repetition”. The intention is that UE can report any level L from the 8-bit mapping table based on its evaluation, the accuracy is defined by comparing PDCCH performance between L and L-2 or L-3. The benefit is that we can save the efforts to align the PDCCH performance to decide the break point.  Issue 4-2: We are also fine with option 1.  Issue 4-3: Support the recommended WF. |
| Ericsson | Issue 4-1: We don’t have strong view either Option 1 or Option 2. Option 2 makes the accuracy requirement table more generic. We are fine as far as the table has notes:   1. Es/Iot < -6dB is applicable for CE Mode B; L >= 7 (option 1 in Issue 4-2) or L >= 8 (option 2 in Issue 4-2). 2. L=0/1/2 should be excluded from CE mode A and L=0/1/2/3 should be excluded from CE Mode B.   [Additional comments]: our simulation results were based on AWGN because RAN4 used AWGN when we specified the channel quality reporting test for NB-IoT in Rel-14.  Issue 4-2: We prefer option 1, since CE Mode B UE should be able to report repetition level 1 also during the operation. Although RAN1 suggested the mapping table, RAN4 is responsible to decide the final mapping table specified in TS36.133.  Issue 4-3: Support option 1. |
| Nokia | For sub topics 4-1, 4-2 and 4-3, we agree the WF (further discussion needed). |

### 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** |
| R4-2001650 (Huawei, HiSilicon) | Qualcomm: typo in the title! |
| Huawei, HiSilicon: Sorry for the typo … We can correct it with revision. |
| Ericsson: We can wait for RAN2 spec (TS36.321 and 331) for the corresponding changes, and RAN4 conclusion on measurement accuracy.  IDLE mode   1. Section number. They set 4.7.5. But the current TS36.133 has until 4.7.2, it looks 4.7.3/4.7.4 are skipped? 2. They refer to 9.1.21.24 and 9.1.21.25, but no corresponding sections are available. 3. They specify:    1. derived from the channel quality measured in the period T2 in the narrowband…   It looks they copy from NB-IoT spec; they have T1 and T2, but no T1 from eMTC. So it is a bit strange only T2 is mentioned. Better to rephrase this sentence.  CONNECTED mode   1. Same comment as IDLE; They refer to 9.1.21.24 and 9.1.21.25, but no corresponding sections are available. |
|  |  |
|  |
|  |

## 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** | *It might be possible to reach following agreements. However, more discussions are needed as requested by company.*  Issue 4-1:  *Try to agree on following, otherwise* move the discussion to 2nd round.   * Separate accuracy requirements for fixed AL24 and fixed RL=1   + Set -6 ≤ Es/Iot ≤ [-3] dB as the side condition to report the repetition level with the fixed AL=24.   + Set Es/Iot ≥ [-3] dB as the side condition to report the aggregation level with the fixed RL=1. * Use static channel for test case as same as Rel-14 NB-IoT channel quality reporting.   Issue 4-2:  *As Qualcomm pointed out, TS36.213 specifies the combination of RL1 and AL12 is not allowed and therefore Reported level 5 should not be used.*  *Since RAN1 has already complete the core part, the moderator proposes to specify the following reporting level table in TS36.133, otherwise move the discussion to 2nd .*   * + - *Report level 7 (RL=1 and AL24) is also applicable for CE Mode B UE.*  |  |  |  |  | | --- | --- | --- | --- | | *Reported level* | *MPDCCH repetition level* | *MPDCCH aggregation level* | *CE mode* | | *0* | *No measurement reporting* | *No measurement reporting* | *A, B* | | *1* | *1* | *1* | *A* | | *2* | *1* | *2* | *A* | | *3* | *1* | *4* | *A* | | *4* | *1* | *8* | *A* | | *5* | *1* | *16* | *A* | | *6* | *1* | *24* | *A* | | *7* | *2* | *24* | *A, B* | | *8* | *4* | *24* | *A, B* | | *9* | *8* | *24* | *A, B* | | *10* | *16* | *24* | *A, B* | | *11* | *32* | *24* | *A, B* | | *12* | *64* | *24* | *A, B* | | *13* | *128* | *24* | *A, B* | | *14* | *256* | *24* | *A, B* |     Issue 4-3:  *RAN4 waits for RAN2 conclusion on this 2-bit reporting.*  ***Tentative agreements:***  *More discussions needed in the second round.*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| R4-2002268 | WF on Rel-16 MTC RRM Requirements | Ericsson |

## Discussion on 2nd round (if applicable)

### 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** |
| Issue 4-1: | ***Possible agreeable option or topics to discuss:***   * Separate accuracy requirements for fixed AL24 and fixed RL=1   + Set -6 ≤ Es/Iot ≤ [-3] dB as the side condition to report the repetition level with the fixed AL=24.   + Set Es/Iot ≥ [-3] dB as the side condition to report the aggregation level with the fixed RL=1. * Use static channel for test case as same as Rel-14 NB-IoT channel quality reporting. |
| Issue 4-2: | ***Possible agreeable option or topics to discuss:***  *As Qualcomm pointed out, TS36.213 specifies the combination of RL1 and AL12 is not allowed and therefore Reported level 5 should not be used.*  *Since RAN1 has already complete the core part, the moderator proposes to specify the following reporting level table in TS36.133, otherwise move the discussion to 2nd .*   * + - *Report level 7 (RL=1 and AL24) is also applicable for CE Mode B UE.*  |  |  |  |  | | --- | --- | --- | --- | | *Reported level* | *MPDCCH repetition level* | *MPDCCH aggregation level* | *CE mode* | | *0* | *No measurement reporting* | *No measurement reporting* | *A, B* | | *1* | *1* | *1* | *A* | | *2* | *1* | *2* | *A* | | *3* | *1* | *4* | *A* | | *4* | *1* | *8* | *A* | | *5* | *1* | *16* | *A* | | *6* | *1* | *24* | *A* | | *7* | *2* | *24* | *A, B* | | *8* | *4* | *24* | *A, B* | | *9* | *8* | *24* | *A, B* | | *10* | *16* | *24* | *A, B* | | *11* | *32* | *24* | *A, B* | | *12* | *64* | *24* | *A, B* | | *13* | *128* | *24* | *A, B* | | *14* | *256* | *24* | *A, B* | |
| Issue 4-3: | ***Possible agreeable option or topics to discuss:***  *RAN4 waits for RAN2 conclusion on this 2-bit reporting.* |

### Open issues - comments

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Issue 4-1: we’re fine with the proposal  Issue 4-2: we’re fine with adding CE mode B to report level 7 (not 7) in the table above. We’d like to note that given the removal of one row in the table, the AL and AL-2/AL-3 in the accuracy requirements should be carefully specified to avoid falling on an invalid AL.  Issue 4-3: We’re fine with the proposal. |
| Huawei, HiSilicon | 4-1: we are fine with the proposals in principle, but shouldn’t the first bullet be “Set -15 ≤ Es/Iot ≤ [-3] dB” since RL reporting with fixed AL24 also applies to CEModeB.  4-2: we are fine with the proposals  4-3: we are fine with the proposals  To moderator, our CR R4-2001650 was not treated in Chairman notes after 1st round. If there is no further comment, can we get a revised number to correct the typo pointed out by Qualcomm? |
| Ericsson | Issue 4-1: Support the proposal  Issue 4-2: We are ok to specify the table below in TS36.133. As Qualcomm commented, the accuracy requirements should be set carefully. We encourage companies to provide the MPDCCH simulation results in the next meeting.   |  |  |  |  | | --- | --- | --- | --- | | *Reported level* | *MPDCCH repetition level* | *MPDCCH aggregation level* | *CE mode* | | *0* | *No measurement reporting* | *No measurement reporting* | *A, B* | | *1* | *1* | *1* | *A* | | *2* | *1* | *2* | *A* | | *3* | *1* | *4* | *A* | | *4* | *1* | *8* | *A* | | *5* | *1* | *16* | *A* | | *6* | *1* | *24* | *A, B* | | *7* | *2* | *24* | *A, B* | | *8* | *4* | *24* | *A, B* | | *9* | *8* | *24* | *A, B* | | *10* | *16* | *24* | *A, B* | | *11* | *32* | *24* | *A, B* | | *12* | *64* | *24* | *A, B* | | *13* | *128* | *24* | *A, B* | | *14* | *256* | *24* | *A, B* |   Issue 4-3: Support the proposal (Note check with RAN2 the progress) |
| Moderator | Since there were on-going discussions on the same topic, the plan was to treat it in the 2nd round. If no comments are received by second round, this CR will be revised and recommended for approval in the moderator summary. New Tdoc number will be requested from the chairman. |
| Nokia | Regarding Issue 4-1, 4-2 and 4-3, we agree to the moderator proposals in section 5.5.1 . |

## 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** |
|  |  |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | WF on Rel-16 MTC RRM agreements  Note: one WF to cover all subtopics | Ericsson |

### 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** |
| R4-2001650 | Recommended to postpone the CR. |

# Topic #5: MPDCCH Improvement

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000727 | Qualcomm Incorporated | P1: RAN4 does not consider defining new RLM test cases based on R16 MPDCCH performance improvement in SNR points above -10 dB or in fading channel conditions.  P2: RAN4 to discuss the possibility of adding new RLM test cases based on R16 MPDCCH performance improvement in SNR points below -10 dB and AWGN channel. |
| R4-2001350 | Ericsson | P1: When the network configures the enhanced RLM (rlm-ReportConfig) and improved MPDCCH (mpdcch-crs-connected-config), UE applies the improved MPDCCH transmission parameters for evaluating the out-of-synch when UE reports the Event E1 to the network. This is applicable for both CE Mode A UE and CE Mode B UE. |
| R4-2001481 | Huawei, HiSilicon | Simulation assumptions provided. |

## Open issues summary

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

Following open issues are remaining:

* SNR test points for RLM Qin/Qout with improved MPDCCH

### Sub-topic 5-1: SNR test points

*Sub-topic description:*

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

The SNR test points at which RLM based on improved MPDCCH is open.

**Issue 5-1: SNR test points**

* Proposals 1 (R4-2000727):
  + RAN4 does not consider defining new RLM test cases based on R16 MPDCCH performance improvement in SNR points above -10 dB or in fading channel conditions.
* Proposals 2 (R4-2000727):
  + RAN4 to discuss the possibility of adding new RLM test cases based on R16 MPDCCH performance improvement in SNR points below -10 dB and AWGN channel.
* Proposals 3 (R4-2001350):
  + When the network configures the enhanced RLM (rlm-ReportConfig) and improved MPDCCH (mpdcch-crs-connected-config), UE applies the improved MPDCCH transmission parameters for evaluating the out-of-synch when UE reports the Event E1 to the network. This is applicable for both CE Mode A UE and CE Mode B UE.
* Proposals 4 (R4-2001481):
  + Test parameters is provided for testing improved MPDCCH using CRS+DMRS
* Recommended WF
  + It seems the view from Qualcomm and Ericsson to apply RLM based on improved MPDCCH when channel quality gets bad, i.e., out-of-synch, is quite aligned. Try to agree on proposals 1, 2 and 3. Proposal 4 becomes relevant when the work to develop actual test cases starts.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Sub topic 5-1: In WF from RAN4#93 meeting, simulation assumptions for MPDCCH performance improvement were agreed. We’re disappointed that no other company has submitted simulation results per the agreed plan. In the absence of results from other companies, discussion on this topic should not move forward.  Sub topic 1-2:  ….  Others: |
| Huawei, HiSilicon | Issue 5-1: In last meeting it was agreed that there will be no impact to the RLM core requirements, but RAN4 will discuss the SNR test points in performance part.  - Proposal 1 and 2 are very specific based on simulation results, so we need more time to check.  - Proposal 3, in the discussion and the figure it is proposed to update Qout, which is used for RLM instead of E1/E2 reporting, but in the proposal they are linked together, so could the proponent explain the logic here? |
| Ericsson | Issue 5-1: We agree with the recommended WF. Two companies have common understanding the improved MPDCCH based RLM is useful especially in very low SNR such as < -10dB. In this case it does not make sense UE always uses DMRS+CRS for MPDCCH demodulation even in higher SNR, e.g.., SNR=20dB, because it needs more UE computation. On the other hand, it is not clear from both UE and BS when UE uses DMRS+CRS for MPDCCH demodulation. Therefore one possible way is to use DMRS+CRS when UE report Event E1 to BS. If advanced RLM is not configured, it is up to UE implementation when it uses CRS+DMRS. |
| Nokia | We propose to continue the discussion in the second round. |

## 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#5-1** | ***Tentative agreements:***  *Companies are encouraged to provide simulation results, and discussions will continue based on the outcome of results.*  *Recommendations for 2nd round:*  *Discussions to be continued.* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| R4-2002268 | WF on Rel-16 MTC RRM Requirements | Ericsson |

## Discussion on 2nd round (if applicable)

### 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** |
| **Issue 5-1**  SNR test points | ***Possible agreeable option or topics to discuss:***  *Companies are encouraged to provide simulation results, and discussions will continue based on the outcome of results.*  *Continue the discussions from the 1st round.* |
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### Open issues - comments

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| **Company** | **Comments** |
| Qualcomm | We don’t think any further progress is possible on issue 5-1 in this meeting. |
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### 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** |
| R4-2001350 (TP, Ericsson) | Qualcomm: Premature to discuss as no other company has submitted simulation results. |
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### 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** |
| 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*

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| **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 #6: Performance requirements

*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** |
| R4-2001751 | Ericsson | WUS: no new test cases  PUR: no new test cases  Improved MPDCCH: new test cases  RSS: no test case in IDLE mode, new test cases for serving cell.  DL quality reporting: New test cases in both IDLE and CONNECTED mode |
| R4-2000726 | Qualcomm Incorporated | WUS: no new test cases  PUR: consult RAN5  Improved MPDCCH: discussions on new test cases shall take place after collecting simulation results.  RSS: new test case for the serving cell in CONNECTED mode  DL quality reporting: new test cases are introduced for MSG3 DL channel quality reporting. |

## Open issues summary

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

RAN4 needs to agree on the type of test cases (test case list) to be introduced for the RRM core requirements.

### Sub-topic 7-1: Test cases

*Sub-topic description:*

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

There are two CRs with very little difference on how to capture the changes. No technical differences in the CRs.

**Issue 7-1: WUS test case**

* Proposals (R4-2001751):

No new test case introduced.

* Proposals (R4-2000726):

RAN4 to not specify any performance tests for group WUS.

* Recommended WF
  + RAN4 agrees not to introduce any test case for group WUS.

**Issue 7-2: PUR test case**

* Proposals (R4-2001751):

No new test case introduced.

* Proposals (R4-2000726):

RAN4 to further consult RAN5 on how to make UE generate MO-data in RRC idle in order to test PUR feature.

* Recommended WF
  + RAN4 agrees to consult RAN5 on how to define test case for PUR in IDLE mode as proposed in R4-2000726.

**Issue 7-3: Improved MPDCCH test case**

* Proposals (R4-2001751):

New test cases are introduced to verify the RLM using improved MPDCCH

* Proposals (R4-2000726):

RAN4 should discuss whether new RLM test cases for UE supporting MPDCCH performance improvement is needed after collecting the simulation results from interested companies.

* Recommended WF
  + More discussions are needed.

**Issue 7-4: RSS**

* Proposals (R4-2001751):

No test case in IDLE mode, but new test cases are introduced for the serving cell in CONNECTED mode.

* Proposals (R4-2000726):

RAN4 to specify performance test for RSS-based RSRP measurement in connected mode for serving cell with AWGN channel. RSS configuration of the two cells should be furnished to UE. UE’s narrowband for monitoring MPDCCH should contain RSS frequency allocation in RSS occasion.

* Recommended WF
  + RAN4 agrees to introduce test case for serving cell measurements in CONNECTED mode.

**Issue 7-5: DL quality reporting**

* Proposals (R4-2001751):

New test cases in both IDLE and CONNECTED mode

* Proposals (R4-2000726):

RAN4 to specify performance tests for MSG3 DL channel quality reporting for at least three scenarios: 1) CE mode A with RP = 1, and AL < 24, 2) CE mode A with RP > 1 and AL = 24, and 3) CE mode B with RP > 1 and AL = 24. Tests to be in AWGN with 4-bit reporting. RAN4 can discuss whether to duplicate the tests for connected mode or split between MSG3 and connected mode to limit the total number of tests. NB-IoT tests in R15 can be used as guidelines.

* Recommended WF
  + RAN4 agrees to introduce test case for DL quality reporting in IDLE and CONNECTED mode. Test configurations are to be discussed further at next meeting.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Qualcomm | Sub topic 7-1: We agree to the WF.  Sub topic 7-2: We agree to the WF.  Sub topic 7-3: Should be postponed to the next meeting or until companies provide simulation results as mentioned in Topic#6.  Sub topic 7-4: The WF is not specific enough. Only if RSS freq allocation remains in the NB that UE is monitoring, serving cell measurement in CONNECTED mode can be defined.  Sub topic 7-5: We agree to the WF.  ….  Others: |
| Huawei, HiSilicon | Issue 7-1: Support the recommended WF.  Issue 7-2: Just to clarify: Is UE mandated to use PUR when it is configured by the network, or is it up to UE implementation? In the latter case it may be difficult to test.  Issue 7-3: Suggest to have more discussion during Perf part.  Issue 7-4: Just to clarify: Is the proposal to define test cases for measurement delay, measurement accuracy or both?  Issue 7-5: Support the recommended WF. |
| Ericsson | Issue 7-1:  Agreeing to the WF.  Issue 7-2:  Agreeing to the WF.  Issue 7-3:  More discussions needed.  Issue 7-4:  Should be discussed after the core requirements are completed.  Issue 7-5:  Agreeing to WF. |
| Nokia | We agree with proposed WF for 7.1 to 7.5. |

### 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** |
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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** | ***Tentative agreements:***  Issue 7-1:  *RAN4 agrees to not specify any performance tests for group WUS.*  Issue 7-2:  *RAN4 agrees to further consult RAN5 on how to make UE generate MO-data in RRC idle in order to test PUR feature.*  Issue 7-5:  *RAN4 agrees to introduce test case for DL quality reporting in IDLE and CONNECTED mode. Test configurations are to be discussed further at next meeting.*  *Candidate options:*  *Recommendations for 2nd round:*  RAN4 is to discusses issue 7-4 (RSS based RSRP measurement) test cases in the 2nd round. |

*Recommendations on WF/LS assignment*

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|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| R4-2002268 | WF on Rel-16 MTC RRM Requirements | Ericsson |

## Discussion on 2nd round (if applicable)

### Open issues

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| **Company** | **Comments** |
| Issue 7-1:  WUS test case | *This issue is to be discussed if time allows after discussing the open issues of the core part:*  ***Possible agreeable option or topics to discuss:***  *RAN4 agrees to not specify any performance tests for group WUS.* |
| Issue 7-2:  PUR test case | *This issue is to be discussed if time allows after discussing the open issues of the core part:*  ***Possible agreeable option or topics to discuss:***  *RAN4 agrees to further consult RAN5 on how to make UE generate MO-data in RRC idle in order to test PUR feature.* |
| Issue 7-3: Improved MPDCCH test case | *This issue is to be discussed if time allows after discussing the open issues of the core part:*  ***Possible agreeable option or topics to discuss:***  If time allows, continue the discussion from the 1st round. |
| Issue 7-4: RSS | *This issue is to be discussed if time allows after discussing the open issues of the core part:*  ***Possible agreeable option or topics to discuss:***  If time allows, continue the discussion from the 1st round. |
| Issue 7-5: DL quality reporting | *This issue is to be discussed if time allows after discussing the open issues of the core part:*  ***Possible agreeable option or topics to discuss:***  *RAN4 agrees to introduce test case for DL quality reporting in IDLE and CONNECTED mode. Test configurations are to be discussed further at next meeting.* |

### Open issues - comments

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| **Company** | **Comments** |
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### 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** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## 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”* |