**3GPP TSG-RAN WG4 Meeting #94-e R4-2002510**

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

**Agenda item:** 8.5.2

**Source:** Moderator (Nokia)

**Title:** Email discussion summary for RAN4#94e\_ #81\_NR\_IAB\_Co-existence

**Document for:** Information

# Introduction

The topic area covered in this document is NR IAB Co-existence. The main technical topics covered are requirements for

* IAB-MT ACS
* IAB-MT ACLR and IAB-MT minimum output power
* IAB-MT in-band blocking

The discussion additionally covers capturing coexistence study assumptions and results.

Candidate target of email discussion for 1st round

* Agree IAB-MT ACS
* Agree the way to capture co-existence assumptions and results
* Find the way forward for other requirements

Target for second round discussion will be to agree way forwards for

* FR1 ACS, IBB and ACLR for IAB-MT
* FR2 ACLR and minimum Tx power for IAB-MT
* FR2 ACS and in-band blocking for IAB-MT.

# Topic #1: IAB-MT ACS

This topic covers IAB-MT ACS requirement, including wanted and interferer signal levels for both FR1 and FR2.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000282 | Samsung | **Observation 1:** Previously agreed ACS [23.5]dB same as BS for <37 GHz  ACS [22.5]dB same as BS above >37 GHz which were sent to ITU WP5D were rounded up to integers and are 24 dB and 23 dB in rel-15 specifcation.  **Proposal 1:** IAB-MT ACS of 24 dB for 24.24 – 33.4 GHz  **Proposal 2:** IAB-MT ACS of 23 dB for 37 – 52.6 GHz  **Proposal 3:** Wanted signal level is REFSENS+[14dB]  **Proposal 4:** Interference signal level is REFSENS+[36.5] for 24.24 – 33.4 GHz  **Proposal 5:** Interference signal level is REFSENS+[35.5] for 37 – 52.6 GHz |
| R4-2001873 | Ericsson | **Observation-1:** The R16 IAB WI need be hardware prepared for FDM/SDM operation which means the ACS for IAB MT and IAB DU shall to be same.  **Proposal-1:** The ACS requirement should be based on BS spec.  **Proposal-2:** the additional reference channel with PDSCH should be specified in additionally  **Proposal-3:** use the BS type ACS for IAB MT on FR1. |
| R4-2001435 | Nokia, Nokia Shanghai Bell | **Proposal 5:** ACS for IAB-MT shall be   * 23.5 dB for frequencies 24.25 – 29.5 GHz and * 22.5 dB for frequencies 37 – 40 GHz |

## Open issues summary

To facilitate the discussion the sub-topics are separated between FR1 and FR2. Additionally, in the proposals there was clear alignment for ACS value in FR2 whereas for there is no alignment for wanted signal level. Therefore, discussion for ACS value and wanted signal are separated.

In FR1 only a single proposal to re-use BS requirements was made, and therefore discussion can concentrate on whether this proposal can be agreed.

### Sub-topic 1-1 IAB-MT ACS value in FR2

In this sub-topic IAB-MT ACS value is discussed. All companies are aligned with the earlier agreed [23.5] for 28 GHz region and [22.5] dB for 39 GHz region. However, it has been observed that in rel-15 specification these values have been rounded upwards to integer values. Therefore, same approach is the recommended WF here.

**Issue 1-1: IAB-MT ACS value in FR2**

All company proposals are close to each other, only discrepancy is whether the ACS value is rounded to an integer value

* Recommended WF

Agree the following values, where ACS is rounded to an integer

* IAB-MT ACS of 24 dB for 24.24 – 33.4 GHz
* IAB-MT ACS of 23 dB for 37 – 52.6 GHz

### Sub-topic 1-2 IAB-MT ACS relationship with sensitivity in FR2

In this sub-topic the wanted signal power level for ACS in FR2 is discussed. Two main options can be seen from the contributions, either re-using the UE or BS signal level. The proposals are in square brackets as there is a relationship to receiver sensitivity which has not been agreed yet.

**Issue 1-2: Wanted signal power level for ACS**

* Proposals
  + Option 1: [REFSENS + 6 dB]
  + Option 2: [REFSENS + 14 dB]
* Recommended WF
  + Agree option 1
  + Additionally there was a proposal to specify PDSCH reference channel. Moderator recommendation is to leave this to reference sensitivity discussion.

### Sub-topic 1-3 IAB-MT ACS value and wanted signal power level for FR1

In this sub-topic ACS value and wanted signal power for FR1 is discussed. Only a single company has a proposal for IAB-MT ACS for FR1. Therefore, the discussion can concentrate on whether the proposal can be agreed.

**Issue 1-3: IAB-MT ACS value and wanted signal power level for FR1**

* Proposals
  + Re-use BS ACS for OTA requirements, i.e. 45 dB with wanted signal level at [refsens + 6 dB]
* Recommended WF
  + Agree the proposal for both OTA and conducted requirements.

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 1-1: need to consider together with IBB as this are related requirements, ususally IBB interference power leve is 9dB higher than ACS interfernece power level. As observed in the R4-2000978 with 40m separation between parent IAB DU and child IAB MT in layout 1, the maximum input power of wanted signal could be much higher than IBB power levels, if there are no maximum input power for IAB MT defined and limited IBB power levels, then mini distance between parent IAB DU and child IAB MT should be carefully designed, otherwise this will misleading the network deployment.  Sub topic 1-2: agree with option 1: +6dB degradation for IAB MT REFSENS for ACS requirement  Sub topic 1-3: the same comments as sub-topic 1-1. this need more discussion on IAB MT class or IAB DU class with child IAB MT. |
| Samsung: | Sub topic 1-1: support option 1  Sub topic 1-2: prefer option 2, the co-channel interference observed by IAB-MT reception would be higher than gNB. Hence the test condition should be consider lager delta offset to REFSENS compared with gNB.  Sub topic 1-3: it seems RAN4 have tentative agreement on FR1 ACS as 33dB captured in R4-1913052. Even though this is marked as yellow for further check, there are two companies provide the simulation results show that with 33dB ACS there is no co-existence issue for IAB-MT as victim. |
| Ericsson | Sub topic 1-1: Proposal is ok, as following the LS is ok and should follow the rel-15 BS spec.  Sub topic 1-2: Option 1 is ok, it is also ok to discuss Reference channel in REFSENS:  Sub topic 1-3: Proposal is ok. |
| Huawei | Sub topic 1-1: ok  Sub topic 1-2: proposal is ok, ACS should test filtering not power levels (blocking tests the high power capability) so to some extent level is not important as long as Rx is linear – so lower power is safer.  Sub topic 1-3: ok  Sub topic 1-4: Linked to sub-topic 1-1 and 1-2, if we use 23/24 and refsens +6dB then option 1 is correct  *Moderator comment: Here the comment to sub-topic 1-4 relates to ACS interferer level which is covered by sub-topic 1-1.* |
| Nokia, Nokia Shanghai Bell | Sub-topic 1-1: We agree with the WF  Sub topic 1-2: Option 1 is preferred |
| Qualcomm | Sub topic 1-1: we agree with moderator’s recommendation  Sub topic 1-2: our preference is option 2 [REFSENS + 14 dB]. Considering the good channel conditions expected between IAB-DU and MT, the normal operating condition for MT receiver is with larger input power. |

### 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.*

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| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
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| YYY | Company A |
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# Topic #2: IAB-MT ACLR and minimum power

In this topic IAB-MT ACLR and minimum power is discussed for both FR1 and FR2.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000972 | ZTE Corporation | **Observation:** ACIR 35dBc could meet both cell average and cell edge 5% throughput loss.  **Proposal 1:** define FR1 IAB MT ACLR as 30dBc; **Proposal 2:** define FR1 IAB MT min output power as 10Db in TRP. |
| R4-2000973 | ZTE Corporation | **Proposal 1:** IAB MT min output power as 10dBm in TRP.  **Proposal 2:** ACLR=17dBc for 24.25-33.4GHz and ACLR=16dBc for 37-52.6GHz. |
| R4-2001432 | Nokia, Nokia Shanghai Bell | **Observation 1:** Co-existence performance can be guaranteed in layout 2 with 16 Db power control range and 16 dBc ACLR.  **Proposal 5:** Adopt 17 dBc as IAB-MT ACLR minimum requirement.  **Proposal 6:** Adopt 20 dBm as minimum output power for IAB-MT. |
| R4-2001280 | Qualcomm Incorporated | **Observation 1:** 20Db IAB-MT ACLR is required for the case of -20dBm minimum output power at IAB-MT  **Observation 2:** 24dB IAB-MT ACLR is required for the case of -10dBm minimum output power at IAB-MT  **Observation 3:** ACLR requirement shall be coupled with proper minimum output power to guarantee appropriate functioning of the IAB system  **Observation 4:** Necessary minimum output power depends on the target deployment scenario and shall be guaranteed by the dynamic range of the IAB-MT transmitter  **Proposal 1:** define 24dB IAB-MT ACLR requirement in FR2 |
| R4-2001865 | Ericsson | **Observation-1:** From co-existing perspective, IAB MT reuse the same ACLR with IAB DU will give advantage on the regulator acceptance.  **Observation-2:** Setting a different number of ACLR on IAB MT than BS will forbid the IAB MT operate on downlink time slot which significantly reduce the IAB deployment flexibility.  **Proposal-1:** choose the ACLR to be the same with BS ACLR for both FR1 and FR2. |

## Open issues summary

To facilitate the discussion the sub-topics are separated between FR1 and FR2. In both FR1 and FR2 the proposals range from the ACLR values in UE requirements to the values in BS requirements, but in FR2 also a compromise between them is proposed.

### Sub-topic 2-1: IAB-MT ACLR and minimum output power in FR2

In this sub-topic IAB-MT ACLR and minimum output power in FR2 is discussed. The proposals from individual companies have a wide range and no option has a clear majority of supporting companies. As the proposals have such a wide range, willingness to compromise is needed to reach a decision.

**Issue 2-1: IAB-MT ACLR and minimum output power in FR2**

* Proposals
  + Option 1: 17 dBc with [10…20] dBm minimum power
  + Option 2: 28 dBc with TBD minimum output power
  + Option 3: 24 dBc with TBD minimum output power
* Recommended WF
  + As a compromise to move forward, agree option 3 and discuss what related minimum power is needed.

### Sub-topic 2-2 IAB-MT ACLR and minimum power in FR1

In this sub-topic IAB-MT ACLR and minimum output power in FR1 is discussed. Two proposals were made, one suggesting re-using ACLR from UE requirements and another re-using BS requirements.

**Issue 2-2: IAB-MT ACLR and minimum power in FR1**

* Proposals
  + Option 1: 30 dBc ACLR with 10 dBm minimum output power
  + Option 2: 45 dBc ACLR with TBD minimum output power
* Recommended WF
  + Discuss how to move forward

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 2-1: prefer 17dBc for FR2 IAB MT ACLR as much more beamforming gain and intreference mitigation could be achieved by the narrow beamwidth of IAB MT compared with legacy NR UE.  Sub topic 2-2: prefer 30dBc for FR1 IAB MT and similar comments as before. |
| Samsung | Sub topic 2-1/2-2: this relates to MT class discussion. |
| Ericsson | Sub topic 2-1: Option 2 is preferred as IAB MT can operate on downlink time slot and also FDM/SDM operation with access link. We think TX min power can be discussed with Tx dynamic range.  Sub topic 2-2: option 2 is ok for us, We think TX min power can be discussed with Tx dynamic range.  Also related to ACLR, ACLR absolute limit is needed. It related to the emission mask definition.  *Moderator comment: Absolute ACLR is part of discussion #82* |
| Huawei | Sub-topic 2-1: The ACLR and the minimum power are linked so difficult to agree ACLR with a TBC for minimum power. We favour a higher minimum power and if this means higher ACLR value then that’s ok.  Sub-topic 2-2(new): This is discussed in Topic area #82 (topic #6) also I think. It should be consistent with the decision on OBUE – but this value is ok if that is the case.  *Moderator comment: The comment above to sub-topic 2-2(new) relates to absolute ACLR which is part of discussion #82.*  Sub-topic 2-2: As with FR2 we favour tougher ACLR and higher minimum power. FR1 has not been discussed so much so far. Whilst it is important maybe we should focus on FR2 in emeeting? |
| Nokia, Nokia Shanghai Bell | Sub-topic 2-1: While our original proposal was 17 dBc based on simulation results, we can accept the compromise proposal. Accepting this means less dynamic range is needed for macro deployments. |
| Qualcomm | Sub topic 2-1: we agree with moderator’s recommended way forward.  Regarding absolute ACLR limit, we believe that the discussion can occur after definition of IAB-MT classes.  Regarding the proposal of defining 17dBc ACLR for IAB-MT, we believe that definition of an excessively relaxed ACLR requirement will create problems with the occupied bandwidth (OBW) regulatory requirement that implicitly imposes an ACLR tighter than ~23dB. Currently this is being solved at UE side through introduction of MPR, but the same approach should be avoided at IAB-MT. |

### 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.*

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| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
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| YYY | Company A |
| Company B |
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# Topic #3: IAB-MT in-band blocking

In this topic IAB-MT in-band blocking is discussed for both FR1 and FR2. In FR1 there are two proposal, either not to specify the requirement or re-use BS requirements. In FR2 company proposal have a wide range from re-using current UE and BS requirements either as is or with increases interference power level. One proposal is to change to concept so that interference level is a fixed power level and not related to sensitivity. One proposal is also to not specify in-band blocking but leave the verification to Rx dynamic range.

As the proposals have such a wide range, willingness to compromise is needed to reach a decision.

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000282 | Samsung | **Proposal 1:** Wanted signal level is REFSENS+[14dB]  **Proposal 2:** Interference signal level is REFSENS+[36.5] for 24.24 – 33.4 GHz  **Proposal 3:** Interference signal level is REFSENS+[35.5] for 37 – 52.6 GHz |
| R4-2000977 | ZTE Corporation | **Proposal 1:** to define the FR1 IAB MT receiver dynamic range requirement based on the wanted signal instead of IBB power level.  **Proposal 2:** to define two reference power level for IAB MT with higher SNR. |
| R4-2000978 | ZTE Corporation | **Proposal 1:** to define the FR2 IAB MT receiver dynamic range requirement based on the wanted signal instead of IBB power level.  **Proposal 2:** to define two reference power level for IAB MT with higher SNR. |
| R4-2001282 | Qualcomm Incorporated | **Observation 1:** The entity of the IAB-MT in-band blocking requirement depends on the distance between the deployed IAB network and the NR network  **Observation 2:** IAB-MT interference at LNA input of gNB receiver is smaller than -69dBm for at least 99.4% of the cases at all analysed distances.  **Proposal 1:** Define radiated in-band blocking requirement at IAB-MT as -45dBm |
| R4-2001432 | Nokia, Nokia Shanghai Bell | **Observation 2:** IAB-MT transmissions do not cause significant degradation to rel-15 gNB receiver performance with the used assumptions.  **Observation 3**: IAB-MT receiver need to be able to tolerate higher interferer levels than rel-15 gNB receiver.  **Proposal 1:** The blocking power evaluation is based on 99% point of the CDF.  **Proposal 2:** Compared to FR2 base station, IAB-MT in-band interferer power level is increased by 6 dB.  **Proposal 3:** The details of in-band blocking requirement are confirmed only after the requirement for reference sensitivity is agreed. |
| R4-2001873 | Ericsson | **Observation-2:** The blocker level for FR2 with 50 meter separation distance is equivalent to current OTA blocking level in BS spec for FR2.  **Observation-3:** The blocker level for FR1 with 40 meter separation distance is equivalent to current OTA blocking level in BS spec for FR1.  **Proposal-4:** Reuse the IAB DU in-band blocking for IAB MT on FR2.  **Proposal-5:** Reuse the IAB DU in-band blocking for IAB MT on FR1.  **Proposal-6:** recommended physical separation distance is 50m for FR2 and 40m for FR1. |

## Open issues summary

### Sub-topic 3-1 In-band blocking requirements in FR2

**Issue 3-1: In-band blocking requirement in FR2**

* Proposals
  + Option 1: Do not specify in-band blocking, impact to be covered by Rx dynamic range
  + Option 2: Based on UE requirements
  + Option 3: Based on BS requirements
  + Option 4: increase interference level compared to current requirements, including the possibility of fixed interference power level
    - Wanted signal level TBD
* Recommended WF
  + Agree in-band blocking requirement is required.
  + Agree conclusions from simulations are based on 99% point of CDF
  + Discuss how to move forward with the signal levels

### Sub-topic 3-2 In-band blocking in FR1

In this sub-topic in-band blocking in FR1 is discussed.

**Issue 3-2: In-band blocking in FR1**

* Proposals
  + Option 1: Do not specify in-band blocking, impact to be covered by Rx dynamic range
  + Option 2: Re-use BS requirements, i.e.
    - Wanted signal level is EISREFSENS + [6dB] for OTA requirements
    - Wanted signal level is REFSENS + [6dB] for conducted requirements
    - Interference signal level is (-43,-38,-35) - ΔOTAREFSENS dBm, depending on class for OTA requirements
    - Interference signal level is (-43,-38,-35) dBm, depending on class for conducted requirements
* Recommended WF
  + Agree option 2 with the possibility to select only a subset of the interference signal levels depending on the outcome of the power class discussion.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| ZTE | Sub topic 3-1: it’s fine to define the IBB blocking requirement for FR2 IAB MT, as mentioned before mini distance between parent IAB DU and child IAB MT should also be part of discussion. The values should be further studied. As there are no maximum input power defined for IAB MT , then IAB MT ‘s RX dynamic range is limited by REFSENS and IBB blocking. If the maximum input power for wanted signal is the same as IBB power level and MT IBB powerl level is the same as IAB DU, considering 4.7dB noise floor increas due to ACS interfernece power levels and co-channel interference interference rise 0~5dB which is simulated during FR2 dynamic range requirement discussion, SNR for wanted signal could be EIS+33dBc-10\*log10(10^(4.7/10)+10^(5/10))-10\*log10(BW)-NF= -1+33-7.9=24.1dB which seems that 256QAM can still be supported.  Sub topic 3-2: similar comment can be applied for FR1 IAB MT, then maximum input power for FR1 IAB MT is -43dBm, then SNR for wanted signal could be -43dBm- (-101.7dB for 5MHz)-10\*log10(10^(4.7/10)+10^(20/10))=38.7dB where 20dB is considered in the Rx dynamic range intra-channel interference rise compared with noise floor.  ALL IN ALL, be careful to specify the IAB MT class or mini distance between parent IAB DU and child IAB MT. We cannot exceed that boundary set by IBB. |
| Samsung | Sub topic 3-1: our proposal on in-band blocking can be covered in option 4. Suggestion from our side is that both wanted signal and interference signal should be anchored with certain offset on REFSENS level. Regarding how to move on with interference level it should be cautious to make decision with 99% CDF, since the interference point to IAB reception with the same direction at extreme high level should be quite a corner case especially for fixed IAB. Our proposal is to verify the in band selectivity requirement on relative high wanted and interference condition for both ACS and in-band blocking. And the interference outside wanted channel within adjacent channel and IBB range can be flat. |
| Ericsson | Sub topic 3-1: Option 3 is preferred with additional min separation distance to other operator. 99% CDF point is ok for us.  Sub topic 3-2: Option 2 of reusing BS req is ok for us. |
| Huawei | Sub-topic 3-1: In-band blocking is necessary (assuming its higher level than ACS) so rule out option 1. As gain may vary it’s important that interferer is linked to antenna gain (rule out option 4) for BS this is the case for UE not, as antenna gain is in range of BS it makes more sense to use BS approach. BS and UE blocking levels are a few dB different (2.5), but the wanted power for UE is much greater (8dB) – assuming blocking comes from a 3rd order product the BS requirement is slightly tougher (2\*2.5<8). Whilst the blocking pdfs are not the same as BS, this seems however the best option to adopt.  Sub-topic 3-2: ok |
| Nokia, Nokia Shanghai Bell | Sub topic 3-1: In-band blocking requirement should be specified. Based on many simulation results, the wanted signal level will be the one in the field which defines the which signal level needs to be tolerated by the receiver. Therefore, option 3 could be used to verify the baseline linearity of the receiver as it seems option 4 will not anyway result in correctly replicating the situation in the field. |
| Qualcomm | Sub topic 3-1: we agree with moderator’s recommended way forward. Based on the analysis carried out, option 4 seems to be a good option to ensure IAB network performance. If the wanted signal level is the one defining the linearity of the receiver, I guess that same receiver won’t have any problem even with a tighter IBB requirement. It is possible, however, that for some deployment scenarios (non-perfect LOS, large distance) the wanted signal power will not be the bottleneck. In such cases, it is not guaranteed that IBB levels decrease accordingly. Option 4 will guarantee good receiver performance also in those cases.  One clarification question to Huawei: If what we worry about are the non-linearities of the front-end LNA, why should the interferer be linked to antenna gain? I am assuming beamforming happens after the front end LNA. |

### 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.*

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| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
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| YYY | Company A |
| Company B |
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# Topic #4: Capturing co-existence study background and results

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

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001708 | Huawei | Proposes a TP capturing antenna assumptions to the TR |
| R4-2001025 | Ericsson | Proposes a TP capturing antenna assumptions to the TR |
| R4-2001432 | Nokia, Nokia Shanghai Bell | Proposes a TP capturing simulation assumptions and company results to the TR |

## Open issues summary

### Sub-topic 4-1 Capturing simulation assumptions and results

**Issue 4-1: Capturing simulation assumptions and results**

* Recommended WF
  + Collect comments on the TPs with the aim to merge the content of the submitted contributions and capture to the TR Section 4.3.2 can be used for comments to individual TPs.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| ZTE | Sub topic 4-1: propose to postpone the TP to next meeting until the agreement is clear and we have TP implemented in one shot. |
| Samsung | Sub topic 4-1: all such kind of background information definitely is needed for TR. However, at least according to our observation it seems the IAB node antenna assumption are not reflected explicitly or clearly in all TPs on antenna assumption, e.g. the IAB node is assumed to reuse the BS antenna model of micro scenario for both layout 1 and layout 2 in co-existence study. In three related TPs the antenna configuration is for BS or Macro scenario, which is not so straight forward for reader what is assumed for IAB node. |
| Ericsson | We need capture the simulation assumption and result, this will depend on the consensus of TP comments below. |
| Huawei | 1432 and the antenna TP’s can be treated almost independently, depending on antenna papers need to ensure antenna info is not repeated.  Antenna papers: They contain same information but using different approach, either world work (obviously my choice is my own paper). If we use 1025 a few comments are: does not list the parameters only gives instructions how to handle them – maybe this is ok but needs to align with rest of content (maybe from 1432) but my preference is all the antenna stuff in one place. It does not clearly state the reliance on element aperture and element spacing which is important. The flow chart may be taking the instructions a step to far (this is TR for IAB after all), the same thing could be stated more simply in text or bullets I think.  1432 (comments on TP only) – simulation assumptions (have we not already agreed this? - its difficult to keep track as we have no official draft TR yet) are ok. Test results we usually capture individual company’s results in annexes rather than main body and just put a summary in the main body. The results are Nokia’s and are what they are but the text in between starts to summarize to a conclusion. Analysis should be presented once we have captured all company results and agreed a conclusion. Also I think we need to make ACIR and blocking simulations a bit more separate, this is blocking but it’s not clearly in its own section – again this may be easier when we have an approved draft. |
| Nokia, Nokia Shanghai Bell | Sub topic 4-1: We would be fine with moving forward with two TPs, one for antenna parameters and one for simulation assumptions and company results. This means antenna related aspect should be removed from R4-2001432. As proposed by Huawei, we are fine to move the individual company results to Annex of the TR. From the antenna parameter TPs content of R4-2001708 is clearer and therefore it is preferred. |

### 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.*

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| **CR/TP number** | **Comments collection** |
| R4-2001708 | Ericsson: We suggest dividing into parameters part and model part. The model is reused for all parameter sets. Also, we need to describe how parameters are selected to secure that the model produces correct result. See out text proposal |
| Qualcomm: Typo in Table 6.2.x.3-2 title. Suggest to substitute with “FR2 UE antenna model”  Typo in following formula:  Typo in following formula. There is one equal missing.    After correction of these typos, we are ok with this TP. |
| ZTE: prefer to have single TP with all simulation assumption implemented instead separating TPs. In addition, FR1 BS and FR2 BS should be replaced by IAB |
| R4-2001025 | Qualcomm: flowchart does not exactly match our understanding. Horizontal and vertical beam widths are directly calculated from element area. |
| ZTE: flow chart might be not necessary. |
|  |
| R4-2001432 | Ericsson: we see Nokia IBB result is similar with Ericsson result if we understand correct, so in the end, it may be good to capture the different IBB level in a Table or some simple observation in TP. |
| Qualcomm: In simulation parameters for layout 2, we should at least add 25m as BS antenna height. Our simulation results are based on this assumption.  We believe this sentence should be reviewed and not exclude results for layout 1:  “Due to the interference level going beyond the BS type 2-O in-band blocking levels it was concluded that IAB-Nodes cannot be deployed using layout 1 at least when the parameters in section 6.2 are applied. Therefore the simulation efforts were concentrated in layout 2.”  Since IAB-DU is shaping to inherit all RF requirements of NR BS, if an IAB-node blocks the co-located NR BS receiver, it will block also its own DU receiver.  Recommendations for IBB, ACLR and ACS levels should be re-discussed once an agreement on values in reached. |
| ZTE: we think it’s premature to exclude that IAB HeNet deployment scenarios without other companies input. In addition, some parameters or configuration could be further adjusted. |

## Summary for 1st round

### Open issues

Overall company views not aligned, with the exception of sub-topic 1-1 where only one company was not aligned with the others.

Regarding receiver requirements the major aspect preventing progress is the lack of agreement on whether the requirements should be based on signal levels from BS or UE requirements. Also some further details are needed to be agreed which have not been discussed yet, including the details of the interfering signal, such as bandwidth, offset from wanted signal and waveform.

On transmitter side in FR1, IAB-MT ACLR is seen to be pending on the IAB-MT class definition. Company proposals for required ACLR are wide apart from each other.

On transmitter side in FR2, IAB-MT ACLR is also seen to be pending on the IAB-MT class definition. But proposals are closer to each other given that occupied bandwidth seem to limit the possible range for ACLR.

Company positions are rather clear, but what is missing is proposals on how to close the gap. Therefore, the overall recommendation for 2nd round of discussion is to concentrate on three way forwards detailing the possible agreements and how to move forward to finalize the requirements

* WF on IAB-MT ACS, IBB and ACLR in FR1
* WF on IAB-MT ACS and IBB in FR2
* WF on IAB-MT ACLR and minimum Tx power in FR2

Additionally it is recommended to work on one text proposal to TR to capture the simulations assumptions including antenna parameters.

The details on each sub-topic are provided below. Please note that while each sub-topic recommends a WF, some topics are combined together resulting in the three WFs listed above.

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic 1-1** | In sub-topic 1-1 for FR2 IAB-MT ACS 5 companies are fine with proposed WF while 1 company wants to consider it further together with in-band blocking.  *Tentative agreements:*   * IAB-MT ACS is 24 dB for 24.24 – 33.4 GHz * IAB-MT ACS is 23 dB for 37 – 52.6 GHz   *Candidate options:*  *-*  *Recommendations for 2nd round:*  Continue finalization of the ACS requirement in FR2 in a WF. |
| **Sub-topic 1-2** | In sub-topic 1-2 for wanted signal level for FR2 IAB-MT ACS four companies prefer option 1 of [REFSENS + 6 dB] whereas two companies prefer option 2 of [REFSENS + 14 dB].  *Tentative agreements:*  *-*  *Candidate options:*  *wanted signal level is*   * [REFSENS + 6 dB] * [REFSENS + 14 dB]   *Recommendations for 2nd round:*  Assign a WF to detail the next steps on how to finalize the requirement, including also further aspects that need agreement, e.g. interfering signal BW, offset and waveform |
| **Sub-topic 1-3** | In sub-topic 1-3 for FR1 ACS requirement 1 company wants to consider this together with IBB, one company prefers 33 dB ACS and two companies are fine with 45 dBc with wanted signal at 33 dBc.  It was commented that simulation results from 2 companies show no issues with 33 dB ACS.  *Recommendations for 2nd round:*  Assign a WF to detail what are the next steps needed to finalize the requirement. |
| **Sub-topic 2-1** | In sub-topic 2-1 for FR2 IAB-MT ACLR, one company prefers option 1 of 17 dBc, one company prefers option 2 of 28 dBc, one company sees this being linked to MT class definition and 3 companies seems to able to accept the proposed WF of option 3 with 24 dBc ACLR.  It was commented that 17 dBc ACLR is not possible in practice as occupied bandwidth requirement cannot be met with 17 dBc ACLR.  *Tentative agreements:*   * Rule out 17 dBc due to the issue with occupied BW.   *Recommendations for 2nd round:*  Assign a WF to detail the next steps on how to finalize the requirement |
| **Sub-topic 2-2** | In sub-topic 2-2 for FR1 IAB-MT ACLR one company preferred option 1, two companies preferred option 2, and one company sees dependence to IAB-MT class definition. Only one company prefers a fixed blocker level.  *Recommendations for 2nd round:*  Assign a WF to detail the next steps on how to finalize the requirement |
| **Sub-topic 3-1** | In sub-topic 3-1 for IAB-MT In-band blocking in FR2. one company wanted to study further, 2 companies prefer option 4 and 3 companies prefer option 3.  *Tentative agreements:*   * Rule out option one. This means in-band blocking requirement is needed and will be defined. * Interfering signal level will be linked to REFSENS   *Recommendations for 2nd round:*  Assign a WF to detail what are the next steps needed and also what further aspects need to be agreed, (e.g. BW, offset and waveform of the interfering signal) to finalize the requirement. |
| **Sub-topic 3-2** | In sub-topic 3-2 for IAB-MT in-band blocking in FR1 only 3 companies provided comments. One company wants to study further and two companies are fine with option 2.  *Candidate options:*   * option 2   *Recommendations for 2nd round:*  Assign a WF to detail what are the next steps needed to finalize the requirement. |
| **Sub-topic 4-1** | In sub-topic 4-1 for capturing coexistence study into the TR companies provided comments on the submitted text proposals. Based on the comments there seems to be agreement to capture the simulation assumptions but company results are more controversial area.  *Tentative agreements:*  Capture the simulation background into the TR in this meeting, postpone other TPs.  *Recommendations for 2nd round:*  Revise one of the TPs to capture the simulation assumptions, including both antenna assumptions and other simulation parameters. Postpone capturing individual company results for next meeting. |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | WF on IAB-MT ACS, IBB and ACLR in FR1 | ZTE |
| #2 | WF on IAB-MT ACS and IBB in FR2 | Ericsson |
| #3 | WF on IAB-MT ACLR and minimum Tx power in FR2 | Nokia |

### 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** |
| R4-2001708 | To be revised. In the revision merge content from R4-2001025 and the simulation assumptions from R4-2001432 taking into account also comments in section 4.3.2 of this document |
| R4-2001025 | To be noted |
| R4-2001432 | To be noted |

## Discussion on 2nd round (if applicable)

It is recommended to concentrate discussion on the way forward documents and TP.

R4-2002492 received comments after it was uploaded so could not be agreed, the proposed agreement on the local area IAB-MT was not agreeable however the proposal on the wide area IAB-MT is acceptable and is as follows:

* IAB-MT ACLR minimum requirement in FR2 is 24 dBc
  + For Wide area IAB MT class:
    - Option 1: reuse BS ACLR

## 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** |
| R4-2002490 | WF on IAB-MT ACS, IBB and ACLR in FR1  Status: agreeable  E-mail comments to draft have been included. |
| R4-2002491 | WF on IAB-MT ACS and IBB in FR2  Status: agreeable  E-mail comments to draft have been included. |
| R4-2002492 | WF on IAB-MT ACLR and minimum Tx power in FR2  Status: Not agreeable  E-mail comments to draft have been included. Sub-bullet with IAB-MT minimum Tx power in FR2 is class dependent is removed according Qualcomm, ZTE proposed to add more sub-bullets to this, thus as compromise all sub-bullet for minimum TX power is removed.  Agreement on local area IAB-MT is premature so WF cannot be agreed however the agreement on wide are IAB-MT is acceptable   * IAB-MT ACLR minimum requirement in FR2 is 24 dBc   + For Wide area IAB MT class:     - Option 1: reuse BS ACLR     - Option 2: 24 dBC |
| R4-2002493 | This is revision of R4-2001708.  Status: agreeable  E-mail comments from 1st round have been included. Revision merge content from R4-2001025 and the simulation assumptions from R4-2001432 taking into account also comments in section 4.3.2 of this document |