**3GPP TSG-RAN WG4 Meeting #94-e R4-20xxxxx**

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

**Agenda item:** 8.5.5, 8.5.5.1, 8.5.5.2, 8.5.5.3, 8.5.5.4, 8.5.5.5

**Source:** Qualcomm Incorporated

**Title:** Email discussion summary for RAN4#94e\_#53\_NR\_IAB\_RRM

**Document for:** Information

# Introduction

3GPP has almost finalized selecting the list of NR IAB RRM features for which RAN4 requirements will be defined. Now, RAN4 needs to define the detailed RRM requirements for these features. This contribution summarizes different companies views regarding these features and provides the recommended way forwards.

The email discussion plans to focus on open issues in the first round and text proposals in the 2nd round.

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

* 1st round: TBA
* 2nd round: TBA

# Topic #1: Introduction of Additional RRM Requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001339 | Nokia | Proposal 3: The IAB-MT handover interrupt time requirement could be introduced based on existing handover interrupt time requirements independently from support of RRM measurements and reporting requirements.Proposal 4: The HO interruption time from existing UE requirements could be re-used as baseline for defining HO interrupt time in IAB while the IAB specific latency values would need more discussion. |
| R4-2002126 | Qualcomm | Observation 2: In TA adjustment accuracy tests, timing alignment timer is set to infinity so that the timer does not expire during the test. If an IAB-MT is not maintaining any accuracy, its timer can expire during the test.Proposal 3: RAN4 agrees to define timer accuracy requirements for IAB-MTs.* Reuse the existing UE timer accuracy requirements defined in section 7.2 of 38.133 for the IAB MT.
 |

## Open issues summary

### Sub-topic 1-1

**Issue 1-1: Introduction of HO related core requirements for IAB-MTs**

* Proposals
	+ Option 1: Support
	+ Option 2: Don’t support
* Recommended WF
	+ Don’t introduce HO related requirements for IAB-MTs
		- Note: This item has been discussed before in previous RAN4 meetings and is not agreeable to some companies.

### Sub-topic 1-2

**Issue 1-2: Introduction of MT timer related core requirements for IAB-MTs**

* Proposals
	+ Option 1: Support
	+ Option 2: Oppose
* Recommended WF
	+ Decide based on other companies’ views about the proposal.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 1-1: Suggest to wait for the clear definition of different IAB MT types. Different requirements shall be specified for different types of IAB MTs. Sub topic 1-2: Suggest to wait for the clear definition of different IAB MT types. Different requirements shall be specified for different types of IAB MTs. |
| Ericsson | Sub topic 1-1: RAN4 agreed not to specify HO requirements. RAN4 should follow the agreements and therefore don’t specify the HO requirements. Sub topic 1-2: RAN4 agreed not to specify timer accuracy requirements. RAN4 should follow the agreements and therefore don’t specify the timer accuracy requirements.  |
| Nokia | Sub topic 1-1: We can agree to the recommended WFSub topic 1-2: Re-use of existing UE timer accuracy requirements in 38.133 section 7.2 is agreeable to us. |

### 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** |
| XXX | Company A |
| Company B |
|  |
| YYY | 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#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 |  |  |

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **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: Definition of macro and micro IAB nodes

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000051 | ZTE | Proposal 1: Define different types of MTs regarding the issue if strict or loose RRM requirements apply.Proposal 2: Define at least two types of MTs.Proposal 3: Take the parameters in following table duplicated from TR 38.802 and TR 38.874 as a starting point to define different types of IAB MTs.

|  |  |  |
| --- | --- | --- |
|  | macro | micro |
| BS Tx power  | Below 6GHz: 44 dBm PA scaled down with simulation BW when system BW is higher than simulation BW. Otherwise, 44 dBmAbove 6GHz: 40 dBm PA scaled down with simulation BW when system BW is higher than simulation BW. Otherwise, 40 dBm | 4 GHz: 33dBm for 20MHz system bandwidthAbove 6GHz: 33 dBm PA scaled down with simulation BW when system BW is higher than simulation BW. Otherwise, 33 dBm. |
| BS antenna height  | 25m | 10m |

 |

## Open issues summary

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### Sub-topic 2-1

**Issue 2-1: Definition of macro and micro IAB nodes, as mentioned in R4-2000051**

* Proposals
	+ Option 1: Support
	+ Option 2: Let RAN4 RF session decide this topic.
* Recommended WF
	+ Let RAN4 RF session decide this topic.
		- Note: RAN4 RF session has been discussing IAB-DU and IAB-MT classes during the last couple of meetings.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 2-1: 0051 is our paper so I changed the source company from Nokia to ZTE ;)We understand that detailed parameters of different types of IAB MTs shall be discussed in RF session, but we think the number of types of nodes shall be discussed in RRM session since the reason to have different types of IAB nodes started from diversed opinions on RRM requirements on IAB MTs. |
| Ericsson | Sub topic 2-1: Support option 2. This is related to IAB class which depends on deployment and should therefore be decided by the RAN4 RF session. |
| Nokia | Sub topic 2-1: Support the recommended WF |

### 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** |
| XXX | Company A |
| Company B |
|  |
| YYY | 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#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **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 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** |
| R4-2001339 | Nokia | 1. RAN4 would need to discuss assumptions and latencies for RRC re-establishment further.
2. RAN4 would need to discuss assumptions and latencies for release with redirection further.
 |
| R4-2001549 | Huawei | Proposal 1: The time for cell identification in RRC re-establishment should be extended considering a longer SSB periodicity. There is no requirements if the SSB transmission periodicity is larger than 160ms.Proposal 2: IAB MT is not required to successfully identify a cell when the SMTC window is larger than 160ms and the serving cell is in low SNR.Proposal 3: There is no requirement when the SSB transmission periodicity is larger than 160ms. |
| **R4-2002128** | Qualcomm | **Proposal 1: Most parts of the existing core requirements of RRC reestablishment delay, as defined in Rel-15 38.133, are reused for IAB MTs.*** **The only exception lies in the description of TSMTC parameter. The description of TSMTC should mention that up to four SMTC windows can be configured per frequency layer for an IAB MT.**
* **An example text proposal is shown below.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| The ~~UE~~IAB-MT re-establishment delay (TUE\_re-establish\_delay) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause 5.3.7 in TS 38.331 [2] is detected by the ~~UE~~IAB-MT and when the ~~UE~~IAB-MT sends PRACH to the target PCell. The ~~UE~~IAB-MT re-establishment delay (TUE\_re-establish\_delay) requirement shall be less than:The intra-frequency target NR cell shall be considered detectable if each relevant SSB can satisfy that:- SS-RSRP related side conditions given in clause 10.1.2 and 10.1.3 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively, and- the conditions of SSB\_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fulfilled.The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:- SS-RSRP related side conditions given in clause 10.1.4 and 10.1.5 are fulfilled for a corresponding NR Band for FR1 and FR2, respectively, and- the conditions of SSB\_RP and SSB Ês/Iot according to Annex B.2.2 for a corresponding NR Band are fulfilled.Tidentify\_intra\_NR: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. If the ~~UE~~ IAB-MT is not configured with intra-frequency NR carrier for RRC re-establishment then Tidentify\_intra\_NR=0; otherwise Tidentify\_intra\_NR shall not exceed the values defined in Table 6.2.1.2.1-1.Tidentify\_inter\_NR,i: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. Tidentify\_inter\_NR,i shall not exceed the values defined in Table 6.2.1.2.1-2.TSMTC: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *~~smtc2~~smtcI where 1<=I<=4,* Tsmtc follows *~~smtc1~~* ~~or~~ *~~smtc2~~smtcI* according to the physical cell ID of the target cell.TSMTC,i: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the ~~UE~~ IAB-MT may assume that the target SSB periodicity is no larger than 20 ms.TSI-NR: It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [2] for the target NR cell.TPRACH: It is the delay caused due to the random access procedure when sending random access to the target NR cell. The delay depends on the PRACH configuration defined in Table 6.3.3.2-2 [6] or Table 6.3.3.2-3 [6] for FR1 and in Table 6.3.3.2-4 [6] for FR2.Nfreq: It is the total number of NR frequencies to be monitored for RRC re-establishment; Nfreq = 1 if the target intra-frequency NR cell is known, else Nfreq = 2 and Tidentify\_intra\_NR = 0 if the target inter-frequency NR cell is known.There is no requirement if the target cell does not contain the IAB-MT ~~UE~~ context.In the requirement defined in the below tables, the target FR1 cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown.Table 6.2.1.2.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell

|  |  |  |
| --- | --- | --- |
| Serving cell SSB Ês/Iot (dB) | Frequency range (FR) of target NR cell | Tidentify\_intra\_NR [ms] |
| Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 5 x TSMTC) | MAX (800 ms, 10 x TSMTC) |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 80 x TSMTC)) |
| < -8 | FR1 | N/A | 800Note1 |
| < -8 | FR2 | N/A | 3520Note1 |
| Note 1: The IAB-MT ~~UE~~ is not required to successfullyidentify a cell on any NR frequency layer when TSMTC > 20 ms and serving cell SSB Ês/Iot < -8 dB. |

Table 6.2.1.2.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell

|  |  |  |
| --- | --- | --- |
| Serving cell SSB Ês/Iot (dB) | Frequency range (FR) of target NR cell | Tidentify\_inter\_NR, i [ms] |
| Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (200 ms, 6 x TSMTC, i) | MAX (800 ms, 13 x TSMTC, i) |
| ≥ -8 | FR2 | N/A | MAX (1000 ms, 104 x TSMTC, i)) |
| < -8 | FR1 | N/A | 800Note1 |
| < -8 | FR2 | N/A | 4000Note1 |
| Note 1: The ~~UE~~ IAB-MT is not required to successfully identify a cell on any NR frequency layer when TSMTC,i > 20 ms and serving cell SSB Ês/Iot < -8 dB. |

 |

**Proposal 2: The existing core requirements of RRC connection release with redirection request, as defined in Rel-15 38.133, are reused for IAB MTs.** |
| **R4-2001853** | Ericsson | --------------------------------------------------Start of TP-----------------------------------------------------* + - 1. SA: RRC Re-establishment

12.1.1.1.1 IntroductionThis clause contains requirements on the IAB-MT regarding RRC connection re-establishment procedure. RRC connection re-establishment is initiated when an IAB-MT in RRC\_CONNECTED state loses RRC connection due to any of failure cases, including radio link failure, handover failure, and RRC connection reconfiguration failure. The RRC connection re-establishment procedure is specified in clause TBD of TS 38.331 [TBD].The requirements in this clause are applicable for RRC connection re-establishment to NR cell.12.1.1.1.2 RequirementsIn RRC\_CONNECTED state the IAB-MT shall be capable of sending *RRCReestablishmentRequest* message within Tre-establish\_delay seconds from the moment it detects a loss in RRC connection. The total RRC connection delay (Tre-establish\_delay) shall be less than:TUL\_grant: It is the time required to acquire and process uplink grant from the target PCell. The uplink grant is required to transmit *RRCReestablishmentRequest* message.The IAB-MT re-establishment delay (TIAB-MT\_re-establish\_delay) is specified in clause 12.1.1.1.2.1.12.1.1.1.2.1 IAB MT Re-establishment delay requirementThe IAB-MT re-establishment delay (TIAB-MT\_re-establish\_delay) is the time between the moments when any of the conditions requiring RRC re-establishment as defined in clause TBD in TS 38.331 [TBD] is detected by the IAB-MT and when the IAB-MT sends PRACH to the target PCell. The IAB-MT re-establishment delay (TIAB-MT\_re-establish\_delay) requirement shall be less than:The intra-frequency target NR cell shall be considered detectable if each relevant SSB can satisfy that:- SS-RSRP related side conditions given in Annex TBD are fulfilled for a corresponding NR Band for FR1 and FR2, respectively, and- the conditions of SSB\_RP and SSB Ês/Iot according to Annex TBD for a corresponding NR Band are fulfilled.The inter-frequency target NR cell shall be considered detectable when for each relevant SSB:- SS-RSRP related side conditions given in Annex TBD are fulfilled for a corresponding NR Band for FR1 and FR2, respectively, and- the conditions of SSB\_RP and SSB Ês/Iot according to Annex TBD for a corresponding NR Band are fulfilled.Tidentify\_intra\_NR: It is the time to identify the target intra-frequency NR cell and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. If the IAB-MT is not configured with intra-frequency NR carrier for RRC re-establishment then Tidentify\_intra\_NR=0; otherwise Tidentify\_intra\_NR shall not exceed the values defined in Table 12.1.1.1.2.1-1.Tidentify\_inter\_NR,i: It is the time to identify the target inter-frequency NR cell on inter-frequency carrier *i* configured for RRC re-establishment and it depends on whether the target NR cell is known cell or unknown cell and on the frequency range (FR) of the target NR cell. Tidentify\_inter\_NR,i shall not exceed the values defined in Table 12.1.1.1.2.1-2.TSMTC: It is the periodicity of the SMTC occasion configured for the intra-frequency carrier. TSMTC,i: It is the periodicity of the SMTC occasion configured for the inter-frequency carrier *i*. If it is not configured, the IAB-MT may assume that the target SSB periodicity is no larger than 160 ms.TSI-NR: It is the time required for receiving all the relevant system information according to the reception procedure and the RRC procedure delay of system information blocks defined in TS 38.331 [TBD] for the target NR cell.TPRACH: It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. TPRACH can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in clause 14 of TS 38.213 [TBD].Nfreq: It is the total number of NR frequencies to be monitored for RRC re-establishment; Nfreq = 1 if the target intra-frequency NR cell is known, else Nfreq = 2 and Tidentify\_intra\_NR = 0 if the target inter-frequency NR cell is known.There is no requirement if the target cell does not contain the IAB-MT context.In the requirement defined in the below tables, the target FR1 cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown.Table 12.1.1.1.2.1-1: Time to identify target NR cell for RRC connection re-establishment to NR intra-frequency cell

|  |  |  |
| --- | --- | --- |
| Serving cell SSB Ês/Iot (dB) | Frequency range (FR) of target NR cell | Tidentify\_intra\_NR [ms] |
| Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (1600 ms, 5 x TSMTC) | MAX (6400 ms, 10 x TSMTC) |
| ≥ -8 | FR2 | N/A | MAX (8000 ms, 80 x TSMTC)) |
| < -8 | FR1 | N/A | 6400Note1 |
| < -8 | FR2 | N/A | 28160Note1 |
| Note 1: The IAB-MT is not required to successfullyidentify a cell on any NR frequency layer when TSMTC >160 ms and serving cell SSB Ês/Iot < -8 dB. |

Table 12.1.1.1.2.1-2: Time to identify target NR cell for RRC connection re-establishment to NR inter-frequency cell

|  |  |  |
| --- | --- | --- |
| Serving cell SSB Ês/Iot (dB) | Frequency range (FR) of target NR cell | Tidentify\_inter\_NR, i [ms] |
| Known NR cell | Unknown NR cell |
| ≥ -8 | FR1 | MAX (1600 ms, 6 x TSMTC, i) | MAX (6400 ms, 13 x TSMTC, i) |
| ≥ -8 | FR2 | N/A | MAX (8000 ms, 104 x TSMTC, i)) |
| < -8 | FR1 | N/A | 6400Note1 |
| < -8 | FR2 | N/A | 32000Note1 |
| Note 1: The IAB-MT is not required to successfully identify a cell on any NR frequency layer when TSMTC,i >160 ms and serving cell SSB Ês/Iot < -8 dB. |

--------------------------------------------------End of TP------------------------------------------------------ |
| **R4-2001854** | Ericsson | --------------------------------------------------Start of TP-----------------------------------------------------SA: RRC Connection Release with Redirection* + - * 1. Introduction

This clause contains requirements on the IAB-MT regarding RRC connection release with redirection procedure. RRC connection release with redirection is initiated by the *RRCRelease* message with redirection to E-UTRAN or NR from NR specified in TS 38.331 [TBD]. The RRC connection release with redirection procedure is specified in clause TBD of TS 38.331 [TBD].12.1.1.3.2 Requirements12.1.1.3.2.1 RRC connection release with redirection to NRThe IAB-MT shall be capable of performing the RRC connection release with redirection to the target NR cell within Tconnection\_release\_redirect\_NR.The time delay (Tconnection\_release\_redirect\_NR) is the time between the end of the last slot containing the RRC command, “*RRCRelease*” (TS 38.331 [TBD]) on the NR PDSCH and the time the IAB-MT starts to send random access to the target NR cell. The time delay (Tconnection\_release\_redirect\_NR) shall be less than: Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACHThe target NR cell shall be considered detetable when for each relevant SSB, the side conditions should be met that,* the conditions of SSB\_RP and SSB Ês/Iot according to Annex TBD for a corresponding NR Band are fulfilled.

TRRC\_procedure\_delay: It is the RRC procedure delay for processing the received message “*RRCRelease*” as defined in clause TBD of TS 38.331 [TBD].Tidentify-NR: It is the time to identify the target NR cell and depends on the frequency range (FR) of the target NR cell. It is defined in Table 12.1.1.3.2-1. Note that Tidentify-NR = TPSS/SSS-sync + Tmeas, in which TPSS/SSS-sync is the cell search time and Tmeas is the measurement time due to cell selection criteria evaluation.TSI-NR: It is the time required for acquiring all the relevant system information of the target NR cell. This time depends upon whether the IAB-MT is provided with the relevant system information of the target NR cell or not by the old NR cell before the RRC connection is released. TRACH: It is the delay uncertainty in acquiring the first available PRACH occasion in the target NR cell. TRACH can be up to the summation of SSB to PRACH occasion association period and 10 ms. SSB to PRACH occasion associated period is defined in clause 14 of TS 38.213 [TBD].Trs is the SMTC periodicity of the target NR cell if the IAB-MT has been provided with an SMTC configuration for the target cell in the redirection command, otherwise Trs is the SMTC periodicity configured in the *measObjectNR* having the same SSB frequency and subcarrier spacing configured for the RRC connection release with redirection. If the IAB-MT is not provided with SMTC configuration or measurement object for the frequency which is also configured for the RRC connection release with redirection then:* the requirement in this clause is applied with Trs = 160 ms if the SSB transmission periodicity is not larger than 160 ms; otherwise,
* there is no requirement if the SSB transmission periodicity is larger than 160ms.

Table 12.1.1.3.2-1: Time to identify target NR cell for RRC connection release with redirection to NR

|  |  |
| --- | --- |
| Frequency range (FR) of target NR cell | Tidentify-NR |
| FR1 | MAX (5440 ms, 11×Trs) |
| FR2 | MAX (7040 ms, 8×11×Trs) |
|  |  |

--------------------------------------------------End of TP------------------------------------------------------ |
| **R4-2001855** | Ericsson | --------------------------------------------------Start of TP------------------------------------------------------Random access* + - * 1. Introduction

This clause contains requirements on the IAB-MT regarding random access procedure. The random access procedure is initiated to establish uplink time synchronization for a IAB-MT which either has not acquired or has lost its uplink synchronization, or to convey IAB-MT’s request Other SI, or for beam failure recovery. The random access is specified in clause 14 of TS 38.213 [TBD] and the control of the RACH transmission is specified in clause TBD of TS 38.321 [TBD].12.1.1.3.2 RequirementsThe IAB-MT shall have capability to calculate PRACH transmission power according to the PRACH power formula defined in TS 38.213 [TBD] and apply this power level at the first preamble or additional preambles. The IAB-MT shall indicate a Random Access problem to upper layers if the maximum number of preamble transmission counter has been reached for the random access procedure on PCell as specified in clause TBD in TS 38.321 [TBD].The requirements in this clause apply for IAB-MT transmission on PCell.***Editor’s Note****: Reference to accuracy requirements for absolute power of the first preamble and relative power of additional preambles depends on agreements related to IAB-MT transmit power tolerance in RF group.*12.1.1.3.3 Contention based random access12.1.1.3.3.1 Correct behaviour when transmitting Random Access PreambleWith the IAB-MT selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, IAB-MT shall have the capability to select a Random Access Preamble randomly with equal probability from the Random Access Preambles associated with the selected SSB if the association between Random Access Preambles and SS blocks is configured, as specified in clause TBD in TS 38.321 [TBD].With the IAB-MT selected SSB with SS-RSRP above *rsrp-ThresholdSSB*, IAB-MT shall have the capability to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, if the association between PRACH occasions and SSBs is configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause TBD in TS 38.321 [TBD].12.1.1.3.3.2 Correct behaviour when receiving Random Access ResponseThe IAB-MT may stop monitoring for Random Access Response(s) and shall transmit the msg3 if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble.The IAB-MT shall again perform the Random Access Resource selection procedure defined in clause TBD in TS 38.321 [TBD], and transmit with the calculated PRACH transmission power when the backoff time expires if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.12.1.1.3.3.3 Correct behaviour when not receiving Random Access ResponseThe IAB-MT shall again perform the Random Access Resource selection procedure defined in clause TBD in TS 38.321 [TBD], and transmit with the calculated PRACH transmission power when the backoff time expires if no Random Access Response is received within the RA Response window defined in clause TBD in TS 38.321 [TBD].12.1.1.3.3.4 Correct behaviour when receiving an UL grant for msg3 retransmissionThe IAB-MT shall re-transmit the msg3 upon the reception of anUL grant for msg3 retransmission.12.1.1.3.3.5 Correct behaviour when receiving a message over Temporary C-RNTIThe IAB-MT shall send ACK if the Contention Resolution is successful.The IAB-MT shall again perform the Random Access Resource selection procedure defined in clause TBD in TS 38.321 [TBD], and transmit with the calculated PRACH transmission power when the backoff time expires unless the received message includes a IAB-MT Contention Resolution Identity MAC control element and the IAB-MT Contention Resolution Identity included in the MAC control element matches the CCCH SDU transmitted in the uplink message. Correct behaviour when contention Resolution timer expiresThe IAB-MT shall re-select a preamble and transmit with the calculated PRACH transmission power when the backoff time expires if the Contention Resolution Timer expires.12.1.1.3.4 Non-contention based random access12.1.1.3.4.1 Correct behaviour when transmitting Random Access PreambleIf the contention-free Random Access Resources and the contention-free PRACH occasions associated with SSBs is configured, with the IAB-MT selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs, IAB-MT shall have the capability to select the Random Access Preamble corresponding to the selected SSB, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause TBD in TS 38.321 [TBD].If the contention-free Random Access Resources and the contention-free PRACH occasions associated with CSI-RSs is configured, with the IAB-MT selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, IAB-MT shall have the capability to select the Random Access Preamble corresponding to the selected CSI-RS, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause TBD in TS 38.321 [TBD].If the random access procedure is initialized for beam failure recovery and if the contention-free Random Access Resources and the contention-free PRACH occasions for beam failure recovery request associated with any of the SSBs and/or CSI-RSs is configured, IAB-MT shall have the capability to select the Random Access Preamble corresponding to the selected SSB with SS-RSRP above *rsrp-ThresholdSSB* amongst the associated SSBs or the selected CSI-RS with CSI-RSRP above *cfra-csirs-DedicatedRACH-Threshold* amongst the associated CSI-RSs, and to transmit Random Access Preamble on the next available PRACH occasion from the PRACH occasions corresponding to the selected SSB permitted by the restrictions given by the *ra-ssb-OccasionMaskIndex* if configured, or from the PRACH occasions in *ra-OccasionList* corresponding to the selected CSI-RS, and PRACH occasion shall be randomly selected with equal probability amongst the selected SSB assocated PRACH occasions or the selected CSI-RS associated PRACH occasions occurring simultaneously but on different subcarriers, as specified in clause TBD in TS 38.321 [TBD].12.1.1.3.4.2 Correct behaviour when receiving Random Access ResponseThe IAB-MT may stop monitoring for Random Access Response(s), if the Random Access Response contains a Random Access Preamble identifier corresponding to the transmitted Random Access Preamble, unless the random access procedure is initialized for Other SI request from IAB-MT.The IAB-MT may stop monitoring for Random Access Response(s) and shall monitor the Other SI transmission if the Random Access Response only contains a Random Access Preamble identifier which is corresponding to the transmitted Random Access Preamble and the random access procedure is initialized for SI request from IAB-MT, as specified in clause [TBD] in TS 38.321 [TBD].The IAB-MT may stop monitoring for Random Access Response(s), if the contention-free Random Access Preamble for beam failure recovery request was transmitted and if the PDCCH addressed to IAB-MT’s C-RNTI is received, as specified in clause [TBD] in TS 38.321 [TBD].The IAB-MT shall again perform the Random Access Resource selection procedure defined in clause TBD in TS 38.321 [TBD] for the next available PRACH occasion, and transmit the preamblewith the calculated PRACH transmission power if all received Random Access Responses contain Random Access Preamble identifiers that do not match the transmitted Random Access Preamble.12.1.1.3.4.3 Correct behaviour when not receiving Random Access ResponseThe IAB-MT shall again perform the Random Access Resource selection procedure defined in clause TBD in TS 38.321 [TBD] for the next available PRACH occasion, and transmit the preamble with the calculated PRACH transmission power, if no Random Access Response is received within the RA Response window configured in *RACH-ConfigCommon* or if no PDCCH addressed to IAB-MT’s C-RNTI is received within the RA Response window configured in *BeamFailureRecoveryConfig*, as defined in clause [TBD] in TS 38.321 [TBD].--------------------------------------------------End of TP------------------------------------------------------ |

## Oppen issues summary

### Sub-topic 3-1

**Issue 3-1: Necessity of defining RRC re-establishment delay requirement when the periodicity of SMTC window is larger than 160 ms and the serving cell is in low SNR.**

* Proposals
	+ Option 1: IAB MT is not required to successfully identify a cell when the SMTC window is larger than 160ms and the serving cell is in low SNR.
	+ Option 2: IAB MT is required to successfully identify a cell when the SMTC window is larger than 160ms and the serving cell is in low SNR.
* Recommended WF
	+ IAB MT is not required to successfully identify a cell when the SMTC window is larger than 160ms and the serving cell is in low SNR.

### Sup-topic 3-2

**Issue 3-2: Necessity of defining RRC re-establishment requirement when the SSB transmission periodicity is larger than 160 ms.**

* Proposals
* Option 1: There is no requirements if the SSB transmission periodicity is larger than 160ms..
* Option 2: There is requirements if the SSB transmission periodicity is larger than 160ms.
* Recommended WF
	+ - Discuss above proposal.

### Sub-topc 3-3

**Issue 3-3: Necessity of defining RRC release with re-direction requirement when the periodicity of SSB is greater than 160 ms**

* Proposals
	+ Option 1: There is no requirement when the SSB transmission periodicity is larger than 160ms.
	+ Option 2: There is requirement when the SSB transmission periodicity is largen than 160 ms.
* Recommended WF
	+ There is no requirement for RRC release with re-direction when the periodicity of SSB is greater than 160 ms.

### Sub-topic 3-4

**Issue 3-4: Applicability of higher number of SMTC windows in RRC re-establishment delay requirement**

* Proposals: The description of TSMTC should mention that up to four SMTC windows can be configured per frequency layer for an IAB MT.
	+ Option 1: Support above proposal.
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Support above proposal.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 3-1: Support Option 1. Sub topic 3-2: Support Option 1. Sub topic 3-3: Support Option 1.  |
| Ericsson | Sub topic 3-1: Support option 1.Sub topic 3-2: Support option 1.Sub topic 3-3: Support option 1.Sub topic 3-4: Support option 2.  |
| Nokia | Sub topic 3-1: We can agree with the recommended WF. It needs to be clarified what ‘low SNR’ is.Sub topic 3-2: As such we can agree to this WF.Sub topic 3-3: We can agree with the recommended WF.Sub topic 3-4: We are wondering why this would be necessary? |

### 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** |
| XXX | Company A |
| Company B |
|  |
| YYY | 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#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **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: Details of MT Timing Related Requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **Tdoc number** | **Company** | **Comments** |
| **R4-2000052** | **ZTE** | Proposal 1: The Te requirement for IAB MT reuses Te requirement for Rel-15.Proposal 2: IAB MT shall only transmit in uplink if it can meet Te requirement |
| **R4-2001856** | **Ericsson** | --------------------------------------------------Start of TP------------------------------------------------------12.2.1 IAB-MT transmit timing12.2.1.1 IntroductionThe IAB-MT shall have capability to follow the frame timing change of the reference cell in RRC connected state. The uplink frame transmission takes place before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell. IAB-MT initial transmit timing accuracy and gradual timing adjustment requirements are defined in the following requirements.12.2.1.2 RequirementsThe IAB-MT initial transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in Table 12.2.1.2-1. This requirement applies when it is the first transmission for PUCCH, PUSCH and SRS or it is the PRACH transmission.The IAB-MT shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the IAB-MT during the last 160 ms. The reference point for the IAB-MT initial transmit timing control requirement shall be the downlink timing of the reference cell minus . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. *N*TA for PRACH is defined as 0. (in *Tc* units) for other channels is the difference between IAB-MT transmission timing and the downlink timing immediately after when the last timing advance in clause 12.2.3 was applied. *N*TA for other channels is not changed until next timing advance is received. The value ofdepends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). is defined in Table 12.2.1.2-2.**Table 12.2.1.2-1: Te Timing Error Limit**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (kHz)** | **SCS of uplink signals (kHz)** | **Te** |
| 1 | 15 | 15 | 12\*64\*Tc |
| 30 | 10\*64\*Tc |
| 60 | 10\*64\*Tc |
| 30 | 15 | 8\*64\*Tc |
| 30 | 8\*64\*Tc |
| 60 | 7\*64\*Tc |
| 2 | 120 | 60 | 3.5\*64\*Tc |
| 120 | 3.5\*64\*Tc |
| 240 | 60 | 3\*64\*Tc |
| 120 | 3\*64\*Tc |
| Note 1: Tc is the basic timing unit defined in TS 38.211 [TBD] |

**Table 12.2.1.2-2: The Value of**

|  |  |
| --- | --- |
| **Frequency range and band of cell used for uplink transmission** | **(Unit: TC)** |
| FR1 FDD band without LTE-NR coexistence case or FR1 TDD band without LTE-NR coexistence case  | 25600 (Note 1) |
| FR1 FDD band with LTE-NR coexistence case | 0 (Note 1) |
| FR1 TDD band with LTE-NR coexistence case | 39936 (Note 1) |
| FR2 | 13792 |
| Note 1: The IAB-MT identifies  based on the information n-TimingAdvanceOffset as specified in TS 38.331 [TBD]. If IAB-MT is not provided with the information n-TimingAdvanceOffset then the default value of  is set as 25600 for FR1 band.  |

When it is the transmission for PUCCH, PUSCH and SRS transmission, the IAB-MT shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in clause 12.2.3 is applied.When the transmission timing error between the IAB-MT and the reference timing exceeds ±Te then the IAB-MT is required to adjust its timing to within ±Te. The reference timing shall be  before the downlink timing of the reference cell. All adjustments made to the IAB-MT uplink timing shall follow these rules:1) The maximum amount of the magnitude of the timing change in one adjustment shall be Tq.2) The minimum aggregate adjustment rate shall be Tp per second.3) The maximum aggregate adjustment rate shall be Tq per 200 ms.Where the maximum autonomous time adjustment step Tq and the aggregate adjustment rate Tp are specified in Table 12.2.1.2-3.Table 12.2.1.2-3: Tq Maximum Autonomous Time Adjustment Step and Tp Minimum Aggregate Adjustment rate

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | SCS of uplink signals (kHz) | Tq | Tp  |
| 1 | 15 | 5.5\*64\*Tc | 5.5\*64\*Tc |
| 30 | 5.5\*64\*Tc | 5.5\*64\*Tc |
| 60 | 5.5\*64\*Tc | 5.5\*64\*Tc |
| 2 | 60 | 2.5\*64\*Tc | 2.5\*64\*Tc |
| 120 | 2.5\*64\*Tc | 2.5\*64\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [TBD] |

--------------------------------------------------End of TP------------------------------------------------------**Ericsson (R4-2001857)**--------------------------------------------------Start of TP------------------------------------------------------12.2.3 IAB-MT timing advance* + - 1. Introduction

The timing advance is initiated from IMT-DU with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [TBD].12.2.3.2. Requirements 12.2.3.2.1 Timing Advance adjustment delayIAB-MT shall adjust the timing of its uplink transmission timing at time slot *n*+ *k+1* for a timing advance command received in time slot *n*, and the value of *k* is defined in clause 4.2 in TS 38.213 [TBD]. The same requirement applies also when the IAB-MT is not able to transmit a configured uplink transmission due to the channel assessment procedure.12.2.3.2.2 Timing Advance adjustment accuracyThe IAB-MT shall adjust the timing of its transmissions with a relative accuracy better than or equal to the IAB-MT Timing Advance adjustment accuracy requirement in Table 12.2.3.2.2-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [TBD].Table 12.2.3.2.2-1: IAB-MT Timing Advance adjustment accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UL Sub Carrier Spacing (kHz) | 15 | 30 | 60 | 120 |
| IAB-MT Timing Advance adjustment accuracy | ±256 Tc | ±256 Tc | ±128 Tc | ±32 Tc |

--------------------------------------------------End of TP------------------------------------------------------ |
| **R4-2001954** | **Huawei** | **Proposal 1: The MT timing related requirements in terms of TA adjustment and transmit timing (Tp and Tq) can reuse the current requirements defined in TS 38.133.****Proposal 2: Write the TS38.174 in a completely self-contained manners.****Observation 1: There is no corresponding test for timer accuracy in TS 38.133.****Proposal 3: Not to define the timer accuracy requirements for IAB.** |
| R4-2001955 | **Huawei** | **<START OF TP>*** 1. Timing

12.2.1 IAB-MT transmit timing12.2.1.1 IntroductionThe IAB-MT shall have capability to follow the frame timing change of the reference cell in connected state. The uplink frame transmission takes place before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell. For serving cell(s) in PTAG, IAB-MT shall use the SpCell as the reference cell for deriving the IAB-MT transmit timing for cells in the PTAG. For serving cell(s) in STAG, IAB-MT shall use any of the activated SCells as the reference cell for deriving the transmit timing for the cells in the STAG. IAB-MT initial transmit timing accuracy, gradual timing adjustment requirements are defined in the following requirements.12.2.1.2 RequirementsThe IAB-MT initial transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in Table 12.2.1.2-1. This requirement applies: - when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.The IAB-MT shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the IAB-MT during the last 160 ms. The reference point for the IAB-MT initial transmit timing control requirement shall be the downlink timing of the reference cell minus . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. *N*TA for PRACH is defined as 0.  (in *Tc* units) for other channels is the difference between IAB-MT transmission timing and the downlink timing immediately after when the last timing advance in clause 12.2.2 was applied. *N*TA for other channels is not changed until next timing advance is received. The value ofdepends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). is defined in Table 12.2.1.2-2.Table 12.2.1.2-1: Te Timing Error Limit

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals ( kHz)** | **SCS of uplink signals ( kHz)** | **Te** |
| 1 | 15 | 15 | 12\*64\*Tc |
| 30 | 10\*64\*Tc |
| 60 | 10\*64\*Tc |
| 30 | 15 | 8\*64\*Tc |
| 30 | 8\*64\*Tc |
| 60 | 7\*64\*Tc |
| 2 | 120 | 60 | 3.5\*64\*Tc |
| 120 | 3.5\*64\*Tc |
| 240 | 60 | 3\*64\*Tc |
| 120 | 3\*64\*Tc |
| Note 1: Tc is the basic timing unit defined in TS 38.211 [6] |

Table 12.2.1.2-2: The Value of

|  |  |
| --- | --- |
| Frequency range and band of cell used for uplink transmission | (Unit: TC) |
| FR1 FDD band without LTE-NR coexistence case or FR1 TDD band without LTE-NR coexistence case  | 25600 (Note 1) |
| FR1 FDD band with LTE-NR coexistence case | 0 (Note 1) |
| FR1 TDD band with LTE-NR coexistence case | 39936 (Note 1) |
| FR2 | 13792 |
| Note 1: The IAB-MT identifies  based on the information n-TimingAdvanceOffset as specified in TS 38.331 [2]. If IAB-MT is not provided with the information n-TimingAdvanceOffset, the default value of  is set as 25600 for FR1 band. In case of multiple UL carriers in the same TAG, IAB-MT expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to clause 4.2 in TS 38.213 [3] and the value 39936 of  can also be provided for a FDD serving cell. |

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the IAB-MT shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in clause 12.2.2 is applied.12.2.1.2.1 Gradual timing adjustmentWhen the transmission timing error between the IAB-MT and the reference timing exceeds ±Te then the IAB-MT is required to adjust its timing to within ±Te. The reference timing shall be  before the downlink timing of the reference cell. All adjustments made to the IAB-MT uplink timing shall follow these rules:1) The maximum amount of the magnitude of the timing change in one adjustment shall be Tq.2) The minimum aggregate adjustment rate shall be Tp per second.3) The maximum aggregate adjustment rate shall be Tq per 200 ms.where the maximum autonomous time adjustment step Tq and the aggregate adjustment rate Tp are specified in Table 12.2.1.2.1-1.Table 12.2.1.2.1-1: Tq Maximum Autonomous Time Adjustment Step and Tp Minimum Aggregate Adjustment rate

|  |  |  |  |
| --- | --- | --- | --- |
| Frequency Range | SCS of uplink signals (kHz) | Tq | Tp  |
| 1 | 15 | 5.5\*64\*Tc | 5.5\*64\*Tc |
| 30 | 5.5\*64\*Tc | 5.5\*64\*Tc |
| 60 | 5.5\*64\*Tc | 5.5\*64\*Tc |
| 2 | 60 | 2.5\*64\*Tc | 2.5\*64\*Tc |
| 120 | 2.5\*64\*Tc | 2.5\*64\*Tc |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [6] |

12.2.2. IAB-MT Timing Advance 12.2.2.1 IntroductionThe timing advance is initiated from gNB to IAB-MT in EN-DC, NR-DC, NE-DC and NR SA operation modes, with MAC message that implies and adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [7]. * + - 1. Requirements 12.2.2.2.1 Timing Advance adjustment delay

IAB-MT shall adjust the timing of its uplink transmission timing at time slot *n*+ *k+1* for a timing advance command received in time slot *n*, and the value of *k* is defined in clause 4.2 in TS 38.213 [3]. The same requirement applies also when the IAB-MT is not able to transmit a configured uplink transmission due to the channel assessment procedure. 12.2.2.2.2 Timing Advance adjustment accuracyThe IAB-MT shall adjust the timing of its transmissions with a relative accuracy better than or equal to the IAB-MT Timing Advance adjustment accuracy requirement in Table 12.2.2.2.2-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [3].Table 12.2.2.2.2-1: IAB-MT Timing Advance adjustment accuracy

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| UL Sub Carrier Spacing(kHz) | 15 | 30 | 60 | 120 |
| IAB-MT Timing Advance adjustment accuracy | ±256 Tc | ±256 Tc | ±128 Tc | ±32 Tc |

**<END OF TP>** |

## Oppen issues summary

### Sub-topic 4-1

**Issue 4-1: TA adjustment accuracy requirement**

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

* + Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Support above proposal.

### Sub-topic 4-2

**Issue 4-2: Transmit timing requirement**

**Proposals: The MT timing related requirements in terms of transmit timing (Tp and Tq) can reuse the current requirements defined in TS 38.133.**

* Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Support above proposal.

### Sub-topic 4-3

**Issure 4-3: Applicability of UL transmission in the presence of SSB**

**Proposals:** IAB MT shall only transmit in uplink if it can meet Te requirement

* Option 1: Support above proposal
	+ Option 2: No need to introduce above condition because SSB periodicity is always less than 160 ms for IAB-MTs.
* Recommended WF
	+ Discuss above proposal.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 4-1: Support Option 1. Sub topic 4-2: Support Option 1.Sub topic 4-3: Support Option 1. Basically Option 2 means there’s no requirement / restriction at all for IAB-MT to transmit in uplink, thus, is not desirable. |
| Ericsson | Sub topic 4-1: Support option 1.Sub topic 4-2: Support option 1.Sub topic 4-3: Support option 1. |
| Nokia | Sub topic 4-1: We can agree with the recommended WF.Sub topic 4-2: We can agree with the recommended WF.Sub topic 4-3: We support option 1 |

### 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** |
| XXX | Company A |
| Company B |
|  |
| YYY | 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#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **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: Details of DU Timing Related Requirements

The TPs that were submitted to this topic will be treated in the second round.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **Tdoc number** | **Company** | **Comments** |
| R4-2001858 | Ericsson | --------------------------------------------------Start of TP------------------------------------------------------**12.2.4 Cell phase synchronization accuracy**12.2.4.1 IntroductionCell phase synchronization accuracy is defined as the maximum absolute deviation in frame start timing between any pair of cells on the same frequency that have overlapping coverage areas.12.2.4.2 RequirementsThe cell phase synchronization accuracy measured at IAB DU antenna connectors shall be better than 3 µs.--------------------------------------------------End of TP------------------------------------------------------ |
| R4-2002125 | Qualcomm | **--------- TP starts -------------------****12.2.4 Cell phase synchronization accuracy**~~Detailed structure of the subclause is TBD.~~Cell phase synchronization accuracy for TDD is defined as maximum absolute frame start timing between any pair of cells including NR or NR IAB on the same frequency that has overlapping coverage. Cell phase synchronization accuracy measured at NR base station antenna connector shall be better than 3us.**--------- TP starts -------------------** |

# Topic #6: RLM requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| Tdoc number | Company | Comments |
| R4-2000053 | ZTE | Proposal 1: Re-use Rel-15 UE RLM requirements for micro type of IAB nodes (MTs) unless there are special RAN1 / RAN2 mechanisms for IAB MTs defined. |
| R4-200089 | Samsung | Proposal 1: For IAB radio link monitoring, the requirement for FR2 could be first discussed and then extended to FR1.Proposal 2: Consider non-mobility IAB in Rel-16, RLM procedure for IAB-MT could be simpler case compared to UE’s procedure. Unnecessary parts may be removed from UE’s requirement for IAB’s requirement.Observation 1: If unexpected blockage occurs, radio link can be probably recovered by beam failure recovery procedure, switching to another beam to the alternative path.Proposal 3: Apply relaxed RLM requirement of NR UE to the requirement of IAB-MT.Proposal 4: Requirement of Evaluation Period of IAB RLM should be defined which is applicable for non-DRX only..Proposal 5: For IAB RLM requirement, largely increase the number of samples and the lower boundary of the Evaluation Period of original requirement of UE in both SSB and CSI-RS cases.Proposal 6: Consider the out-of-sync and in-sync block error rates whether it is feasible for IAB RLM requirement and discuss on how we can modify it.Proposal 7: Remove the sharing factor P in Evaluation Period calculation for IAB RLM requirement if the number of samples and the lower boundary is largely increased.Proposal 8: For IAB RLM requirement, the case where Evaluation Period for CSI-RS of RLM with Density=1 should be taken into consideration. |
| R4-2002127 | Qualcomm | Proposal 1: The SSB and CSI-RS based evaluation period requirements that have been defined for Rel-15 UEs are reused for IAB MTs.* The evaluation period requirements are defined only for no-DRX mode.

Proposal 2: The following RLM related requirements, that have been defined in 38.133 for Rel-15 UEs, can be reused for IAB-MTs.* Measurement restrictions for SSB based RLM and CSI-RS based RLM
* Minimum requirement at transitions
* Minimum requirement for L1 indication.
* Scheduling availability during RLM
 |

## Open issues summary

### Sub-topic 6-1

**Issues:**

**Proposals: RLM requirements for IAB-MTs are defined for no-DRX mode only.**

* + Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Support above proposal.

### Sub-topic 6-2

**Issues: Relaxed RLM requirement.**

**Proposals: Apply relaxed RLM requirement of NR UE to the requirement of IAB-MT during no-DRX case.**

* **Increase the number of samples and the lower boundary of the SSB and CSI-RS based RLM evaluation period.**
	+ Option 1: Support above proposal
	+ Note: Supporting companies should provide the updated number of samples and lower boundary.
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Decide based on feedback.

### Sub-topic 6-3

**Issues: Sharing factor P.**

Pr**oposals: Remove the sharing factor P in Evaluation Period calculation for IAB RLM requirement.**

* + Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Decide based on inputs.

### Sub-topic 6-4

**Issues: Modification of OOS and IS BLER rates.**

**Proposals: “Modify OOS and IS BLER rates, compared to the ones that got defined for Rel-15 UEs, to define IAB RLM requirements.”**

* Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Decide based on feedback.

### Sub-topic 6-5

**Issues: Density of CSI-RS to define CSI-RS based RLM requirements.**

**Proposals: “For IAB RLM requirement, the case where Evaluation Period for CSI-RS of RLM with Density=1 should be taken into consideration.”**

* Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Decide based on feedback.

### Sub-topic 6-6

**Issues: Reuse of Rel-15 requirements.**

**Proposals: Reused the SSB and CSI-RS based RLM evaluation period of Rel-15 UEs to define the requirements for IAB-MT nodes.**

* Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Decide based on feedback.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 6-6: We think this should also depends on the classification of different types of deployment of IAB MT nodes. Now the definition of different types of IAB nodes are still under discussion. For macro type of IAB MTs, we think having a relaxed requirement makes sense. But for micro type of IAB MTs, we suggest to re-use UE requirements in Rel-15. Suggest to wait for the clear definition of different IAB MT types. |
| Ericsson | Sub-topics 6-1, 6-2, 6-3. 6-4, 6-5, 6-6: We are ok with option 1 provided that the RLM requirements are applicable for only certain IAB class e.g. local area IAB (subject to RF agreements).  |
| Nokia | Sub topic 6-1: We can agree to the recommended WF and that RLM requirements for IAB-MTs are defined for no-DRX mode only.Sub topic 6-2: We support relaxation of the IAB RLM requirements for the non-DRX case. We suggest increasing the evaluation period for both SSB and CSI-RS based RLM. The increase would apply for both In-Sync and Out-Of-Sync evaluation periods. For SSB-based RLM an increase of a factor 5 is proposed for minimum time and maximum time: OoS = Max(1000, Ceil(50\*P)\*TSSB); in-sync = Max(500,Ceil(25\*P)\*TSSB). For CSI-RS based RLM an increase of a factor 5 with Mout=100 and Min=50 which gives: OoS = Max(1000, Ceil(Mout\*P)\*TCSI-RS) and In-Sync = Max(500, Ceil(Min\*P)\*TCSI-RS).Sub topic 6-3: P sharing factor would need to be discussed for SSB and CSI-RS separately. Additionally, removing the P sharing factor would depend on the assumed RRM measurements applicable for the IAB MT. Assuming no measurement gaps will be configured the P sharing factor can be removed from SSB based RLM for FR1. For FR2 and SSB based RLM removing the P sharing would be possible assuming long evaluation times for RLM and relaxed (if any) SSB-based RRM measurements. However, RRM measurement requirements are still FFS. P sharing factor for CSI-RS based RLM can be removed for FR1 and FR2 assuming no measurement gaps are configured. Sub topic 6-4: Likely existing OOS and IS BLER rates can apply.Sub topic 6-5: We support the proposal. We prefer to include D=1 to enable reduced CSI-RS signaling overhead.Sub topic 6-6: See our response to sub topic 6-2. |

### 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** |
| XXX | Company A |
| Company B |
|  |
| YYY | 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#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **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 #7: Link recovery requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **Tdoc number** | **Company** | **Comments** |
| R4-20000890 | Samsung | **Proposal 1: For IAB link recovery, the requirement for FR2 could be first discussed and then extended to FR1.****Proposal 2: Consider non-mobility IAB in Rel-16, link recovery procedure for IAB-MT could be simpler case compared to UE’s procedure. Unnecessary parts may be removed from UE’s requirement for IAB’s requirement..****Observation 1: For FR2, 3dB beamwidth of UE beam is normally much larger than that of MT beam; PC1 UE can be considered as candidate reference for IAB-MT.****Observation 2: It is fatal for a MT to wrongly select the active beam because of its very small 3dB beamwidth. Beam failure recovery procedure is crucial for recovering the link, which should be performed as quickly as possible.****Proposal 3: Carefully revisit the current BFD and CBD requirement of UE and the same or more stringent requirement of link recovery should be applied for IAB-MT.****Proposal 4: Requirement of Evaluation Period of IAB BFD and CBD should be defined which is applicable for non-DRX only.****Proposal 5: For IAB CBD requirement, beam sweeping factor N=8 in Evaluation Period calculation for FR2 should be reduced as less beam candidates for beam sweeping and more importance of beam switching.****Proposal 6: Discussions are needed for out-of-sync block error rates of IAB BFD requirement. If the Qout level of IAB RLM is redefined to be lower than 10%, the BLERout of IAB BFD should be revisit accordingly.** **Proposal 7: Analyze if any cases of calculating P can be removed for Evaluation Period of IAB BFD and CBD and consider the possibility of omitting the P in IAB BFD or/and CBD requirement.** |
| R4-2002124 | Qualcomm | Proposal 1: The SSB and CSI-RS based evaluation period requirements that have been defined for Rel-15 UEs are reused for IAB MTs.* The evaluation period requirements are defined only for no-DRX mode.

Proposal 2: The following RLM related requirements, that have been defined in 38.133 for Rel-15 UEs, can be reused for IAB-MTs.* Minimum requirement for L1 indication.
* Scheduling availability during BFD and CBD.
 |

## Open issues summary

### Sub-topic 7-1

**Proposals: BFD/CBD requirements for IAB-MTs are defined for no-DRX mode only.**

* + Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Support above proposal.

### Sub-topic 7-2

**Issues: Reuse of Rel-15 requirements.**

**Proposals: Reused the SSB and CSI-RS based BFD/CBD evaluation period of Rel-15 UEs to define the requirements for IAB-MT nodes.**

* Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Decide based on feedback.

### Sub-topic 7-3

**Issues: Beam sweeping factor**

**Proposal: For IAB CBD requirement, beam sweeping factor N=8 in Evaluation Period calculation for FR2 should be reduced.**

* Option 1: Support above proposal
	+ Note: Supporting companies should provide the new value of N.
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Decide based on feedback.

### Sub-topic 7-4

**Issues: Sharing factor P.**

**Proposals: Remove the sharing factor P in Evaluation Period calculation for IAB BFD/CBD requirement.**

* + Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Decide based on inputs.

### Sub-topic 7-5

**Issues: Modification of OOS and IS BLER rates.**

**Proposals: “Modify OOS and IS BLER rates, compared to the ones that got defined for Rel-15 UEs, to define IAB BFD requirements.”**

* Option 1: Support above proposal
	+ Option 2: Don’t support above proposal
* Recommended WF
	+ Decide based on feedback.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 7-2: Suggest to wait for the clear definition of different IAB MT types. Different requirements shall be specified for different types of IAB MTs. Sub topic 7-5: Suggest to wait for the clear definition of different IAB MT types. Different requirements shall be specified for different types of IAB MTs. |
| Ericsson | Sub-topics 7-1, 7-2, 7-3. 7-4, 7-5: We are ok with option 1 provided that the link recovery requirements are applicable for only certain IAB class e.g. local area IAB (subject to RF agreements).  |
| Nokia | Sub topic 7-1: We support the proposal that BFD/CBD requirements for IAB-MTs are defined for no-DRX mode only.Sub topic 7-2: It should be feasible to re-use existing link recovery requirements.Sub topic 7-3: Assuming this is fixed device at specific location the device would not have to sweep in a similar manner as a mobile device. Hence the sweeping could be reduced with a factor 2.Sub topic 7-4: Similar as for RLM discussion sub topic 6-3 we believe that the P sharing factor can be removed assuming measurement gaps will not be configured for Rel-16 IAB MT.Sub topic 7-5: Existing OOS and BLER rates could be re-used without modifications. |

### 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** |
| XXX | Company A |
| Company B |
|  |
| YYY | 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#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

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

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **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 #8: Applicability of signaling characteristics related RRM requirements

There has only been one TP in this section. It will be discussed in the 2nd round.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **Tdoc number** | **Company** | **Comments** |
| R4-2001852 | Ericsson | Sub topic 1-1: --------------------------------------------------Start of TP------------------------------------------------------4.7 Applicability of RRM requirements in this specification4.7.1 Applicability of signalling characteristics related RRM requirementsThe RRM requirements on the signalling characteristics for IAB MTs specified in section 12.3 shall apply only for the local area IAB class defined in section 4.4. --------------------------------------------------End of TP------------------------------------------------------ |

## Open issues summary

### Sub-topic 8-1

## Companies views collection for 1st round

## Summary for 1st round

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)