**3GPP TSG-RAN WG4 Meeting #** **102-e R4-**

**Electronic Meeting, February 21 – March 3, 2022**

**Agenda item:** 10.17.4

**Source:** Moderator (ZTE Corporation)

**Title:** Email discussion summary for [102-e][226] NR\_IAB\_enh\_RRM

**Document for:** Information

# Introduction

TDocs submitted to the following agenda items will be treated:

- 10.17.4 RRM core requirements

According to the guidance of the Chair, Include the following tdocs from 10.17.3/4: R4-2204880, R4-2204881, R4-2205410, R4-2205962, R4-2206029, R4-2206030, R4-2203642. Other tdocs from 10.17.4 will be moved to BS RF/Test/Demod Session.

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

* 1st round: Companies discuss open issues and provide comments on the CR/TP.
* 2nd round: Finalize on the open issues and the CR/TP.

# Topic #1: RRM requirements related to timing and CLI

*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** |
| R4-2203642 | Qualcomm | **Proposal 1: RAN4 needs to define CLI measurement requirements and Rel 16 UE CLI measurement requirement can be used as baseline.** |
| R4-2204880 | Huawei, HiSilicon | **Observation 1: There is no enhancement on CLI measurement and reporting for Rel-17 eIAB compared with Rel-16 IAB based on RAN1/2 agreements.**  **Proposal 1: No RRM requirements for CLI measurement need to be specified in Rel-17 IAB.** |
| R4-2204881 | Huawei, HiSilicon, Nokia, Nokia Shanghai Bell | CR on timing requirements for Rel-17 IAB |
| R4-2205410 | ZTE Corporation | Proposal 1: For CLI measurements by IAB-MT, no new RRM requirements need to be specified in R17.  **Observation 1:** UL timing of a parent node will be impacted when there is a timing uncertainty between parent node DU DL Tx timing and its child node DU DL Tx timing.  **Observation 2:** Te2 was agreed to be out of scope of RF session.  **Proposal 2: Discuss whether to specify requirements for Te2 in RRM session for case# 6 timing.** |
| R4-2205962 | Nokia, Nokia Shanghai Bell | 1. RIM scenarios are not typical for IAB deployments. Network planning of static IAB deployments should prevent at least major interference scenarios that are addressed by CLI measurements. 2. The only agreed enhancement in RAN1 is that coordination signalling (Intended TDD DL-UL Configuration) is extended to support IAB specific UFD patterns. DFU patterns were already present in the Rel-16 IAB specifications without any impact on RAN4 RRM requirements. 3. For CLI measurements by IAB-MT, no new RRM requirements need to be specified in R17. 4. There is not need to adopt Rel 16 UE CLI measurement performance requirement shall be adopted for Rel 17 eIAB. |
| R4-2206029 | Ericsson | **CLI for IAB:**   * **Observation 1**: Unlike, the UE, which moves around, the IAB is fixed node. Therefore, the need for CLI requirements (if CLI is needed) depends on the actual deployment scenario. * **Observation 2**: IAB can be deployed in wide range of deployment scenarios. * **Observation 3**: Standardization of the CLI measurement requirements will limit the IAB implementation flexibility making CLI measurement requirements less effective and even degrade the overall performance in some scenarios. * **Observation 4**: RAN2/RAN3 signaling for CLI for IAB is sufficient for cross layer interference mitigation/management. * **Observation 5**: RAN4 concluded in Rel-16 not to define RRM measurement requirements for IAB-MT to prevent any implementation limitation in IAB. * **Proposal #1**: No RRM requirements related to CLI measurements are specified for IAB-MT.   **Case-6 Timing for IAB-MT:**   * **Observation 6**: TAE between IAB-MT and its co-located IAB-DU and the IAB-DU’s 3 µs cell phase synchronization will result in that the IAB-MT timing become 3 µs + TAE. * **Observation 7**: IAB-MT and IAB-DU operate in different cells and if IAB-MT does not follow the cell phase synchronization requirement then there can be interference between the two cells. * **Proposal#2**: IAB-MT should follow the cell phase synchronization requirement of 3 µs when it transmits in DL time slot. |
| R4-2206030 | Ericsson | Case 6 timing requirement for IAB in TS 38.174 |

## 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

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

**Issue 1-1: CLI measurement**

* Proposals
  + Option 1: RAN4 needs to define CLI measurement requirements and Rel 16 UE CLI measurement requirement can be used as baseline. (Qualcomm)
  + Option 2: For CLI measurements by IAB-MT, no new RRM requirements need to be specified in R17. (Huawei, ZTE, Nokia, Ericsson)
* Recommended WF: Discussion needed.

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| **Company** | **Comments** |
| ZTE | Option 2, as explained in our paper. So basically it is not necessary to copy all UE requirements and TCs to IAB-MT since they’re quite different in many aspects. |
| Qualcomm | As we pointed out in our paper, there are CLI scenarios resulting from Rel 17 IAB full-duplex operations. CLI will arise even when UEs or IAB-MTs are stationary. On the other hand, RAN1 did not agree on any enhancement to CLI related mechanisms, but RAN1 did agree on applying all Rel 16 UE CLI measurement/mitigation techniques to Rel 17 IAB-MT. Thus RAN4 should define CLI measurement requirements. |
| Ericsson | Support Option 2.  As analyzed in our contribution, the CLI measurement requirements defined for the UE are not very relevant for IAB-MT which is fixed node. Applying the same requirements to IAB-MT will not only limit the IAB-MT implementation but will not likely be useful for interference mitigation. |
| Nokia | We Support Option 2.  In our view, in static IAB deployments, the IAB nodes are the part of network infrastructure. Therefore, the strongest sources of interference can be avoided by deployment planning. Moreover, the TDD patterns (Uplink Downlink and Flexible) and soft/hard allocations can be exchanged in between the IAB nodes. Together with FDM and SDM this provides powerful enough means to avoid interference.  Regarding the FFSs that are raised in the paper by QC, they are valid but rather not in the context of IAB but in the context of CLI itself. In particular, one of the major challenges in application of CLI is the lack of knowledge of timing advance in between nodes and/or UEs that may considerably impact measurement accuracy. Those issue issues were not completely resolved in whole Rel-16 CLI WI. Hence, it is hardly possible that a resolution can be found in the very limited time-frame of the eIAB WI. |
| Huawei | We support option 2. We can understand the motivation of proponent companies in option 1. RAN1 has discussed at very beginning to take R16 interference management (not equivalent to CLI measurement and reporting) frameworks as baseline, but there is no new functionality to be verified from RAN1. And as commented by Nokia, even for Rel-16 CLI requirements for UE, some offset for measurement is up to UE implementation. Anther more import point is that, the basic principle of defining RRM requirement for IAB is to consider the basic/essential functionality (e.g. timing, RA). So it is agreed not to have L1/L3 measurement requirements. Compare with these requirements, we didn’t see the necessary to consider CLI measurement requirements for IAB-MT. |

**Issue 1-2: Case 6 timing**

* Proposals
  + Option 1: Discuss whether to specify requirements for Te2 in RRM session for case# 6 timing. (ZTE)
  + Option 2: IAB-MT should follow the cell phase synchronization requirement of 3 µs when it transmits in DL time slot. (Ericsson)
* Recommended WF
  + Discussions are needed. Note that dCR R4-2206030 is directly related to this issue.

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| **Company** | **Comments** |
| ZTE | Agree that the technical issue raised by Ericsson is valid, but maybe we need to further discuss. For example, the analysis given by Ericsson is based on the assumption of co-located IAB MT and DU, however this might not always be the case. |
| Ericsson | We agree with ZTE that the IAB-MT and IAB-DU may not always be co-located. For example, the IAB-MT can be installed outside the building and IAB-DU can be inside the building. But still case-6 timing can be enabled in such deployment. In summary case-6 timing can be enabled in both co-located and non-co-located IAB-MT/IAB-DU deployment scenarios. The main aim is to avoid the cell interference issue. Therefore when IAB-MT will transmit in DL time slot, IAB-MT needs to follow the cell phase sync requirement.  In summary we support Option 2.  Option 1 corresponds to cell phase sync between IAB-DUs i.e. also between parent and child IAB-DUs. This is already covered by section 12.2.4.2:  “*The cell phase synchronization accuracy measured at IAB DU antenna connectors shall be better than 3 µs.”* |
| Nokia | Firstly, we would like to remind that the following agreements were achieved at the previous meeting:  **On Case 1 Timing**  No new RRM requirements are needed for Case #1 timing procedures.  Clarify in the TS 38.174 that current transmit timing requirements apply to case#1 timing mode.  **On Case 6 Timing**  There is no RRM impact of case#6 timing.  Therefore, we prefer to follow previously achieved agreements and not to introduce any new requirements.  Secondly, we have additional comments on the proposals:   * Option 1 (ZTE): Te2 is defined as timing error between parent DU and child DU. However, there is already exiting requirement on DU timing in TS 38.174, Clause 12.2.4: “*The cell phase synchronization accuracy measured at IAB DU antenna connectors shall be better than 3 µs*.” Therefore, we do not see a need in specifying any additional requirement. * Option 2 (Ericsson): In our understanding, a similar issue is already discussed in eIAB RF, i.e., MT error relative to the DU timing. We do not see much benefit in defining such requirement in RRM since they are more on the radio (i.e., RF) side than on the baseband. There is much less intent to test those in RRM than in RF. |
| Huawei | We think it is related to the discussion in RF session. Option 1/2 seem to extend the definition of cell phase synchronization requirements. For option 2, more clarification is needed. Does it mean the 3 us requirement also apply between Node1- MT and Node2-DU OR between Node1-MT and Node2-MT. And also, if IAB can support simultaneous TX without case 6, there is no need to have any restriction on MT timing, as it just follow legacy requirements. So at current stage, we suggest to hold on the discussion and wait for the conclusion in RF session. |

### CRs/TPs comments collection

*Moderator: The two contributions are addressing to a same issue. See if the CR/TP can be merged.*

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| **CR/TP number** | **Comments collection** |
| R4-2204881 | ZTE: Wait for issue 1-2 to see whether if the two CRs can be merged into a big CR. |
| E///: This is not related to issue 1-2, which is related to case 6 timing. This is CR with CR number based on the endorsed CR in RAN4#101bis-e. The CR is fine for us. |
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| R4-2206030 | ZTE: Wait for issue 1-2 to see whether if the two CRs can be merged into a big CR. |
| E///: As commented above this CR is related to case 6 timing but introducing cell phase sync. In our view if this draft CR is agreeable there is no need to merge this (draft CR) with 4881. The Big CR will include all the endorsed CRs. |
| Nokia:  the draft CR is pending on the agreement in 1-2.  However, even if it is agreed, why we need to use big CR? It would be straightforward to merge it into normal CR R4-2204881, then it could be consign by all companies. |

## 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 1-1** | Options:   * + Option 1: RAN4 needs to define CLI measurement requirements and Rel 16 UE CLI measurement requirement can be used as baseline. (Qualcomm)   + Option 2: For CLI measurements by IAB-MT, no new RRM requirements need to be specified in R17. (Huawei, ZTE, Nokia, Ericsson)   Further discuss during the 2nd round, or the GTW if necessary. |
| **Issue 1-2** | *Recommended WF: Companies please discuss directly using a separate email thread for a revised version of* R4-2206030. |

## Discussion on 2nd round (if applicable)

### Open issues

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| **Company** | **Comments** |
| ZTE | 1-1: To address QC comments, I think what you mentioned are mostly within RAN1 scope. From RAN4 perspective we don’t necessarily define requirements for all scenarios supported by RAN1/2, as happened also for UE. So I think we should mainly discuss from RAN4 perspective.  We still think that such requirements are not needed. |
| E/// | Issue 1-1: Support Option 2.  We also understand there is RAN1 functionality e.g. measurements for CLI. The discussion is whether RAN4 should define CLI measurement requirements for IAB-MT. As stated in the first round the interference situation for IAB-MT depends on the actual deployment of the IAB. There can be different implementation approach to mitigate the interference. RAN1/2/3 mechanism are some of the tools. But implementation can also use other approaches. Therefore, we do not find any good motivation to define CLI measurement requirements for IAB-MT. |
| QC | Issue 1-1: We still have concerns about not defining CLI measurement requirement for IAB-MT as the CLI mitigation feature would give IAB more flexibility in deployment options and better performance. However, we would like to agree with majority point of view and not debate this issue any further. |
| Huawei | 1-1：Same view as ZTE and Ericsson. And also as commented in 1st round, from RAN4 perspective, we only define basic RRM requirements for IAB. As also as commented by companies, even for CLI requirement of UE, there is some part are left to UE implementations. For new functionality introduced in RAN1 in this WI, there is new requirements to be verified. |
| Nokia, Nokia Shanghai Bellk | 1-1: We would like to thank QC for the compromise. Like in the first round we still think that even without CLI requirements there are enough means to mitigate strong interference in eIAB deployments. |
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# Recommendations for Tdocs

## 1st round

**New tdocs**

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| **Title** | **Source** | **Comments** |
| WF on IAB enhancement RRM | ZTE Corporation |  |
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**Existing tdocs**

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| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-2204880 | Discussion on RRM requirements for eIAB | Huawei, HiSilicon | Noted |  |
| R4-2204881 | CR on timing requirements for Rel-17 IAB | Huawei, HiSilicon, Nokia, Nokia Shanghai Bell | Agreed |  |
| R4-2205410 | On RRM for eIAB | ZTE Corporation | Noted |  |
| R4-2205962 | On IAB Enhanced RRM Requirements | Nokia, Nokia Shanghai Bell | Noted |  |
| R4-2206029 | Further analysis of RRM requirements for enhanced IAB | Ericsson | Noted |  |
| R4-2206030 | Case 6 timing requirement for IAB in TS 38.174 | Ericsson | revised |  |
| R4-2203642 | CLI measurement requirement for R17 NR eIAB RRM | Qualcomm | Noted |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

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| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
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   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents

# Annex

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Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)