**3GPP TSG-RAN WG4 Meeting #95e R4-2008500**

**Electronic Meeting, May 25th – June 5th, 2020**

**Agenda item:** 6.5.3, 6.5.3.1, 6.5.3.2, 6.5.3.3, 6.5.3.4, 6.5.3.5

**Source:** Moderator (Qualcomm)

**Title: Email discussion summary for [95e][211] NR\_IAB\_RRM**

**Document for:** Information

# Introduction

This contribution summarizes the 1st round of discussion regarding IAB RRM features.

The revised version of TPs will be replaced with their formal Tdoc numbers before the beginning of the 2nd round.

# Topic #1: General

## Companies’ contributions summary

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2007269 | ZTE | **Observation 1:** Capturing a same set of requirements in multiple documents (TR and TS) will increase maintenance work.**Observation 2:** It puzzles readers to have a same set of requirements in different documents.Proposal 1: Don’t capture RRM requirements in IAB TR. |

## Open issues summary

Feature lead’s note:

RAN4 already agreed to capture RRM requirements in IAB TR in the last meeting (see below) and that agreement itself was a compromise between different companies proposals.

*Tentative agreement:*

* *RRM requirements will be captured in IAB TR*
* *The description of RRM requirements from IAB TS will be reused in the relevant sections of IAB TR.*
	+ *Companies are encouraged to briefly describe the rationale behind introducing these requirements*

Besides, RAN4 is capturing RF agreements in both IAB TS and TR spec. Hence, although, the advantage of capturing same set of requirements in two specs might be unclear, there is no harm to capture it in two specs. Also, according to the last meeting’s agreement, companies can describe the rationale behind introducing requirements in IAB TR if they want. The IAB TS spec will not contain any rationale.

Hence, we don’t need to discuss this issue in this meeting.

## Companies views’ collection for 1st round

### Open issues

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

### CRs/TPs comments collection

*Major close-to-finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| EricssonR4-2007991 | Huawei: R4-2007991 and R4-2008238 shall be aligned to use a unified reference list. |
| Nokia: Generally fine, the references to other specifications would be better to add one by one when necessary. |
|  |
| NokiaR4-2008238 | Ericsson. Only 3 specs are added as references. We suggest to all relevant RAN1 and RAN2 specs which are used or likely to be used as reference. E/// TPs in R4-2007993 and R4-2007993 already add references. It cannot be a CR rather TP since the spec is not approved.  |
| Huawei: R4-2007991 and R4-2008238 shall be aligned to use a unified reference list. |
| Samsung: We could follow the spec editor’s opinion to unify the wording of reference requirements. This contribution cannot be a CR before the version of TS update. |
| Nokia: this is draftCR, we can focus on the content update.  |

## 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:* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on IAB RRM requirements | Qualcomm |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| EricssonR4-2007991 | Status: Agreeable. |
| NokiaR4-2008238 | Status: To be revised.Suggestion for revision:1. Please use the reference list of R4-2007991 to cite other specs.
2. Please submit the revised document as a TP; not as a CR.
 |

## Discussion on 2nd round (if applicable)

### Companies views’ collection for 2nd round

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2008596Nokia | Company A |
| Company B |
| Company C |

## 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”* |

# Topic #2: Details of RRC mobility control requirements

Companies have submitted explicit proposals and TPs. The explicit proposals will be treated in the 1st round and the TPs will be treated in the second round.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **Tdoc number** | **Company** | **Comments** |
| R4-2007189 | ZTE | Proposal 1: For IAB-MTs that support four SMTC configurations per frequency layer, option 1 is supported; For IAB-MTs that do not support four SMTC configurations per frequency layer, option 2 is supported.Proposal 2: Study if signalling is needed for indication of such capability. |
| R4-2007488 | Qualcomm | **Observation 1:** RAN1 has agreed that supporting up to 4 SMTCs configurated for an IAB node MT per frequency locations is an optional capability.**Proposal 1:** * For IAB-MTs that support four SMTC configurations per frequency layer, requirements should be derived by assuming each IAB-MT can be configured up to four SMTC windows per frequency layer.
* For IAB-MTs that don’t support four SMTC configurations per frequency layer, requirements should be derived by assuming each IAB-MT can be configured up to two and one SMTC windows per intra-frequency and inter-frequency layers respectively.
* A TP capturing this proposal is shown in R4-2007489.
 |
|  R4-2007992 | Ericsson | * **Observation # 1**: According to RAN1 NR feature list support of up to 4 SMTCs is optional for IAB-MT.
* **Proposal # 1**: All IAB-MT shall meet requirements for SMTC1 and SMTC2 defined in TS 38.331. However, only IAB-MT which is capable of 4 SMTCs is required to meet requirements for 4 SMTCs.
* **Proposal # 2**: Only IAB-MT, which is capable of up to 4 SMTC configurations, is required to meet corresponding requirements for 4 SMTCs.
 |
|  |  |  |

## Oppen issues summary

Feature lead’s note:

RAN1 has already agreed that that supporting up to 4 SMTCs configurated for an IAB node MT per frequency locations is an optional capability. This means either RAN2 will define signalling for it or this capability will be conveyed to the network via manufacturer’s declaration. So, RAN4 does not need to study the signalling aspect of this feature.

### Sub-topic 2-1

**Issue 2-1: Number of supportable SMTC configurations per frequency layer.**

**Proposal:**

* Option A (denoted as option 3 in the last meeting):
	+ For IAB-MTs that support four SMTC configurations per frequency layer, requirements are derived by assuming each IAB-MT can be configured up to four SMTC windows per frequency layer.
	+ For IAB-MTs that don’t support four SMTC configurations per frequency layer, requirements are derived by assuming each IAB-MT can be configured up to two SMTC windows in intra-frequency and one SMTC window per inter-frequency layer.
* Option B (denoted as option 2 in the last meeting):
	+ Requirements are derived by assuming all IAB-MTs can be configured up to two SMTC windows in intra-frequency and one SMTC window per inter-frequency layer.
* Recommended WF: Support option A.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Issue 2-1:We support option A because it defines requirements for both values of IAB-MT capability. |
| ZTE | Issue 2-1:Support option A. |
| Samsung | Sub topic 2-1: Support option A. We think following the same reason as UE requirement the multi-SMTC should be mentioned in RAN4 spec. Now that in TS38.133 it defined dual STMC, multi-SMTC configuration should be also supportable for MT. |
| E/// | Issue 2-1: Option A |

### 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** |
| QualcommR4-2007489 | E///: In principle the proposals in this TP are similar to those in E/// TPs (R4-2007993 and R4-2007994). But in QC’s TP some of the term like SMTC,i,k (with subscript i, k) may cause confusion since RRC spec defines smtc1, smtc2, smtc3 and smtc4. In RRC re-establishment. In Tsmtc,j definitiom, “ If it is not configured, the UE may assume that the target SSB periodicity is no larger than 20 ms” should be 160 ms not 20 ms. On RRC release with redirection: we prefer to elaborate Trs wrt SMTC configuration in the text like for other variables instead in the table (Table 12.1.1.3.2-1). In both QC and E/// TP (R4-2007994) mistakenly variable Tsmtc is used; it should be Trs.  |
| Huawei: Same view as Ericsson that it should be 160ms not 20ms |
|  |
| EricssonR4-2007993 | Huawei: For IAB-MT which is not capable of 4 SMTC configurations, the IAB-MT can be configured with 1 SMTC for inter-frequency carrier. And the agreements in RAN4#94e that “Agreement: There is no requirement for RRC re-establishment for IAB-MTs if the SSB transmission periodicity is larger than 160 ms.” is not captured. |
| ZTE: Similar comments on capturing previous agreements. |
| Ericsson: We are fine to capture the above agreement from RAN4#94-e in the updated TP and will also correct that IAB-MT not capable of 4 SMTC configurations can be configured with 1 SMTC for inter-frequency carrier. |
| EricssonR4-2007994 | Huawei: Same comments in 7993, the agreements in RAN4#94e “Agreement: There is no requirement for RRC release with re-direction when the periodicity of SSB is greater than 160 ms. Is not captured. |
| ZTE: Similar comments on capturing previous agreements. |
| Ericsson: We are fine to capture the above agreement from RAN4#94-e in the updated TP. |
|  | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#2-1** | Tentative agreements:* + For IAB-MTs that support four SMTC configurations per frequency layer, requirements are derived by assuming each IAB-MT can be configured up to four SMTC windows per frequency layer.
	+ For IAB-MTs that don’t support four SMTC configurations per frequency layer, requirements are derived by assuming each IAB-MT can be configured up to two SMTC windows in intra-frequency and one SMTC window per inter-frequency layer.

Candidate options:Recommendations for 2nd round: Does not need to be discussed in the 2nd round. |

Suggestion on WF/LS assignment

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| QualcommR4-2007489 | Status: can be noted. |
| EricssonR4-2007993 | Status: To be revisedSuggestion for revision: Please incorporate the feedback that was received during the 1st round.  |
| EricssonR4-2007994 | Status: To be revisedSuggestion for revision: Please incorporate the feedback that was received during the 1st round. |

## Discussion on 2nd round

### Companies views’ collection for 2nd round

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| EricssonR4-2008597 |  |
| EricssonR4-2008598 |  |

## 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”* |

# Topic #3: Details of MT Timing Related Requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **Tdoc number** | **Company** | **Comments** |
| R4-2008197 | Nokia | 1. The current Te requirements for IAB-MT should be applied for SSB periodicity larger than 160ms.

**Observation 1: CA scenarios need to be considered in IAB-MT RRM requirements.**1. IAB-MT CA scenarios requirements for transmit timing can reuse the related requirements for Rel-15 NR UE.

**Observation 2: DRX mode should not be excluded from IAB-MT requirements except RLM/BFD/CBD requirements.**Proposal 3: DRX mode support for transmit timing requirements for IAB-MT can reuse the requirements for Rel-15 NR UE.  |
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## Oppen issues summary

**Feature lead’s note:**

RAN4 already agreed that the Te related requirements of Rel-15 will be applicable for IAB-MTs. Please see below:

*RAN4 94e Agreement: The MT timing related requirements in terms of TA adjustment accuracy (Te) reuse the current requirements defined in TS 38.133.*

Besides, RAN1’s following agreement suggests that a DL SSB will be always present in every 160 ms for IAB-MTs. Please see below:

|  |
| --- |
| *RAN1 96 Agreements** Existing NR mechanisms are used by the network to signal to IAB MTs the SSB periodicity for cell re-selection.
* The IAB-node MT initial access assumption that half frames with SS/PBCH blocks occur with a periodicity of 16 frames does not have an impact on cell re-selection.
 |

Hence, we don’t need to revisit previous RAN4 agreement and consider SSB periodicity being larger than 160ms for defining Te requirement of IAB MTs.

### Sub-topic 3-1

**Issue 3-1: CA scenarios in IAB-MT Timing requirements**

Proposal: Consider CA scanrios in IAB-MT RRM requirements. IAB-MT CA scenarios requirements for transmit timing can reuse the related requirements for Rel-15 NR UE.

**Recommended WF:** Decide based on feedback.

### Sub-topic 3-2

**Issue 3-2: DRX mode in IAB-MT Timing requirements**

**Proposal:** DRX mode support for transmit timing requirements for IAB-MT can reuse the requirements for Rel-15 NR UE.

**Recommended WF:** Decide based on feedback.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | 3-1: For wide area (WA) IAB-MT, RF group has agreed that multicarrier operation is based on base station multicarrier framework. Therefore for at least WA IAB-MT, no transmit timing requirements are needed for CA scenarios. For local area (LA) IAB-MT, there is no agreement in RF group about CA scenarios. So we suggest not to add any CA scenarios in the timing requirements.Sub topic 3-2: In our view all requirements should be consistently defined i.e. all requirements are defined in non-DR. Therefore, no need to do any change in the timing requirements to add DRX mode support.….Others: |

|  |  |
| --- | --- |
| Qualcomm | Sub-topic 3-2: Same view as E///. DRX mode is not important for IAB-MTs. |
| Samsung | Sub-topic 3-1: Currently not sure to consider requirements for CA scenarios since now CA are not agreed in RF session.Sub-topic 3-2: We also think DRX mode is not important for IAB-MTs. |
| Nokia | Sub-topic 3-1: CA support should be considered since it was agreed that for wide area IAB-MT the CA/DC-support follows the current BS approach in RF session.Sub-topic 3-2: We only agree no DRX in RLM and BFR, other requirements for IAB-MTs should not exclude DRX mode as DRX support is optional for IAB-MT. |

### CRs/TPs comments collection

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| NokiaR4-2008239 | Ericsson: As commented under sub-topics 3-1 and 3-2, the proposed changes to the timing requirements are unnecessary and will specially create lot of confusion for WA MT because it does not use UE CA rather BS multicarrier framework. Therefore the current timing requirements in TS 38.174 are fine. The references which are TBD can possibly be replaced with spec reference if the related TP is agreed and can be updated directly by the rapporteur in the next version of the TS 38.174.  |
| Qualcomm: Defining requirements for 640 ms SSB periodicity is not needed.Besides, as commented under sub-topic 3-2, DRX mode is not important for IAB-MTs. |
| Nokia: Same comment under sub-topic 3-1 and 3-2.  |
|  | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#3-1** | Tentative agreement: FFS whether to support CA scenarios for IAB-MT timing requirements.Candidate options:* Yes (Nokia)
* No (Samsung, Ericsson)

Recommendations for 2nd round: Discuss further. The proponent of 3-1 (Nokia) is requested to show the status of supporting CA scenarios for wide area and local area networks in IAB RF session. Companies may need more time to check the status of IAB RF session’s discussion regarding the support of CA scenarios before commenting here.  |
| **Sub-topic#3-2** | Tentative agreement: FFS whether to define transmission timing requirements for IAB-MTs during DRX mode.Candidate options:* Yes (Nokia)
* No (Samsung, Ericsson, Qualcomm)

Recommendations for 2nd round: Discuss further. Three companies (Ericsson, Samsung, Qualcomm) mentioned that DRX mode is not important for IAB-MTs. The proponent of 3-2 (Nokia) is requested to explain further why defining transmission timing requirements during DRX mode is important for IAB-MTs. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| NokiaR4-2008239 | Status*:* To be revisedReason for status: The TP proposed three new aspects (support of CA mode, DRX mode and greater than 160 ms SSB periodicity) . But, several companies did not agree to these new requirements. Depending on the discussion of the 2nd round, the TP may need to be revised.  |

## Discussion on 2nd round

### Open Issues for 2nd round

#### Sub-topic 3-1

**Issue 3-1: CA scenarios in IAB-MT Timing requirements**

Proposal: Consider CA scenarios in IAB-MT RRM requirements. IAB-MT CA scenarios requirements for transmit timing can reuse the related requirements for Rel-15 NR UE.

Candidate options from the 1st round:

* Yes (Nokia)
* No (Samsung, Ericsson)

**Recommended WF:** Decide based on feedback.

#### Sub-topic 3-2

**Issue 3-2: DRX mode in IAB-MT Timing requirements**

**Proposal:** DRX mode support for transmit timing requirements for IAB-MT can reuse the requirements for Rel-15 NR UE.

Candidate options from the 1st round:

* Yes (Nokia)
* No (Samsung, Ericsson, Qualcomm)

**Recommended WF:** Decide based on feedback.

### Companies views’ collection for 2nd round

#### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

#### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2008599Nokia | Company A |
| Company B |
| Company C |

## 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”* |

# Topic #4: RLM requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| Tdoc number | Company | Comments |
| R4-2006016 | ZTE | Proposal 1: Extend the evaluation period of IS and OOS by multiplying K to the evaluation period for UEs..Proposal 2: Different values of K is to be used for FR1 and FR2 since in FR2 for SSB based evaluation, there is another scaling factor N for beam sweeping.Proposal 3: N for CSI-RS based RLM requirements in FR2 is omitted since N = 1.Proposal 4: TEvaluate\_out\_SSB and TEvaluate\_in\_SSB are defined in Table 12.3.1.2.2-1 for FR1 with scaling factor K1 = 6.TEvaluate\_out\_SSB and TEvaluate\_in\_SSB are defined in Table 12.3.1.2.2-2 for FR2 with scaling factor N=8 and K2 = 4.Table 12.3.1.2.2-1: Evaluation period TEvaluate\_out\_SSB and TEvaluate\_in\_SSB for FR1

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_SSB (ms)  | TEvaluate\_in\_SSB (ms)  |
| no DRX | Max(200 × K1, Ceil(10 × P × K1) × TSSB) | Max(100 × K1, Ceil(5 × P × K1) × TSSB) |
| NOTE: TSSB is the periodicity of the SSB configured for RLM. |

Table 12.3.1.2.2-2: Evaluation period TEvaluate\_out\_SSB and TEvaluate\_in\_SSB for FR2

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_SSB (ms)  | TEvaluate\_in\_SSB (ms)  |
| no DRX | Max(200 × K2, Ceil(10 × P × N × K2) × TSSB) | Max(100 × K2, Ceil(5 × P × N × K2) × TSSB) |
| NOTE: TSSB is the periodicity of the SSB configured for RLM. |

TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS are defined in Table 12.3.1.3.2-1 for FR1 with scaling factor K1 = 6.- TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS are defined in Table 12.3.1.3.2-2 for FR2 with scaling factor K2 = 6.Table 12.3.1.3.2-1: Evaluation period TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS for FR1

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_CSI-RS (ms)  | TEvaluate\_in\_CSI-RS (ms)  |
| no DRX | Max(200 × K1, Ceil(Mout×P × K1)×TCSI-RS) | Max(100 × K1, Ceil(Min×P × K1) × TCSI-RS) |
| NOTE: TCSI-RS is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for TCSI-RS equal to 5 ms, 10ms, 20 ms or 40 ms. |

Table 12.3.1.3.2-2: Evaluation period TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS for FR2

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_CSI-RS (ms)  | TEvaluate\_in\_CSI-RS (ms)  |
| no DRX | Max(200 × K2, Ceil(Mout×P × K2)×TCSI-RS) | Max(100 × K2, Ceil(Min×P × K2) × TCSI-RS) |
| NOTE: TCSI-RS is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for TCSI-RS equal to 5 ms, 10 ms, 20 ms or 40 ms. |

 |
| R4-2006433 | Samsung | ***Observation 1: Consider non-mobility IAB in Rel-16, radio propagation environment for IAB link would be much simpler compared to UE’s.*** ***Observation 2: Compared to UE, radio link failure has much less chance to happen for IAB.******Observation 3: Even if unexpected blockage occurs, temperately link outage can be quickly recovered by beam failure recovery procedure so that no radio link failure easily happens.******Proposal 1: Relax existing UE RLM requirement for IAB RLM requirement.******Proposal 2: For IAB RLM requirement, increase the number of samples and the lower boundary of that in UE Evaluation Period for both SSB and CSI-RS based measurement cases.******Observation 4: As the IAB radio link failure is mainly caused by unexpected link blockage, it happens less frequently on FR1 than FR2.******Proposal 3: Since the situations for FR1 and FR2 are different, separate scaling factor should be applied to relaxing the RLM evaluation period for FR1 and FR2.******Proposal 4: Compared to UE, the evaluation period for IAB RLM requirement could be relaxed by 5 times and 2 times for FR1 and FR2, respectively. For example, the SSB-based evaluation period would be defined as following.*****Evaluation period TEvaluate\_out\_SSB and TEvaluate\_in\_SSB for FR1**

|  |  |  |
| --- | --- | --- |
| **Configuration** | **TEvaluate\_out\_SSB (ms)** | **TEvaluate\_in\_SSB (ms)** |
| no DRX | Max(1000, Ceil(50 × P) × TSSB) | Max(500, Ceil(25 × P) × TSSB) |
| NOTE: TSSB is the periodicity of the SSB configured for RLM. |

**Evaluation period TEvaluate\_out\_SSB and TEvaluate\_in\_SSB for FR2**

|  |  |  |
| --- | --- | --- |
| **Configuration** | **TEvaluate\_out\_SSB (ms)** | **TEvaluate\_in\_SSB (ms)** |
| no DRX | Max(400, Ceil(20 × P × N) × TSSB) | Max(200, Ceil(10 × P × N) × TSSB) |
| NOTE: TSSB is the periodicity of the SSB configured for RLM. |

 |
| R4-2007490 | Qualcomm | **Observation 1: the beam sweeping factor for fixed UEs (power class 1) was also decided to be 8 in Rel-15.****Observation 2: Since RAN4 has already agreed to a relaxation factor to define RLM evaluation period, a smaller value of N (e.g. N = 4) can also be considered for SSB based RLM-RS.****Proposal 1: For FR2, at least, the relaxation factor of RLM evaluation period of IAB-MTs should not be greater than 2.****Proposal 2:** * **For CSI-RS based RLM-RS evaluation period, reuse the beam sweeping factor of Rel-15 UEs.**
* **For SSB based RLM-RS evaluation period, assume N = 8.**
	+ **Since RAN4 has already agreed to a relaxation factor for RLM evaluation period, a smaller value of N (e.g. N = 4) can also be considered.**
 |
|  R4-2007684 | Huawei | Proposal 1: It is suggested to extend the evaluation period in TS 38.133 by scaling factor of 5 for IAB MT RLM. |

## Open issues summary

### Sub-topic 4-1

**Issues: Framework of RLM evaluation period.**

**Proposal:**

RLM evaluation periods of IAB-MTs follow the following framework (where K1 and K2 denote the relaxation factors for FR1 and FR2 respectively):

Table 12.3.1.2.2-1: Evaluation period TEvaluate\_out\_SSB and TEvaluate\_in\_SSB for FR1

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_SSB (ms)  | TEvaluate\_in\_SSB (ms)  |
| no DRX | Max(200 × K1, Ceil(10 × P × K1) × TSSB) | Max(100 × K1, Ceil(5 × P × K1) × TSSB) |
| NOTE: TSSB is the periodicity of the SSB configured for RLM. |

Table 12.3.1.2.2-2: Evaluation period TEvaluate\_out\_SSB and TEvaluate\_in\_SSB for FR2

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_SSB (ms)  | TEvaluate\_in\_SSB (ms)  |
| no DRX | Max(200 × K2, Ceil(10 × P × N × K2) × TSSB) | Max(100 × K2, Ceil(5 × P × N × K2) × TSSB) |
| NOTE: TSSB is the periodicity of the SSB configured for RLM. |

Table 12.3.1.3.2-1: Evaluation period TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS for FR1

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_CSI-RS (ms)  | TEvaluate\_in\_CSI-RS (ms)  |
| no DRX | Max(200 × K1, Ceil(Mout×P × K1)×TCSI-RS) | Max(100 × K1, Ceil(Min×P × K1) × TCSI-RS) |
| NOTE: TCSI-RS is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for TCSI-RS equal to 5 ms, 10ms, 20 ms or 40 ms. |

Table 12.3.1.3.2-2: Evaluation period TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS for FR2

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_CSI-RS (ms)  | TEvaluate\_in\_CSI-RS (ms)  |
| no DRX | Max(200 × K2, Ceil(Mout×P × K2)×TCSI-RS) | Max(100 × K2, Ceil(Min×P × K2) × TCSI-RS) |
| NOTE: TCSI-RS is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for TCSI-RS equal to 5 ms, 10 ms, 20 ms or 40 ms. |

**Recommended WF:**

Support above proposal.

### Sub-topic 4-2

**Issues: Beam sweeping factor N for SSB based RLM evaluation period in FR2.**

**Proposal:** N = 8.

**Recommended WF:** Support above proposal.

### Sub-topic 4-3

**Issues: Relaxation factors K1 and K2 for SSB RLM evaluation period.**

**Options:**

**K1 in FR1 SSB-based evaluation period:**

* Option 1: K1 = 6
* Option 2: K1 = 5

**K2 in FR2 SSB-based evaluation period:**

* Option 1: K2 = 5
* Option 2: K2 = 4
* Option 3: K2 = 2

**Recommended WF:** Decide based on feedback.

### Sub-topic 4-4

**Issues: Relaxation factors K1 and K2 for CSI-RS RLM evaluation period.**

**Options:**

**K1 in FR1 CSI-RS-based evaluation period:**

* Option 1: K1 = 6
* Option 2: K1 = 5

**K2 in FR2 CSI-RS-based evaluation period:**

* Option 1: K2 = 6
* Option 2: K2 = 5
* Option 3: K2 = 2

**Recommended WF:** Decide based on feedback.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Sub top 4-3: Slightly prefer K1=k2=5 Sub top 4-4: Slightly prefer K1=k2=5 |
| Qualcomm | Sub-topic 4-1 and 4-2: Support recommended WF.Sub-topic 4-3: K1 = 5, K2 = 2.Sub-topic 4-4: K1 = 5, K2 = 2. |
| ZTE | Sub-topic 4-1 and 4-2: Support recommended WF.Sub-topic 4-3: K1 = 6, K2 = 4 as proposed in our paper & TP.Sub-topic 4-4: K1 = K2 = 6. |
| Samsung | Sub-topic 4-1: The conclusion is agreeable to us. But we suggest K1 and K2 may not need to exist in the final version of the table.Sub-topic 4-2: Support recommended WF.Sub-topic 4-3: Support K1 = 5, K2 = 2. As discussed in our paper, radio link failure are mainly caused by unexpected blockage for MT. Consider different wave length of FR1 and FR2, blockage is easier to happen on FR2. Therefore we suggest different scaling factor for FR1 and FR2 in which the factor for FR2 should be smaller.On the other hand, to keep from too long evaluation period for FR2, K2 = 2 is preferable.Sub-topic 4-4: The same as Sub-topic 4-3, support K1 = 5, K2 = 2. |
| Nokia | Sub-topic 4-1: we do not think the relaxation factors K1 and K2 is needed for RLM. If the radio link failure happens, this will cause long period to detect the link problem issue. Sub-topic 4-2: support the recommended WF. |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| ZTER4-2006017 | Qualcomm: Value of K1, K2 and N should follow the outcome sub-topic 4-2, 4-3 and 4-4. Also, measurement restriction and scheduling availability sections can directly cite 38.133. |
|  Samsung: The final values of K should be consensus based. K1 and K2 may not need to exist in the table. The same requirement can be written in reference way. |
|   |
|  | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#4-1** | Tentative agreements:RLM evaluation periods of IAB-MTs follow the following framework (where K1 and K2 denote the relaxation factors for FR1 and FR2 respectively):Table 12.3.1.2.2-1: Evaluation period TEvaluate\_out\_SSB and TEvaluate\_in\_SSB for FR1

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_SSB (ms)  | TEvaluate\_in\_SSB (ms)  |
| no DRX | Max(200 × K1, Ceil(10 × P × K1) × TSSB) | Max(100 × K1, Ceil(5 × P × K1) × TSSB) |
| NOTE: TSSB is the periodicity of the SSB configured for RLM. |

Table 12.3.1.2.2-2: Evaluation period TEvaluate\_out\_SSB and TEvaluate\_in\_SSB for FR2

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_SSB (ms)  | TEvaluate\_in\_SSB (ms)  |
| no DRX | Max(200 × K2, Ceil(10 × P × N × K2) × TSSB) | Max(100 × K2, Ceil(5 × P × N × K2) × TSSB) |
| NOTE: TSSB is the periodicity of the SSB configured for RLM. |

Table 12.3.1.3.2-1: Evaluation period TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS for FR1

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_CSI-RS (ms)  | TEvaluate\_in\_CSI-RS (ms)  |
| no DRX | Max(200 × K1, Ceil(Mout×P × K1)×TCSI-RS) | Max(100 × K1, Ceil(Min×P × K1) × TCSI-RS) |
| NOTE: TCSI-RS is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for TCSI-RS equal to 5 ms, 10ms, 20 ms or 40 ms. |

Table 12.3.1.3.2-2: Evaluation period TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS for FR2

|  |  |  |
| --- | --- | --- |
| Configuration | TEvaluate\_out\_CSI-RS (ms)  | TEvaluate\_in\_CSI-RS (ms)  |
| no DRX | Max(200 × K2, Ceil(Mout×P × K2)×TCSI-RS) | Max(100 × K2, Ceil(Min×P × K2) × TCSI-RS) |
| NOTE: TCSI-RS is the periodicity of the CSI-RS resource configured for RLM. The requirements in this table apply for TCSI-RS equal to 5 ms, 10 ms, 20 ms or 40 ms. |

The agreement will be captured with the following editor’s note in the spec:[Editor’s note: K1 and K2 will eventually be replaced by their values once RAN4 finalizes these] Candidate options:Recommendations for 2nd round: Further discussion is not needed. |
| **Sub-topic#4-2** | Tentative agreements:Beam sweeping factor N for SSB based RLM evaluation period in FR2:* N = 8.

Candidate options:Recommendations for 2nd round: Further discussion is not needed. |
| **Sub-topic#4-3** | Tentative agreement:Relaxation factors K1 for SSB based RLM evaluation period in FR1:* K1 = 5.

Relaxation factors K2 for SSB based RLM evaluation period in FR2:* K2 is FFS.

Candidate options for K2:* K2 = 5 (supported by: Huawei)
* K2 = 4 (supported by: ZTE)
* K2 = 2 (supported by: Samsung, Qualcomm)

Recommendations for 2nd round:Discuss K2 further.Reason for agreement regarding K1:Three companies (Huawei, Qualcomm, Samsung) proposed K1 = 5. ZTE proposed K1 = 6. Nokia proposed not to introduce any relaxation factor K1 and K2 but RAN4 already agreed to introduce relaxation factors K1 and K2 in the last meeting. Feature lead hopes that both ZTE and Nokia can compromise with the proposed K1 value. |
| **Sub-topic#4-4** | Tentative agreement:Relaxation factors K1 for CSI-RS based RLM evaluation period in FR1:* K1 = 5.

Relaxation factors K2 for CSI-RS based RLM evaluation period in FR2:* K2 is FFS.

Candidate options for K2:* K2 = 5 (supported by: Huawei)
* K2 = 6 (supported by: ZTE)
* K2 = 2 (supported by: Samsung, Qualcomm)

Recommendations for 2nd round:Discuss K2 further.Reason for agreement regarding K1:Three companies (Huawei, Qualcomm, Samsung) proposed K1 = 5. ZTE proposed K1 = 6. Nokia proposed not to introduce any relaxation factor K1 and K2 but RAN4 already agreed to introduce relaxation factors K1 and K2 in the last meeting. Feature lead hopes that both ZTE and Nokia can compromise with the proposed K1 value. |

Suggestion on WF/LS assignment

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| ZTER4-2006017 | Status: To be revised.Suggestion from the feature lead for revised TP:* Please keep K1, K2 and N in a generic form so that the updated TP can be accepted even if K1 and K2 don’t get decided during this meeting
* Please add the following editor’s note in the updated TP: “[Editor’s note: K1 and K2 will eventually be replaced by their values once RAN4 finalizes these]”
* Measurement restriction and scheduling availability sections can directly cite 38.133.
 |

## Discussion on 2nd round (if applicable)

### Open issues for 2nd round

#### Sub-topic 4-5

**Issues: Relaxation factors K2 for SSB RLM evaluation period.**

**K2 in FR2 SSB-based evaluation period:**

Candidate options from the 1st round:

* K2 = 5 (supported by: Huawei)
* K2 = 4 (supported by: ZTE)
* K2 = 2 (supported by: Samsung, Qualcomm)

**Recommended WF:** Decide based on feedback.

#### Sub-topic 4-6

**Issues: Relaxation factors K2 for CSI-RS RLM evaluation period.**

**K2 in FR2 CSI-RS-based evaluation period:**

Candidate options from the 1st round:

* K2 = 5 (supported by: Huawei)
* K2 = 6 (supported by: ZTE)
* K2 = 2 (supported by: Samsung, Qualcomm)

**Recommended WF:** Decide based on feedback.

### Companies views’ collection for 2nd round

#### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

#### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2008600ZTE |  |

## 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”* |

# Topic #5: Link recovery requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **Tdoc number** | **Company** | **Comments** |
| R4-2006015 | ZTE | Proposal 1: Beam sweeping factor N = 8. |
| R4- 2006434 | Samsung | ***Observation 1: Consider non-mobility IAB in Rel-16, radio propagation environment and link recovery procedure for IAB-MT would be much simpler compared to UE’s.******Observation 2: For FR2, MT’s beam pattern and UE’s beam pattern may be different in regard to beam shape and effective sphere coverage. Normally only a few beam directions are used for MT to access DU.******Observation 3: As the fixed location for both MT and DU, on FR2 very limited number of beams can serve as potential beams for IAB transmission whereas all directions of UE beams would be probably selected as active beam for UE transmission.******Observation 4: Beam failure can be recovered by beam switching to an alternative path, which should be performed timely and precisely.******Observation 5: It is fatal for a MT to wrongly select the active beam because it has impact on a large number of data traffic compared to a single UE.******Proposal 1: Considering all these differences between MT and UE, MT beam failure recovery should complete more quickly than UE for securing higher link quality.******Proposal 2: For IAB CBD requirement, beam sweeping factor N=8 in Evaluation Period calculation for FR2 should be reduced as less beam candidates for beam switching along with all above differences analyzed between MT and UE.******Proposal 3: For IAB CBD requirement, reduce the beam sweeping factor to N=4 of Evaluation Period in both SSB and CSI-RS based measurement cases.*** |
| R4-2007487 | Qualcomm | Observation 1: IAB-MTs may need to use narrower RX beams to obtain higher link budget.Observation 2: the beam sweeping factor for fixed UEs (power class 1) was also decided to be 8 in Rel-15.Proposal 1: For IAB CBD requirement, use beam sweeping factor N=8 in evaluation period calculation.Proposal 2: For IAB BFD requirement, reuse the beam sweeping factors that were defined for UEs in Rel-15. Proposal 3: Re-use the measurement restriction requirements and minimum requirements for L1 indication, that were defined for UEs in Rel-15, in IAB networks. |
| R4-2007683 | Huawei | Proposal 1: There is no need to remove the sharing factor P in BFD and CBD requirements for IAB-MT.Proposal 2: The requirements of evaluation period of BFD/CBD for Rel-15 UE can apply for IAB-MT.Proposal 3: Adopt the same beam sweeping factor which is 8 for FR2 in TS 38.174. |

## Open issues summary

Feature lead’s note:

RAN4 has already agreed to keep sharing factor P in RLM/BFD/CBD requirements. See the following agreement from RAN4 94bis-e:

|  |
| --- |
| *WF on RLM requirements and sharing factor in RLM/BFD/CBD evaluation for IAB-MTs**Agreement*: Sharing factor P is also necessary since measurement gap can be configured for IAB-MTs |

So, we don’t need to discuss this issue again in this meeting.

### Sub-topic 5-1

**Issues: Beam sweeping factor N for IAB CBD requirements**.

**Options:** Down-select N from following options.

* Option 1: N = 8
* Option 2: N = 4

**Recommended WF:** Decided based on feedback.

### Sub-topic 5-2

**Issues: Beam sweeping factor N for IAB BFD requirements**

**Proposal:** For IAB BFD requirement, reuse the beam sweeping factors that were defined for UEs in Rel-15.

**Recommended WF:** Support above proposal.

### Sub-topic 5-3

**Issues: measurement restriction requirements and minimum requirements for L1 indication during BFD of IAB-MTs.**

**Proposal:** Re-use the measurement restriction requirements and minimum requirements for L1 indication, that were defined for UEs in Rel-15, in IAB networks.

**Recommended WF:** Support above proposal.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Sub-topic 5-1: Support option 1, i.e., N = 8.Support recommended WF for both sub-topic 5-2 and 5-3. |
| ZTE | 5-1: Support Option 1 which is N = 8. No need to change this value.Support recommended WF for both sub-topic 5-2 and 5-3. |
| Samsung | Sub-topic 5-1: We support option 2 N=4 for following reason:1. For MT link, very limited beam candidates are used for MT to access DU since the location of IAB is fixed, whereas all directions of UE beams would be probably selected as active beam for UE transmission.
2. For high frequency of FR2, normally only 1~3 radio paths, which are relatively stable, exist other than LoS between MT and DU, leading easier beam candidate detection, while UE has more beams to sweep.
3. Wrongly selecting beam for MT has more severe impact compared to a single UE on the data package transmission as different functionalities, thus MT beam failure recovery procedure should complete more quickly than UE.

Considering the differences between MT and UE, we do think reduce the factor N is necessary for MT.Sub-topic 5-2 and 5-3: Support recommended WF. |
| Nokia | Sub-topic 5-1:Support Option 1 Sub-topic 5-2: Support the recommended WF.Sub-topic 5-3:Support the recommended WF. |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| SamsungR4-2006435 | Qualcomm: Value of N should reflect the outcome of sub-topic 5-1. |
|  Samsung: Our intension is just to remove TBD in the TS. This TP can be revised to consensus based version after we reached agreement on the value of N. |
|  |
| QualcommR4-2007486 | Company A |
| Company B |
|  |

## 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: FFS Beam sweeping factor N for IAB CBD requirements:Candidate options:1. N = 8 (supported by: ZTE, Qualcomm, Nokia)2. N = 4 (supported by: Samsung)3. N = 6Recommendations for 2nd round: Discuss further.Reason for status:Three companies (Qualcomm, ZTE and Nokia) supported N = 8 and one company (Samsung) supported N = 4. RAN4 RRM session has been discussing this issue for three meetings and companies have not changed their positions. Feature lead hopes that Samsung can compromise to the majority view and accept N = 8. |
| **Sub-topic #5-2** | Tentative agreements: For IAB BFD requirement, reuse the beam sweeping factors that were defined for UEs in Rel-15.Candidate options:Recommendations for 2nd round: No further discussion is necessary. |
| **Sub-topic #5-3** | Tentative agreements: Re-use the measurement restriction requirements and minimum requirements for L1 indication, that were defined for UEs in Rel-15, in IAB networks.Candidate options:Recommendations for 2nd round: No further discussion is necessary |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### 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**  |
| SamsungR4-2006435 | Status: To be revisedSuggestion for the revised TP: Update the value of N with N = 8 (agreed during the first round). |
| QualcommR4-2007486 | Stauts: Agreeable. |

## Discussion on 2nd round (if applicable)

### Open issues for 2nd round

#### Sub-topic 5-1

**Issue: Beam sweeping factor N for IAB CBD requirements:**

Candidate options from the 1st round:

1. N = 8 (supported by: ZTE, Qualcomm, Nokia)

2. N = 4 (supported by: Samsung)

3. N = 6

**Recommended WF:** Decide based on feedback.

### Companies views’ collection for 2nd round

#### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

#### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2008601Samsung | Company A |
| Company B |
| Company C |
| R4-2008611Qualcomm | Company A |
| Company B |
| Company C |

## 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”* |

# Other contributions