**3GPP TSG-RAN WG4 Meeting # 98-bis-e R4-210XXXX**

**Electronic Meeting, 12th – 20th April, 2021**

**Agenda item:** 8.13

**Source:** Moderator (Samsung)

**Title:** Email discussion summary for [98-bis-e][313] NR\_eIAB

**Document for:** Information

# Introduction

This is Rel-17 enhancement on IAB based on Rel-16 WI with latest WID agreed as RP-210758. RAN4 scope on core part is to define necessary RF and RRM according to Rel-17 extension. This meeting is to kick-off the RAN4 discussion regarding the necessary aspect to be defined under Rel-17.

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

* 1st round:
  + Clarification on work plan if needed
  + collect view regarding the candidate aspects to be discussed further in RAN4
* 2nd round: discuss on tentative WF regarding detail RAN4 scope according to views collected during 1st round

# Topic #1: Work plan

*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** |
| R4-2105039 | Samsung, Qualcomm | Overall work plan shared in this contribution with coordination on all related working groups for RAN4 information.  As pointed out in work plan RAN4 perf part will be included back after related TU and scope clear. |

## Open issues summary

### Sub-topic 1-1: work plan

Sub-topic description:

The work plan is just for information. And it has been shared in RAN4 reflector before submission. There is no comment received so far. Hence it is supposed this one can be noted. But if any further clarification and/or comment in the 1st round would be still allowed and welcome.

It is suggested not to continue on discussion for work plan in the 2nd round.

**Issue 1-1: Work plan on Rel-17 eIAB**

* Proposals: work plan just provides the suggested topic to be studied for coming meeting based on existing allocated TU.
* Recommended WF
  + Work plan is just for information which is recommended to be noted.
  + Clarification and comment can be collected during the 1st round discussion.

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1 work plan

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| **Company** | **Comments** |
| XXX |  |
| Ericsson | Work plan is ok, just a question on the RF performance part, in case there are RF requirements identified, should that be mentioned in work plan for Rel-17 eIAB work? |
| Nokia, Nokia Shanghai Bell | Sub-topic 1-1: Is the intention to revise the work plan during this meeting to add content for future meetings in case RAN4 impact is identified? |
| Samsung | To align with the workplan format with other working group, the work plan on eIAB will be updated and shared before every RAN4 meeting. This is kind of recommendation for next meeting input rather than typical RAN4 work plan with full schedule plan. And if RAN4 impact identified for future discussion it will be included in next version. For RF perf part this will be updated after TU fixed as explained in the contribution. |

### CRs/TPs comments collection

NA for this meeting

## 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:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

NA for this meeting

## Discussion on 2nd round (if applicable)

It is suggested not to continue on discussion for work plan in the 2nd round.

# Topic #2: Rel-17 eIAB impact on RAN4

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2105040](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2105040.zip) | Samsung | **Simultaneous operation of IAB-node’s child and parent links:**  **Observation** **1**: Further study is needed on RAN4 specification impact due to simultaneous operation of IAB-node’s child and parent links.  **Dual connectivity scenario**:  **Observation** **2**: Further clarification is needed on whether existing RAN4 IAB RF requirement have already accommodated for additional DC scenario to be agreed in other working group.  **Observation** **3**: Further study is needed on whether RAN4 RRM requirement for IAB should be extended to cover additional DC scenario to be agreed in other working group.  **IAB-node timing mode(s):**  **Observation 4**: Regarding the timing enhancement RAN4 study may be needed and dependent on RAN1 outcome.  **DL power control :**  **Observation 5**: No IAB RF requirement impact due to DL power control enhancement within Rel-17 eIAB WI.  **UL power control :**  **Observation 6:** Regarding UL power control RAN4 study may be needed and dependent on RAN1 outcome.  **CLI and interference measurements of BH links:**  **Observation 7:** No impact due to self-interference of intra-IAB node in RAN1  **Observation 8**: Regarding the DU-to-DU CLI measurement/report, it is not clear regarding RAN4 impact according to current RAN1 status. |
| [R4-2106662](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106662.zip) | Nokia, Nokia Shanghai Bell | **Observation 1:** The work in RAN1 for IAB Rel.17 is still in early stages and the actual solutions for possible enhancements are still FFS.  **Observation 2:** It seems early for RAN4 to start discussing Rel.17 requirements before RAN1 has reached sufficient maturity with the definitions for the Rel.17 enhancements.  **Proposal:** The progress and stability of the enhanced PHY design shall be taken into account in the RAN4 work plan and while specifying the requirements for Rel.17 features. |
| [R4-2106663](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106663.zip) | Nokia, Nokia Shanghai Bell | **Observation 1:** A very high bar is required for changing rel-16 IAB RF requirements as it may result in a need of hardware upgrades.  **Proposal 1:** Whether or not SDM and/or FDM multiplexing is supported shall be declared by IAB-DU and IAB-MT.  **Proposal 2:** Possible RF requirements related to supporting SDM and/or FDM multiplexing shall be applicable only when support for the feature is declared.  **Proposal 3:** Overall, impact to rel-16 IAB operation needs to be considered when the new features and related RF requirements are analyzed. |
| [R4-2106664](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106664.zip) | Nokia, Nokia Shanghai Bell | **Observation 1:** The principles of CLI scenarios in SDM and FDM operation are similar to dynamic TDD operation.  **Observation 2:** According to rel-16 CLI study BS-to-BS interference is an issue in FR1 macro deployments and to a certain extent also in FR2 macro deployments.  **Observation 3:** From adjacent channel interference perspective, cross-link interference scenarios do not fundamentally change between rel-16 and rel-17. |
| [R4-2107239](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107239.zip) | Ericsson | **Observation 1:** The RF requirements for simultaneous transmission of both MT and DU within an IAB node are specified in Rel-16 TS 38.174.  **Proposal 1**: No RF specification impact in Rel-17 for simultaneous Tx on MT and co-located DU.  **Observation 2:** MT TX/DU RX or MT RX/DU Tx simultaneous operation requires enough isolation between MT and DU transceiver which could possibly be achieved through site deployment. High level of needed isolation could be possibly achieved by increasing the antenna isolation by large physical separation between antennas.  **Observation #3:** Simultaneous MT Tx/DU RX or MT Rx/DU TX even when enough isolation within one operator operating band is achieved may result in interference in adjacent operator´s network.  **Proposal 2:** No RF specification impact in Rel-17 for MT RX/ DU Tx or MT TX/DU RX simultaneous operation.  **Observation 4:** MT RX/DU RX simultaneous receiving does not necessitate the additional RF requirement.  **Observation 5:** MT RX/DU RX simultaneous receiving imply child IAB-MT transmitting only in downlink time slot as the parent IAB-DU can only transmit in down time slot.  **Proposal 3:** There is no RF specification impact for MT RX/DU RX receiving.  **Proposal 4:** DC on IAB-MT follow the same BS multiple carrier approach as CA. |
| [R4-2107240](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107240.zip) | Ericsson | **Observation#1:** Parent IAB-DU does not need to be aware about the TAE between its DL timing and the DL timing of child IAB-DU for case#6 timing operation.  **Observation-2:** For the case of child IAB-MT synchronizing with co-located child IAB-DU, Parent IAB-DU needs to be aware about the TAE between its DL timing and the DL timing of child IAB-DU for case#6 timing operation. so the correct setting of the receiving timing on parent IAB-DU will be possible  **Observation-3:** Parent IAB-DU set its receiving timing differently depending on the child IAB-MT synchronization implementation.  **Observation-4:** The TAE between DL TX of child IAB-DU and parent IAB-DU could be signalled to parent IAB-DU. Alternatively, the parent IAB-DU receiving timing needs to tolerate the maximum TAE.  **Proposal-1:** RAN4 discuss two aspects for Case#6 timing.   1. TAE impact: pre-known by parent IAB-node or be tolerated on parent IAB node for implementation (b) 2. Signalling aspect: whether the synchronization implementation option (a) or (b) should be signalled to parent IAB.   **Proposal-2:** Focus Case 7 timing discussion for the shared receiver for IAB-MT and IAB-DU case. |

## Open issues summary

As pointed by two companies that the RAN4 will highly depend on RAN1 progress which is reported as 30% completion level in Mar RAN-R SR(RP-2100443. Hence it may be premature to make decision on all aspects in RAN4 based on current status. However, it is still target to discuss based on existing agreement and conclusion to make progress as much as possible according to planned schedule.

### Sub-topic 2-1: Simultaneous operation of IAB-node’s child and parent links

Sub-topic description: there are three contributions (R4-2105040, R4-2106663 and R4-2107293) submitted with discussion on this issue. R4-2105040 and R4-2107293 provide preliminary analysis on RF impact due to each simultaneous operation case. While the R4-210663 mainly clarifies the effect to legacy release product and suggests on new declaration allowed for product flexibility to support SDM and/or FDM in Rel-17. In below summary the proposals from three contributions merged together.

Open issues and candidate options before e-meeting:

**Issue 2-1: simultaneous operation of IAB-node’s child and parent links**

* Proposal:
  + Proposal 1: for declaration and potential new requirement applicability:
  + Proposal 1-1: Declaration is suggested to be added on whether support simultaneous operation of IAB-node’s child and parent links.
  + Proposal 1-2: If any new or updated RF requirement to be defined for simultaneous operation, the requirement will be applied for IAB node which declares to support new/updated requirement.
  + Proposal 2: for each simultaneous operation comb
  + Proposal 2-1: on simultaneous MT TX/DU TX, no RF specification impact identified.
  + Proposal 2-2: on simultaneous MT TX/DU RX
    - Option 1: No RF specification impact
    - Option 2: Update needed on reception requirement such as side condition, blocking.
  + Proposal 2-3: on simultaneous MT RX/DU TX
    - Option 1: No RF specification impact
    - Option 2: Update needed on reception requirement such as side condition, blocking.
  + Proposal 2-4: on simultaneous MT RX/DU RX, no RF specification impact identified.
* Recommended WF
  + View on each proposal or alternative option are encouraged to be shared in the 1st round discussion

### Sub-topic 2-2: Clarification on DC scenario operation

Sub-topic description Currently RAN1 discussion is mainly on DC scenario on Inter-carrier, inter-band. And DC scenario on Inter-carrier, intra-band is additionally supported at least for FR2. That may be premature in RAN4 to make conclusion without final conclusion from RAN1. However, it is suggested to clarify companies’ understanding regarding whether existing Rel-16 IAB specification is compatible for DC scenario in general as mentioned in R4-2105040 and R4-2107239. Furthermore, how to resolve the remaining issue on CA/DC related capability can be clarified future as well.

Open issues and candidate options before e-meeting:

**Issue 2-2: Clarification on existing Rel-16 IAB specification**

* Proposal:
  + IAB RF requirement: existing Rel-16 IAB specification is compatible for DC scenario similar as BS
  + IAB RRM requirement: further study needed to clarify the DC scenario impact on IAB RRM requirement
* Recommended WF
  + View on each proposal or alternative option are encouraged to be shared in the 1st round discussion

### Sub-topic 2-3: Timing related

Sub-topic description: case 6 and case 7 timing mode are agreed to be supported on top of case 1 which is agreed for Rel16. Furthermore, RAN1 is working on the detail regarding switching among case 1, case 6 and case7. It’s obvious that further RAN4 study needed regarding the additional timing mode and switching between cases, which is not easy without full RAN4 conclusion. However, the study on case 6 and case 7 seems doable. Furthermore, in R4-2107240, the analysis regarding implementation impact on case 6 is presented which is used as starting point to trigger discussion.

Open issues and candidate options before e-meeting:

**Issue 2-3: Timing related**

* Proposal 1: Further study needed regarding timing enhancement to support case 6, case 7 timing and switching between case1/6/7.
* Proposal 2: For IAB timing enhancement it should be discussed and clarified first whether RAN4 discussion should be based on implementation agnostic way.
* Proposal 3: if it is identified that different implementation will have impact on RAN4 requirement or Parent node behaviour on IAB timing enhancement, further discussion would be needed on below aspect
  + Option 1: Declaration is defined to indicate
    - Alternative 1: whether support additional timing mode (and switching)beside case 1
    - Alternative 2: timing related implementation
  + Option 2: signalling related to parent IAB/donor gNB
  + Option 3: TBA
* Recommended WF
  + View on each proposal or alternative option are encouraged to be shared in the 1st round discussion

### Sub-topic 2-4: CLI and power control related

Sub-topic description: Regarding Power control and CLI related aspect, RAN4 should wait for RAN1 further progress to proceed with next step discussion except the DL power control which seems mainly for parent IAB or Donor gNB. Furthermore, in R4-2106664, more study is provided regarding Rel-17 IAB enhancement and Rel-16 CLI study with some initial observations.

Open issues and candidate options before e-meeting:

Issue 2-4: CLI and power control related

* Proposal 1: No new RF requirement is suggested due to DL power control enhancement on IAB node and gNB.
* Proposal 2: it’s suggested that if no fundamentally change between rel-16 and rel-17 with respect to adjacent channel interference, Rel-17 IAB enhancement can leverage on Rel-16 CLI conclusion.
* Recommended WF
  + View on each proposal or alternative option are encouraged to be shared in the 1st round discussion

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1: Simultaneous operation of IAB-node’s child and parent links

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| **Company** | **Comments** |
| Ericsson | Issue 2-1:  Proposal1:  seems the proposal 1 connects to proposal 2. It is ok to declare the specific operation mode for simultaneous operation. If it relates to specific RF requirement, proposal 1-2 seems better than proposal 1-1 in general. Proposal 1-1 may also relate to function updates which may or may not relate to RF requirement and thus it hard to judge it is needed for now.  Proposal 2:  Proposal 2-1 is ok  Proposal 2-2: Option 1 is ok  Proposal 2-3: option 1 is ok.  Proposal 2-4: ok. |
| Nokia, Nokia Shanghai Bell | Proposal 1-1 and 1-2: We support these. As rel-17 includes other enhancements on top of simultaneous operation of child and parent links, it is necessary to make sure possible new RF requirements are not required to be met by IAB-Nodes which use other rel-17 functionality.  Proposal 2: Further analysis on possible specification impacts may be needed before hard conclusions are made. If there are impacts it is necessary to separate   * Impacts on the node which uses simultaneous MT/DU operation * Impacts simultaneous MT/DU operation might cause to other nodes in the network   We think that some areas like isolation between MT and DU when using different antenna panels is best left for implementation and site solution. However, for example FDM operation within the same antenna panel may have e.g. signal quality impact if there is simultaneously power controlled MT transmission and full power DU transmission using adjacent resource blocks.  Additionally, we don’t fully agree with proposal 2-1, because currently there is no test requirement for simultaneous transmission of both MT and DU within an IAB node, this should be specified in TS 38.176-1 and 38.176-2, to test IAB for the configuration in normal operation conditions even if this would not require additional core requirements. |
| Samsung | Proposal 1-1 and 1-2: in general we agree with the discussion direction to differentiate the product kind.  Proposal 21- and 2-4: we agree  Proposal 2-2 and 2-3: option 2 is preferred. Hence further study would be needed.  To Nokia please note that the proposal 2 is purely for RF requirement as core part. For conformance testing it would be separated discussion in later phase which is not touched here. |

Sub topic 2-2: Clarification on existing Rel-16 IAB specification

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| **Company** | **Comments** |
| Ericsson | Issue 2-2: Proposal for eIAB RF requirement on DC is ok. DC scenario can be based on the multi-carrier approach and that has specified in Rel-16.  For RRM discussion, according to work plan (5039), there is no RRM discussion in 98-bis-e, thus such discussion should take place next meeting. |
| Nokia, Nokia Shanghai Bell | We agree existing rel-16 IAB RF specification is compatible for DC scenario. However, it may be necessary to review if existing capabilities are up-to-date, as they were not thoroughly discussed in rel-16.  RRM side should be considered in RRM session once there is time allocation for that. |
| Samsung | Share the same understanding with proposal. |

Sub topic 2-3: Timing related

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| **Company** | **Comments** |
| Ericsson | Proposal 1:ok  Proposal 2: it seems difficult to talk about timing related issue without touching the implementation aspect. When discuss the frequency error requirement in rel-16, the different implementation options also discussed to settle the requirement, eg. The sync source of IAB-MT, frequeny error calculation, layer1 simulation etc etc.  Proposal 3: Seems this proposal first want to confirm the implementation impact on parent node behavior. Paper (7240) identifies the TAE impact to set the correct receive timing on parent IAB -DU for the case 6 timing for one of implementation (IAB-MT and IAB-DU shared clock solution). Such TAE has no impact on parent IAB if IAB-MT is sync with parent IAB-DU like a normal UE. Option 1 declaration general is ok but the content to declare could be further discuss for Alternative 1 and 2.  Option 2 seems ok and also may consider if a LS to RAN1 is needed if RAN4 identify the implementation impact on case 6 timing. |
| Nokia, Nokia Shanghai Bell | Our understanding is that in all timing modes DL timing is adjusted using the same methods, GNSS or OTA synchronization, as in Rel-16. The RAN1 defined timing cases are options to synchronize IAB DL signals (all cases) and align either TX (Case#6) or RX (Case#7) signals to enable simultaneous TX/RX of IAB DU & MT.  As DL is in all cases fixed, the only requirement that would apply is the existing cell phase synchronization accuracy requirement of 3us. Hence, also the switching of timing modes should not affect that. Therefore, no new synchronization accuracy requirements or related signaling is needed. As such, there is also no need to discuss specific implementations. Speaking more generally, requirements are defined to guarantee system performance and implementation freedom is allowed as long as requirements are met, so it seems unnecessary at this moment to run the process in the opposite way of defining implementation first and adapting requirements to that.  Timing issues might be useful to review also in RRM session as synchronization requirement is in RRM specification. |
| Samsung | Further study should not be precluded. However, as share in our contribution, we also believe not too much impact due to introduction of timing mode #6 and #7 based on exiting Rel-16 specification.  And we share the similar understanding as Nokia that the discussion on this aspect should be on implementation agnostic way. Furthermore, the proposal 3 seems more like RAN1 scope. We prefer to wait for more progress in RAN1 regarding the switching aspect. |

Sub topic 2-4: CLI and power control related

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| **Company** | **Comments** |
| Ercisson | Propsoal 1. Ok. RAN1 agreements has wording of “without mandating an expected ehaviour at the parent node”, so RAN4 should interpret this is “best of effort” and no impact on RF.  Proposal 2. Ok. Unless the fundamental coexisting simulation in Rel-16 would be changed, proposal 2 is reasonable. |
| Nokia, Nokia Shanghai Bell | Proposal 1 and 2: agree |
| Samsung | Agree with proposal 1 and proposal 2. |

### CRs/TPs comments collection

NA for this meeting

## 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:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

NA for this meeting

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
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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** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
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. Do not include hyper-links in the documents