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

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

**Agenda item:** 5.3.1

**Source:** Moderator (CATT)

**Title:** Email discussion summary for [98-bis-e][303] NR\_IAB\_RF\_Maintenance

**Document for:** Information

# Introduction

This email thread is to discuss the issues for R16 NR IAB RF maintenance. The main open issue is IAB-MT EVM procedure and there’re several other maintenance CRs submitted.

The targets of the email discussion for 1st round and 2nd round are as follows,

* 1st round: Discuss the open issues for IAB-MT EVM procedure and try to reach agreements. Collect comments for the maintenance CRs.
* 2nd round: continue the discussion and agree the CRs.

# Topic #1: IAB-MT EVM measurement procedure

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2104781 | CATT | Observation 1: BS EVM equalizer approach may be reused by IAB-MT for both FR1 and FR2.Observation 2: Rewriting B.7 and C.7 is clearer. |
| R4-2106667 | Nokia, Nokia Shanghai Bell | Observation 1: Both UE and BS ways of estimation of Tx chain amplitude and frequency response could be allowed.Proposal: Enable re-use of BS test equipment for EVM testing. |
| [R4-2107046](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107046.zip) | Keysight Technologies UK Ltd | Observation 1* EVM measurement capability available today in test equipment are for Uplink signal with using definition from UE (TS38.521) conformance test specification, not opposite.
* Some of proposed measurement capability in previous RAN4 meeting doesn’t exist today and may not be available at the time needed, which is to measure Uplink signal EVM using definition from BS (TS38.141) conformance specification

Observation 2* Using existing test setup, it is simply to choose which Uplink or Downlink signal to make EVM measurement on measurement equipment, if use of existing EVM measurement capability is agreed. Which is to use existing Uplink signal EVM measurement for IAB-MT EVM measurement.

Observation 3* It doesn’t make sense for TE vender to add IAB-MT specific EVM measurement, while there are already EVM measurement capability available for Uplink signal and Downlink signal following existing conformance test specification respectively. And there are not much of measured result difference expected.

Observation 4* While WF [2] show no observation (on using BS TS38.104 definition) for some of items for annex text, there are some dependency with equalizer definition and other items for IAB-MT.

Proposal 1* Use of existing equalizer definition from TS38.521 (Uplink signal EVM measurement) for IAB-MT EVM measurement

Proposal 2* For specification annex text, re-use some of text from TS38.521 annex for IAB-MT rather from TS38.104, which is, “E.3 Signal Processing” in place of B.5.2/C.5.2 “window length” and B.6/C.6 “Estimation of Tx chain amplitude and frequency response parameters”
 |
| [R4-2107225](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107225.zip) | Ericsson | Observation-1: The UE equalizer coefficient is calculated with both data and reference data and average per time slot and per allocated subcarrier.Observation-2: The BS equalizer coefficient is the same zero-forcing equalizer as UE equalizer. The derivation of the equalizer is different, BS only use reference signal and optimize the phase and amplitude response selectively and UE use both data and reference signal and use the least square estimation.Proposal-1: Apply both BS EVM procedure or UE EVM procedure with CP-OFDM only to IAB-MT EVM procedure.Proposal-2: Use the declaration D.106 to support the optional configuration of the PTRS signal in test model. |

## Open issues summary

### Sub-topic 1-1

**Issue 1-1: Which EVM equalizer generation method should be used by IAB-MT, BS or UE?**

* Proposals
	+ Option 1: BS method (CATT)
	+ Option 2: UE method (Keysight)
	+ Option 3: Both BS and UE method should be allowed (Nokia, Ericsson)
* Recommended WF
	+ To be discussed

------------------GTW Discussion-----------------:

Keysight: For uplink EVM measurement, TE use UE method, no implementation on BS method for uplink. Also no much difference from performance aspect with two methods.

E///: For FR2 test method, PTRS configured and this impact EVM equalizer which impact EVM procedure. How to ensure PTRS used?

Nokia: We already have agreed WF stating BS approach used except averaging EVM. We prefer to enable either both or only BS approach.

Keysight: There is different among BS and UE for EVM equalizer. TE vendors need to implement considering the difference. NO issue in the market with UE method.

E///: Not only EVM measurement procedure, also test model. The changes probably always can’t be avoided.

Keysight: Why we need to use BS approach for uplink EVM measurement? This will be a specific IAB-MT test specific implementation with additional effort from TE vendors.

E///: We have BS specific procedure i.e. PTRS, we want to reuse BS approach as much as possible.

Tentative Agreement: Both BS and UE method should be allowed in the specification.

1st round comments:

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| --- | --- |
| **Company** | **Comments** |
| Ericsson | Option 3, For proponent of option 2, what is the EVM impact of PT-RS signal if only the UE EVM procedure is used.  |
| Qualcomm | Option 2. The method simplest to implement for the test equipment should be chosen. Based on the inputs, this seems to be option 2. Option 3 would also be fine if TE vendors can confirm it is easy to implement |
| ZTE | Fine with option 3 |
| Huawei | Option 3 seems to allow for option 1 and 2 so should satisfy the test equipment concerns. If the result is the same as indicyted then option 3 is best. |
| Nokia, Nokia Shanghai Bell | Option 3 is our preference, as there is technically minor difference between the UE and BS measurement procedures. We are also ok with option 1. |
| CATT | If option 3 is the conclusion, it seems TE vendors’ concern is not solved because TE vendors need to implement both BS and UE method. |
| Keysight | Option 2. Yes, opt2 is easier, and we strongly recommend RAN4 to choose this.From TE vender point of view, there is no measurement instrument with EVM functionality for BS EVM method on Uplink signal. It doesn’t make sense to make this topic as flexible, actually confusing. And Agree with CATT’s comment, with Option 3, TE venders might be needed to do both method for for IAB-MT for very similar result expected. It doesn’t make sense for us.For Ericsson, UE method has defined already for Uplink without PT-RS but looks at data for equalization, and already been used for UE EVM measurement, shouldn’t be any problem.  |

**Issue 1-2: How to adapt “Averaged EVM” clause to IAB-MT**

* Proposals
	+ Option 1: Copy the whole content from TS 38.141 and make the necessary modifications as the approach in CR R4-2104782.
	+ Option 2: Refer BS spec TS 38.141 as the approach in CR R4-2107226.
* Recommended WF
	+ To be discussed

1st round comments:

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| --- | --- |
| **Company** | **Comments** |
| Ericsson | This connect to the Issue 1-1 and it may be too early to discuss the CR. If we keep the previous WF, the discussion point is that if it is more future prove to general reference way with possible modification of the “changing downlink signal to uplink signal”.  |
| Qualcomm | If option 2 is chosen in Issue 1-2, shouldn’t text from 38.521 be reused? |
| ZTE | Both options are fine for us, maybe option1 has better clarifications on its details, however it should also keep consistent with Issue 1-1; |
| Huawei | If modifications/clarifications are required then maybe option 1 is better but its ok to reference as long as meaning is not lost. |
| Nokia, Nokia Shanghai Bell | We prefer option 1. As the downlink and uplink imply opposite behaviours for IAB-MT and BS, it is cleanest to write the text out to avoid any possible misunderstanding when it comes to details in the formulas. Additionally, if this is the only aspect to be modified, the scope of the modifications could be documented in the TR. |
| CATT | Option 1 and agree the TP should align with Issue 1-2. |

**Issue 1-3: Proposal 2 in** [**R4-2107046**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107046.zip)

* Proposals
	+ Option 1: For specification annex text, re-use some of text from TS38.521 annex for IAB-MT rather from TS38.104, which is, “E.3 Signal Processing” in place of B.5.2/C.5.2 “window length” and B.6/C.6 “Estimation of Tx chain amplitude and frequency response parameters”
	+ Option 2: Keep the agreements in last meeting for the parts other than equalizer.
* Recommended WF
	+ To be discussed

1st round comments:

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | This connect to the Issue 1-1. When the UE EVM procedure is used, could the whole section can be referred or only selected section indicated in Option 1? |
| ZTE | Please see the comments on Issue 1-1. |
| Huawei | Obviously depends on agreement n 1-1, but if option 3 is used then both methods need to be reused or referenced. |
| Nokia, Nokia Shanghai Bell | We prefer option 2. |
| CATT | We can discuss together with Issue 1-1. |
| Keysight | This topic is related with issue 1-1. Depending discussion on Issue 1-1, then decide what to do with text. |

**Issue 1-4: Proposal 2 in** [**R4-2107225**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2107225.zip)

Proposal-2: Use the declaration D.106 to support the optional configuration of the PTRS signal in test model.

*Moderator: TP* [*R4-2106318*](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106318.zip) *proposed the whole set of declarations, so moderator suggests discussing this issue in thread [305].*

* Recommended WF
	+ It’ll be discussed together with other declarations in [R4-2106318](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106318.zip) in thread [305].

1st round comments:

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| --- | --- |
| **Company** | **Comments** |
| Ericsson | There is no PTRS signal declaration in [305], then this may be the only place to discuss though it is not related to maintenance. There is concern of the optional meaning of PTRS signal and this is our opinion to explain it. |
| Qualcomm | Option 1 is preferable since it will simplify implementation. |
| ZTE | Fine with that. |
| Nokia, Nokia Shanghai Bell | We are fine to discuss this in 305, but we add our view here also. D.106 is demodulation performance related declaration aimed towards declaring the capabilities of PUSCH receiver. It is not good to mix neither RF declarations and demod declarations nor PUSCH transmitter and receiver declarations. For BS a declaration about PT-RS on transmitter side is not used so it is still unclear to us why declaration would be needed for IAB-MT? |
| CATT | Sorry for the misunderstanding as a moderator. Let’s discuss it in this thread if it’s needed. PTRS for IAB-MT is optional, so declaration may be needed? Don’t understand the comments from Nokia. In [R4-2106318](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106318.zip), D.106 applies to both IAB-DU and IAB-MT. For IAB-MT, my understanding is that it should be transmitter’s declarations, not DEMOD declarations. Although PTRS support is related to RF test, but it’s physical layer signals not just pure RF implementations. Still think the number should align with [R4-2106318](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_98bis_e/Docs/R4-2106318.zip)? |

## Companies views’ collection for 1st round

### Open issues

Please comment in the tables below the issues in 1.2.

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2104782, Draft CR for TS 38.174: IAB-MT EVM measurement, CATT | Ericsson: This connect to the issue 1-1 and need to wait the outcome of the it. the discussion point is that if it is more future prove to general reference way with possible modification of the “changing downlink signal to uplink signal”. |
| Nokia, Nokia Shanghai Bell: The part for FR1 includes FDD part though we do not have any FDD band. This would need to be revised in case also UE approach is supported, based on outcome of sub-topic 1-1 |
|  |
|  |
| R4-2104783, Draft CR for TR 38.809: IAB-MT EVM measurement CATT | Ericsson: This connect to the issue 1-1 and need to wait the outcome of the it.  |
| Nokia, Nokia Shanghai Bell: ok as such but may need to be revised based on outcome of sub-topic 1-1 |
|  |
|  |
| R4-2107226, CR on Tx signal quality requirements, Ericsson | Huawei: Clearly linked to CR R4-2104782 and topic 1-1, wait for outcome of topic 1-1 (and merge with CATT CR) |
| Nokia, Nokia Shanghai Bell: As commented in issue 1-2, it is better to write out the sections needing any changes e.g. changes between UL and DL to avoid any misunderstandings with the detailed formulas. |
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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.*

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

### CRs/TPs

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

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **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)

# Topic #2: Maintenance CRs

## Companies views’ collection for 1st round

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2104784, Draft CR for TS 38.174: Correction of IAB-DU class definition, CATT | Ericsson: adding MT on multiple Band is ok, but not the class definition as it is purposely to state the connect to BS deployment scenario |
| Qualcomm: agree with Ericsson |
| Huawei: For the class definitions I don’t agree, the IAB-DU does not communicate with UE’s it communicates with IAB-MT as such the IAB\_DU to UE distance does not really make sense. The scenarios for an IAB-DU wide area are used in a wide area deployment of BS and hence it’s the BS to UE distance that (partially) defines that scenario. Agree the current version seems wrong and open to clarification but I don’t think the suggested modification is correct. |
| Nokia, Nokia Shanghai Bell: Other changes ok, but there seems to be one additional newline added towards the end of symbols section. This newline should not be implemented. |
| CATT: Let me think the class definition more. The other changes can be resubmitted in next meeting. |
| R4-2106306, Draft CR to TS 38.174 – corrections to general and transmitter part, Nokia, Nokia Shanghai Bell | Ericsson: CR should be issued on TS 38.174 version 16.2.0, donot know what is the difference between them. |
|  Qualcomm: ok |
|  |
| R4-2106307, Draft CR to TS 38.174 – corrections to receiver part, Nokia, Nokia Shanghai Bell |  Ericsson: CR should be issued on TS 38.174 version 16.2.0, donot know what is the difference between them. |
| Qualcomm:ok |
| Huawei: the IAB-MT channel Bandwidth correction in clause 7.5.6 is in the previous CR (6306) as well, it’s probably not confusing so its ok, if CR is updated though worth clearing up. |
| R4-2107227, CR on Tx Power related requirements, Ericsson | Qualcomm: why is this change needed? the dynamic range also has to do with how many RBs are scheduled, not just power control. |
| Huawei: power control is the next clause so this could be confusing, the opening paragraph is stating the name and its description, this addition seems unnecessary. |
| Nokia, Nokia Shanghai Bell: Not OK. Dynamic range should be separated from power control in core spec as wide area IAB-MT has no power control requirement. Seems likely that there is related discussion in performance part also. |
| R4-2107228, CR on Rx Charateristic other related requirements, Ericsson | Qualcomm: changes are ok, seems to make changes to the same sections as R4-2106307. |
| Company B |
|  |

## Summary for 1st round

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

*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 |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **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