**3GPP TSG-RAN WG4 Meeting # 102-e R4-220xxxx**

**Electronic Meeting, 21 February – 03 March 2022**

**Agenda item:** 10.13.2

**Source:** Moderator (Samsung)

**Title:** Email discussion summary for [102-e][309] NTN\_Solutions\_Part2

**Document for:** Information

# Introduction

This summary document captures issues related to NR-NTN coexistence aspects. It contains a summary of the contributions under Agenda Item 10.13.2 at TSG-RAN WG4 #102-e, together with identified key open issues, and recommends topics/questions to be handled via email discussions. The goal of this document is to provide recommendations on prioritization of discussion and finalize this topic if agreed.

A total of 14 TDOCs have been received for this agenda (See Annex 2) and 4 topics are listed as below to cover proposals and contents in these documents as appropriate.

* Topic #1: Co-existence scenarios and assumptions
* Topic #2: Co-existence results handling
* Topic #3: ACLR and ACS
* Topic #4: HAPS coexistence scenarios and results

To progress the discussion, it is proposed that the meeting could:

* in 1st round: to discuss and conclude on issues in Topic #1,2 and try to consequently conclude on Topic#3 if possible; to discuss and conclude on issues in Topic #4 if any; to discuss and agree on draft TPs to update TR 38.863 if any;
* in 2nd round: to conclude on ACLR and ACS values in Topic#3; to conclude on Topic #4; to discuss and agree on draft TPs to update TR 38.863.

# Topic #1: Co-existence scenarios and assumptions

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-22040502 | Qualcomm Incorporated | Observation 1: TN UE location can be outside the TN cluster and up to the isolation region. That assumption will not cause any changes to the current agreed NTN UE requirements.  Proposal 1: Keep the current UE deployment assumptions for option 2 in case 1 and keep the current NTN UE ACLR and ACS requirements agreed in last meeting.  Proposal 2: To add one note in TR38.863 to clarify the NTN UE deployment for case 1.  Table 6.2.1.1-1 Network and UE deployment   | No. | Combination | Aggressor | Victim | Which NTN cell/UE to observe? | Which TN/UE to observe? | Which TN cells in a TN to observe? | | --- | --- | --- | --- | --- | --- | --- | | 1 | TN with NTN | TN DL | NTN DL | NTN cell:  Observe NTN central beam for SINR, 6 adjacent beams for inter-beam interference.  NTN UE:  NTN UEs dropped at the edge of TN clusters  Note: An isolation region is considered for NTN UEs deployed (see Annex 2 in [2]) | One cluster with 19 TN cells (57 sectors) randomly placed in the central NTN beam | All active TN clusters which has the NTN UE(s) at its edge. |   Proposal 3: A clarification that “To simply the simulation, the TN UEs are not deployed in the isolation region.” should be added in clause Annex 2 of simulation assumptions document. |
| R4-2205045 | Ericsson | Observation 1: For case 6, it’s not realistic to consider that the satellite beam will be full of urban macro TNs.  Proposal 1: For case 6, consider the following assumption: only 50% of the satellite beam area will occupied by urban macro TNs. |
| R4-2205925 | THALES | Proposal 1: RAN4 shall consider the rural TN deployment scenario is predominant in the case of GEO.  Proposal 2: RAN4 shall consider the urban TN deployment for GEO as a mixture of urban and rural TN deployment.  Proposal 3: RAN4 agrees that the urban TN deployment for GEO (as a mixture of urban and rural TN deployment) is predominantly a rural TN deployment. |

## Open issues summary

### Sub-topic 1-1

**Issue 1-1: Case 1 assumptions**

* Proposals
  + Option 1: Adopt following
* Option 1a: Keep the current UE deployment assumptions for option 2 in Case 1.
* Option 1b: Add one note in TR38.863 (marked in yellow) to clarify the NTN UE deployment for case 1.

Table 6.2.1.1-1 Network and UE deployment

| No. | Combination | Aggressor | Victim | Which NTN cell/UE to observe? | Which TN/UE to observe? | Which TN cells in a TN to observe? |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | TN with NTN | TN DL | NTN DL | NTN cell:  Observe NTN central beam for SINR, 6 adjacent beams for inter-beam interference.  NTN UE:  NTN UEs dropped at the edge of TN clusters  Note: An isolation region is considered for NTN UEs deployed (see Annex 2 in [X]) | One cluster with 19 TN cells (57 sectors) randomly placed in the central NTN beam | All active TN clusters which has the NTN UE(s) at its edge. |

* Option 1c: A clarification that “To simplify the simulation, the TN UEs are not deployed in the isolation region.” should be added in clause Annex 2 of simulation assumptions document.
  + Option 2: If isolation distance is adopted by all, option 1“no isolation”can be removed in Case 1 and corresponding edits can be made in assumption document and TR 38.863.
* Recommended WF
  + TBA

### Sub-topic 1-2

**Issue 1-2: Case 6 Urban TN deployment**

* Proposals
  + Option 1: The Urban TN deployment for GEO in Case 6 is a mixture of urban and rural TN deployment, in which only 50% of the satellite beam area will occupied by urban macro TNs.
* Recommended WF
  + TBA

**Issue 1-3: Case 6 dominant scenario**

* Proposals
  + Option 1: Rural TN deployment scenario is predominant in the case of GEO, and the requirements to Rural scenario applies to Urban TN deployment scenario which is a mixture of urban and rural deployment.
  + Option 2: To add a note to indicate how the result of Case 6 is derived in TR 38.863
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Issue 1-1: Case 1 assumptions**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Company** | **Agree with Opt.1a?** | **Agree with Opt.1b?** | **Agree with Opt.1c?** | **Agree with Opt.2?** | **Comments** |
| Ericsson | Ok | Yes, preferrable | No, that’s not corret | Ok but we need to capture as well why we have this isolation area |  |
| ZTE |  | Fine with that. |  | Okay with that. |  |
| THALES |  | Not necessary to consider the note with respect to the isolation region. |  |  | Actually, it depends a lot on the NTN-TN selection algorithm being used.  The “isolation region” may be misleading if proper selection algorithm is performed and the UE connects to NTN only if NTN is better than TN.  If we say “isolation region” is should be clarified that this is applicable to the case when companies not applying any selection algorithm between TN and NTN. |
| Huawei |  |  | Agree |  |  |
| Qualcomm | OK | OK | OK | OK |  |
| Samsung | Ok | Ok |  | Ok | We support to clearly state the implemented simulation assumptions in the TR.  If the wording -- ‘isolation region’ is difficult for some companies, we can discuss and find a common ground. |
| Nokia | OK | OK |  | OK | The used simulations assumptions used to derive the requirements should be clearly documented in the TR. |

**Issue 1-2: Case 6 Urban TN deployment**

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| --- | --- | --- |
| **Company** | **Agree with Option 1?** | **Comments** |
| Ericsson | Ok, seems reasonable |  |
| ZTE | Okay for us. |  |
| Hughes/EchoStar | Disagreed | Unrealistic to have 50% urban in a 250 Km radius GEO coverage. In real-life it is very much less than that. |
| Inmarsat | Disagree | We also don’t think it’s realistic to consider a 50% distribution. |
| THALES | Disagree | Actually this kind of mixture with 250 km GEO beam diameter corresponds to a 125km/sqrt(2) urban area radius or 250km/sqrt(2) urban area diameter, **which means an urban area with a diameter of 177,3 km**, which is still huge.  Proof: GEO area/Urban area=[pi\*(250/2)^2]/[pi\*(125/sqrt(2))^2]=2 => urban area is 50% of the GEO beam. It may not seem much, but is huge.  In our contribution R4-2205925 we consider an urban area of 50 km diameter only inside the GEO beam. |
| Huawei | Partially. | I suppose this clarification is just an assumption. For the real deployment, the situation can be various. I’m not sure that “50%” reflect the real scenario. |
| Qualcomm | Fine with option 1 |  |
| Samsung | Partially. | We agree with the direction to make additional assumption to lower the urban deployment density. However, 50% may be too high.  We suggest to keep the agreement in last GTW and we can continue to advance the assumptions of Urban for Case 6. |
| Moderator | Agreement in GTW (2/23): The Urban TN deployment for GEO in Case 6 is a mixture of urban and rural TN deployment  Further discuss the percentage of satellite beam area occupied by urban macro TNs. Please | |

**Issue 1-3: Case 6 dominant scenario**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree with Option 1?** | **Comments** |
| Ericsson | Disagree, the mix of urban and rural is even more realistic |  |
| ZTE |  | Whether rural TN deployment scenario is predominant or not, this might be difficult to have clear answer since this might be different among regions. |
| Hughes/EchoStar | Agreed |  |
| Inmarsat | Agree | This is a more realistic scenario |
| THALES | Agree, since this corresponds to a realistic mix of urban and rural | We think that 50 km diameter for an urban deployment is the worst case.    And the result is:    Therefore, and ACS of 38 dBs is sufficient for SAN. |
| Qualcomm | The worst case among co-ex scenarios should be used for ACLR/ACS derivation. So the conclusions are applicable for all the scenarios including Rural and Urban. No need to consider this option. |  |
| Samsung | Partially. | It may be predominant by Rural deployment case, but we cannot easily say it apply to Urban case. If we need to make that statement in the TR, we need more analysis and discussions. |
| Moderator | A new option 2 has been provided. Let’s continue our discussion by commenting to these 2 options. | |
| Nokia | We support that the used simulations assumptions used to derive the requirements should be clearly documented in the TR. | |

## Summary for 1st round

### Open issues

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|  | **Status summary** |
| **Issue 1-1: Case 1 assumptions** | *Tentative agreements:* N/A  *Candidate options:*  Option 1: The “Note 1” in Annex 2 of R4-2202991 and corresponding part in the draft TR 38.863 will be modified as following:  Note 1: The NTN UE(s) shall be dropped at the edge of the “central 19 TN cells (cluster)”. For Case 1 (Urban scenario), an Isolation distance of 1500m as 2\*ISD is considered to reduce the calculation complexity in associated with NTN-TN selection algorithm at the border. As defined in Figure A2-1, isolation distance is the distance between the blue-dotted line which represents TN cell boarder and the red line.  *Recommendations for 2nd round:* Further discuss the new Option 1. |
| **Issue 1-2: Case 6 Urban TN deployment** | Agreement in GTW (2/23): The Urban TN deployment for GEO in Case 6 is a mixture of urban and rural TN deployment  *Candidate options:* Further discuss the percentage of satellite beam area occupied by urban macro TNs.   * Option 1: 50% * Option 2: 4% (simply derived from Thales’ figure)   *Recommendations for 2nd round:* Further discuss candidate options. |
| **Issue 1-3: Case 6 dominant scenario** | *Tentative agreements:* N/A  *Candidate options:*   * Option 1: Rural TN deployment scenario is predominant in the case of GEO, and the requirements to Rural scenario applies to Urban TN deployment scenario which is a mixture of urban and rural deployment. * Option 2: To add a note to indicate how the result of Case 6 is derived in TR 38.863   *Recommendations for 2nd round:* Further discuss candidate options. |

## Discussion on 2nd round

### Open issues and view collection

**Issue 1-1: Case 1 assumptions**

* Proposals
  + Option 1: The “Note 1” in Annex 2 of R4-2202991 and corresponding part in the draft TR 38.863 will be modified as following:

Note 1: The NTN UE(s) shall be dropped at the edge of the “central 19 TN cells (cluster)”. For Case 1 (Urban scenario), an Isolation distance of 1500m as 2\*ISD is considered to reduce the calculation complexity in associated with NTN-TN selection algorithm at the border. As defined in Figure A2-1, isolation distance is the distance between the blue-dotted line which represents TN cell boarder and the red line.

* Recommended WF
  + TBA

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| **Company** | **Comments** |
| Moderator | The Note 1 has been incorporated into the revised R4-2204333. Please provide your modifications there. |
| Qualcomm | We suggest to making the following modifications to emphasize the Isolation distance is mainly to reflect the NTN-TN selection algorithm at the border:  Note 1: The NTN UE(s) shall be dropped at the edge of the “central 19 TN cells (cluster)”. For Case 1 (Urban scenario), an Isolation distance of 1500m as 2\*ISD is considered to reflect the NTN-TN selection algorithm at the border~~. reduce the calculation complexity in associated with NTN-TN selection algorithm at the border.~~ As defined in Figure A2-1, isolation distance is the distance between the blue-dotted line which represents TN cell boarder and the red line. No UEs deployed in the isolation region is to reduce the calculation complexity. |
| Moderator | Qualcomm’s modification has been captured in the revised R4-220433 on ftp. |
| Ericsson | Some additional updates in revised R4-220433. |

**Issue 1-2-1: Percentage of satellite beam area occupied by urban macro in Case 6**

* Proposals
  + Option 1: 50%
  + Option 2: 4%
  + Option 3: any other values
* Recommended WF
  + TBA

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| --- | --- |
| **Company** | **Comments** |
| Samsung | 1. We are open to any value that can be agreed by the meeting, and this can be used for future improved studies in this topic. We think 4% may be a reasonable value. 2. We’d like to clarify, once we have agreed on #% of this urban ratio, the (future) study will use both this urban % ratio and activity ratio as 20%. 3. We suggest, no matter what kind of new/improved assumption for co-ex studies is agreed, we need to clearly state the assumptions that have been used for the current study results and its ACIR/ACLR/ACS derivations. 4. We need to be very careful to do not mix the “new” and “old” assumptions and to not mislead the readers about how current results were derived.   Taking the place I live for a reference (as shown in the picture below), the 250 km GEO beam diameter range will cover two major cities (one with 30~40 km diameter, one with 20~30 km diameter) and several more smaller cities (around 10 km diameter).  By calculating, it seems 4% urban area is reasonable. |
| Qualcomm | Clarification question: would we capture the percentage in the TR? We assumed it is related how to decide the worst case for case 6? |
| Moderator | To Qualcomm:  My interpretation is this percentage is related to deciding worst case of Case 6, but I would like to emphasize it is for Case 6 only. The ideal outcome would be capturing the percentage in the TR 38.863. |
| Ericsson | Thanks to Samsung for the proposal and its justification.  Note that for case 6, we should consider the GEO satellite at 45deg elevation angle, this was the worst case identified in last meeting.  Then, we should probably consider a % of urban and a % of rural in such beam, the entire beam should not be full of TN, even rural. I don’t think we could conclude on those % in this meeting then, some more analysis would be needed considering several cases (worst case, representative case…).  Still, we could agree using a beam full of rural TNs as the basis to derive the SAN ACS. |
| Samsung | Just to clarify that we are not the proponent for 4%.  We do share the concern, from current results, that the current urban assumption for GEO beam may overestimate the density of TN stations. So that we provide some easy-getting information to help the discussion.  If it’s hard to agree the % of Urban in Case 6 as a general statement, maybe we can go with some soft wording, like “one possible case” or similar. |

**Issue 1-3: Case 6 dominant scenario**

* Proposals
  + Option 1: Rural TN deployment scenario is predominant in the case of GEO, and the requirements to Rural scenario applies to Urban TN deployment scenario which is a mixture of urban and rural deployment.
  + Option 2: To add a note to indicate how the result of Case 6 is derived in TR 38.863
* Recommended WF
  + TBA

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| --- | --- |
| **Company** | **Comments** |
| Moderator | A note has been incorporated into the revised R4-2204333. Please provide your modifications there. |
| Qualcomm | We are OK with both Option 1 and Option 2. We should clearly indicate in TR 38.863 on how the ACS in Case 6 is derived. |
| Ericsson | Option 1’s wording is confusing, we proposed some updates in the revision of R4-2204333.  Ok with option 2. |
| Samsung | We are open to Option 2. We believe the followings are the facts that we should consider when drafting the wording.   1. The meeting, in GTW session, agreed as a compromise manner to use rural results to derive Case 6 ACIR and consequently SAN ACS; (Let’s not say which one is dominant or worse or…) 2. The “Urban” scenario in Case 6 is already studied with the previously agreed assumptions, and its results are captured in current TR’s collected results section; 3. In this 102-e meeting, the proposal and its considerations of having new Urban % in “Urban” scenario for Case 6 study is generally agreed, and the number of this percentage is TBD at the moment. (Whatever number or new assumption is agreed in this meeting, it should be clarified to not mix with current study results, but (maybe) for future study.) |

## Summary for 2nd round

### Open issues

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| --- | --- |
|  | **Status summary** |
| **Issue 1-1: Case 1 assumptions** |  |
| **Issue 1-2-1: Percentage of satellite beam area occupied by urban macro in Case 6** |  |
| **Issue 1-3: Case 6 dominant scenario** |  |

# Topic #2: Co-existence results handling

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2205044 | Ericsson | Preliminary results for coexistence with NB-IoT considering only the worst case scenarios identified during the NTN-TN coexistence study are provided. |
| R4-2205045 | Ericsson | Proposal 2: For case 6, considering the scenario with GEO satellite and an elevation angle of 45o, the needed ACIR value should be equal to 40dB to guarantee coexistence. |
| R4-2205924 | THALES | **Proposal 1:** RAN4 should consider defining a clear selection and averaging algorithm between different ACIR values (at 5% or 5%-tile throughput loss) from different companies.  **Proposal 2:** RAN4 shall consider using the following algorithm for averaging throughput loss results between different companies:   1. Consider only results that do not have much variance with respect to other companies’ results. 2. We should not take the worst value (of a company) into account if the value at 5% throughput loss is 10 dB higher (or lower) that the average of the other companies. For this particular case, the respective company throughput loss shall not be used to compute the average throughput loss. 3. We cannot have a conclusion if only one company submitted results. We need at least 2 companies providing results for a Case. 4. The correct average methodology between different companies should be (according e.g., to TR 36.942):    1. independently done with respect to each scenario;    2. the average should be done on throughput loss (based on different throughput loss between the companies), and not on ACIR (dB or linear, especially if the values are too different);    3. a new curve representing the averaged throughput loss (between selected companies) should be obtained;    4. finally, a (new) ACIR value is obtained at 5% throughput loss from the average throughput loss previously computed.   **Proposal 3:** RAN4 should not consider the worst case value (of a company) into account if the value at 5% throughput loss is 10 dB higher (or lower) that the average of the other companies. For this case, the throughput loss shall not be used to compute the average throughput loss. |

## Open issues summary

### Sub-topic 2-1

**Issue 2-1: Algorithm to average ACIR values**

* Proposals
  + Option 1: use the following algorithm for averaging throughput loss results between different companies:

1. Consider only results that do not have much variance with respect to other companies’ results.
2. The worst value (of a company) should not be taken into account if the value at 5% throughput loss is 10 dB higher (or lower) that the average of the other companies. (For this particular case, the respective company throughput loss shall not be used to compute the average throughput loss.)
3. A conclusion should not be made if only one company submitted results. A valid case should have at least results provided by 2 companies.
4. The correct average methodology between different companies should be (according e.g. to TR 36.942):
   1. independently done with respect to each scenario;
   2. the average should be done on throughput loss (based on different throughput loss between the companies), and not on ACIR (dB or linear, especially if the values are too different);
   3. a new curve representing the averaged throughput loss (between selected companies) should be obtained;

finally, a (new) ACIR value is obtained at 5% throughput loss from the average throughput loss previously computed.

1. The worst-case value (of a company) should not be taken into account if the value at 5% throughput loss is 10 dB higher (or lower) that the average of the other companies. (For this case, the throughput loss shall not be used to compute the average throughput loss.)

* Recommended WF
  + TBA

**Issue 2-2: ACIR range**

* Proposals: Legacy issue left from #101-bis-e meeting, with updates of Option 4 value to 40dB

|  |  |  |  |
| --- | --- | --- | --- |
| Case # / ACIR | Case 2 | Case 3 | Case 6 |
| Option 1 | 22~30 dB | 18~26 dB |  |
| Option 2 | 25~30 dB | 20 dB | 35~40 dB |
| Option 3 (Qualcomm) | 22~30 | 20~26dB | 46 dB |
| Option 4 (Ericsson) | 22~30 dB | 20~26dB | 40 dB |
| Option 5 (Thales) | 25~30 dB | 18~26 dB  (worst case)  Or better 22-24 dB for LEO and 14-16 dB for GEO (as per simulation results) | 37~38 dB |

* Recommended WF
  + TBA

### Sub-topic 2-2

**Issue 2-3: TN(NB-IoT) and TN co-existence result**

* Proposals
  + Option 1: Adopt results provided by R4-2205044 in co-existence result summary and TR 38.863
* Recommended WF
  + Agree with Option 1.

## Companies views’ collection for 1st round

### Open issues

**Issue 2-1: Algorithm to average ACIR values**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree with Option 1?** | **Comments** |
| Moderator |  | With regard to Proposal 1 in R4-2205924, it is proposed not to discuss it as it is the common approach in RAN4. |
| THALES |  | The proposal 1 is the common approach for RAN4, but is seems that TR 38.863 is not applying the exact methodology..  In TR 38.863 the ACIR averaging between companies is performed directly between the ACIR values in dB (obtained at 5% throughput loss).  The proposed methodology from Option 1 first averages the throughput loss, and derives a new equivalent ACIR from the unique curve with throughput loss average between all the companies. Is not the same thing, the result is different.  Moreover, averaging between companies seems currently different from case to case/scenario to scenario. The results are already there, a lot of work has been done, we just need to be sure that we extract the correct conclusions e.g. for someone outside 3GPP who is interested in the results from the TR 38.863. |
| Huawei |  | Support moderator’s suggestion. |

**Issue 2-2: ACIR range**

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| --- | --- | --- | --- | --- |
| **Company** | **Case 2**  **Which Option?** | **Case 3**  **Which Option?** | **Case 6**  **Which Option?** | **Comments** |
| Moderator |  |  |  | Any other values? |
| Ericsson | 25-30 dB  Any option would still be fine | 20-26dB | 35-40dB | For case 6, 46dB is considering the satellite beam full of urban TNs, which would not be realistic. If we have to go for a range of values, 35-40dB seems reasonable then. |
| ZTE |  |  | Fine with 35-40dB | Due to the lower active factor for TN BS, maybe 35-40dBc is fine for us. |
| Hughes/EchoStar | 22-30 dB | Option 2 | Option 5, with comment | Should stick to the previously agreed ACS=38 dB |
| THALES | Ok with any.  In any case, Scenario 2 is not the worst case requirement for ACS, scenario 6 is the worst case. | It seems that companies want to differentiate between LEO and GEO ACLR.  For GEO the SAN ACLR seems to be 14-16 dBs | 38 dBs | We might need to separate ACS and ACLR SAN values as a type of SAN class, if we decide to introduce different SAN classes for GEO and for LEO. |
| Huawei |  |  |  | If the proposal is just to update the proposed value from Ericsson instead of updating the final agreement, I’m fine with it. |
| Qualcomm | 22-30dB | 20-26dB | 35-40dB |  |
| Samsung |  |  |  | We have no issue to capture the new results submitted from any companies.  And if we do not update the final results, we think there’s no need to further update this table. This is only an intermediate discussion tool used in last meeting to derive and discuss the final ACLR and ACS. |
| Moderator | Agreement in GTW (2/23):  Case 2: 22-30dB  Case 3: 20-26dB  Case 6: 35-40dB | | | |

**Issue 2-3: TN(NB-IoT) and TN co-existence result**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree with WF?** | **Comments** |
| Ericsson | Agree |  |
| ZTE |  |  |
| Samsung | Agree | Agree, but the NB-IoT scenarios are not calibrated, we think this fact should be stated somewhere together with the submitted results. |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary** |
| **Issue 2-1: Algorithm to average ACIR values** | *Tentative agreements:* N/A  *Candidate options:* Original Option 1  *Recommendations for 2nd round:* Further discuss candidate option. |
| **Issue 2-2: ACIR range** | Agreement in GTW (2/23):  Case 2: 22-30dB  Case 3: 20-26dB  Case 6: 35-40dB  *Candidate options:* N/A  *Recommendations for 2nd round:* N/A |
| **Issue 2-3: TN(NB-IoT) and TN co-existence result** | *Tentative agreements:* Adopt results provided by R4-2205044 in co-existence result summary and TR 38.863 with a note stating NB-IoT scenarios are not calibrated yet.  *Candidate options:* N/A  *Recommendations for 2nd round:* Source of R4-2205044 is invited to update the co-existence result summary. |

## Discussion on 2nd round

### Open issues and view collection

**Issue 2-1: Algorithm to average ACIR values**

* Proposals
  + Option 1: use the following algorithm for averaging throughput loss results between different companies:

1. Consider only results that do not have much variance with respect to other companies’ results.
2. The worst value (of a company) should not be taken into account if the value at 5% throughput loss is 10 dB higher (or lower) that the average of the other companies. (For this particular case, the respective company throughput loss shall not be used to compute the average throughput loss.)
3. A conclusion should not be made if only one company submitted results. A valid case should have at least results provided by 2 companies.
4. The correct average methodology between different companies should be (according e.g. to TR 36.942):
   1. independently done with respect to each scenario;
   2. the average should be done on throughput loss (based on different throughput loss between the companies), and not on ACIR (dB or linear, especially if the values are too different);
   3. a new curve representing the averaged throughput loss (between selected companies) should be obtained;

finally, a (new) ACIR value is obtained at 5% throughput loss from the average throughput loss previously computed.

1. The worst-case value (of a company) should not be taken into account if the value at 5% throughput loss is 10 dB higher (or lower) that the average of the other companies. (For this case, the throughput loss shall not be used to compute the average throughput loss.)

* Recommended WF
  + Capture Option 1 in the draft TR 38.863

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| --- | --- | --- |
| **Company** | **Agree with the WF?** | **Comments** |
| Ericsson | Partially agree | I don’t think we did b), but we averaged the ACIR values, right? This was also done for NR and many other studies actually. |
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## Summary for 2nd round

### Open issues

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| --- | --- |
|  | **Status summary** |
| **Issue 2-1: Algorithm to average ACIR values** |  |

# Topic #3: ACLR and ACS

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-22040545 | Ericsson | Proposal 2: For case 6, considering the scenario with GEO satellite and an elevation angle of 45o, the needed ACIR value should be equal to 40dB to guarantee coexistence.  Proposal 3: Based on case 6 and the new assumption (50% TNs), the SAN ACS limit should be equal to 40dBc. |
| R4-2205104 | Ligado Networks, Inmarsat | Observation 1: For Case 3, the received signal strength at the TN UE from a GEO NTN satellite beam is expected to be ~10 dB lower than that received from the LEO NTN satellite beam.  Observation 2: For Case 3, the noise floor rise at the TN UE as a result of ACI from the GEO NTN satellite beams is expected to be 1.1 dB lower than that received from the LEO NTN satellite beams when ACLR value of 24 dB is used for both.  Observation 3: For Case 3, ACLR of 13.5 dBc for the GEO SAN will result in the same noise rise and degradation as that observed due to the LEO SAN.  Proposal 1: Use separate ACLR values for GEO and LEO SANs.  Proposal 2: Specify ACLR value of 13.5 dBc for a GEO SAN. |
| R4-2205925 | THALES | Proposal 4: RAN4 shall consider that the “rural” SAN ACS requirement (≤ 38 dB) identified in RAN4#101-bis-e as worst case is also applicable to “urban” deployment. |

## Open issues summary

### Sub-topic 3-1

**Issue 3-1: Case 6 SAN ACS value**

* Proposals
  + Option 1(Ericsson): 40 dB
  + Option 2(last meeting): [38dB]
* Recommended WF
  + TBA

**Issue 3-2: Applicability of SAN ACS value**

* Proposals

The “rural” SAN ACS requirement (≤ 38 dB) identified in RAN4#101-bis-e as worst case is also applicable to “urban” deployment. As further interpreted by Moderator, in the case of “rural” SAN ACS requirement (≤ 38 dB) agreed, following options are proposed for discussion

* + Option 1: There should be a note in TR 38.863 and TS 38.108 indicating the SAN ACS value applies to both Rural and Urban scenarios.
  + Option 2: There should be a note in TR 38.863 and TS 38.108 indicating the SAN ACS value only applies to Rural scenario
* Recommended WF
  + TBA

### Sub-topic 2-2

**Issue 3-3: Consideration of ACLR for GEO and LEO SAN**

* Proposals
  + Option 1: Use separate ACLR values for GEO and LEO SANs.
  + Option 2: Use the same ACLR values for GEO and LEO SANs
* Recommended WF
  + TBA

**Issue 3-4: GEO SAN ACLR value**

* Proposals
  + Option 1: 13.5dBc for GEO SAN and 24dBc for LEO SAN.
  + Option 2: 24dBc for both GEO and LEO SAN
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Issue 3-1: Case 6 SAN ACS value**

|  |  |  |
| --- | --- | --- |
| **Company** | **Which Option do you support?** | **Comments** |
| Ericsson | 39 dBc as compromise? | 40 is based on our simulation results only, we were expected more results from other companies.  To compromise, 39 might be acceptable but we would like to hear the satellite manufacturer’s view on feasibility with this value. |
| ZTE | 39dBc is also fine for us. |  |
| Ligado Networks |  | Pending SAN class agreement to determine if same value is applicable for both GEO and LEO or different need to be specified based on the coexistence study results. |
| Hughes/EchoStar | Option 2 | Also pending SAN class agreement |
| Inmarsat | Option 2 | 40 dBs seems tight, we think the 38 dB value is more realistic also considering the likely deployment scenarios. If we decide for multiple SAN classes (e.g. GEO, LEO) we should also determine which ACS values apply to different classes. |
| THALES | Option 2 | New simulation results from R4-2205925 show that 38 dB can be applicable for GEO urban mixture. If GEO rural, than is only 35 dBs.  And 38 dB is also applicable for LEO from previous meeting.  During previous meeting we have considered 38 dB as worst case for both LEO and GEO. |
| Huawei | Option 3 | Because it only has an impact on the receiver of satellite instead of Terrestrial network for ACS requirements. Different satellites are applicable to different scenario. One compromise is that the ACS value can be declared by manufacturer. |
| Qualcomm | 39dB is fine for us |  |
| Samsung |  | We share the view with Ericsson and Huawei that the ACS will impact the SAN receiver performance and it’s related to each Satellite’s target scenario and feasibility.  We observed some results suggested 40 dBc is required for some deployment scenario, so technically we prefer higher ACS values than 38 dBc. But we’d like to hear what is the need from satellite manufacturers and operators for the NR-NTN operation. |
| Moderator | Agreement in GTW (2/23): Case 6 SAN ACS value: 38 dB for both SAN classes (LEO and GEO) | |

**Issue 3-2: Applicability of SAN ACS value**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Agree with Opt.1?** | **Agree with Opt.2?** | **Comments** |
| Ericsson | ACS shall be applicable for both rural and urban. But I don’t think we need a note to capture this, it’s common understanding in all RAN4 specifications. | | |
| ZTE | Agree with Ericsson that we don’t need to capture the note. | | |
| Hughes/EchoStar | Option 1 - as described in R4-2205925, SAN ACS requirement (≤ 38 dB) supports RAN4#101-bis-e as worst case is also applicable to “urban” deployment. | | |
| Inmarsat | Tend to agree with Option 1 – if we don’t capture this note, how can we ensure the applicability is clear? | | |
| THALES | Option 1 is ok if required (for someone who has not participated in the simulation scenarios). We can also contribute with the figure for GEO case, as you wish. | | |
| Huawei | Option 3: there is no need to indicate the applicability of SAN ACS value. Because it only has an impact on the receiver of satellite instead of Terrestrial network. Different satellites are applicable to different scenario. One compromise is that the ACS value can be declared by manufacturer. | | |
| Qualcomm | Agree with Ericsson and ZTE. | | |
| Samsung | Agree with Ericsson and ZTE. | | |
| Moderator | Agreement in GTW (2/23): There should be a note in TR 38.863 indicating the SAN ACS value applies to both Rural and Urban scenarios. | | |

**Issue 3-3: Consideration of ACLR for GEO and LEO SAN**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Agree with Opt.1?** | **Agree with Opt.2?** | **Comments** |
| Ericsson | Open for discussion | That’s our preference |  |
| ZTE |  | More preferred |  |
| Ligado Networks | Agree |  | Coexistence study results for GEO NTN show an ACLR range of 8-16 dB versus significantly higher range for LEO. |
| Hughes/EchoStar | Preferred |  |  |
| Inmarsat | Agree |  | Coexistence study results show that ACLR for GEO can be significantly lower than LEO, between 8-16 dB |
| THALES | Yes, if we introduce 2 SAN classes. | Yes, if we introduce 1 SAN class only. | Depends on the SAN class discussion from Part1.  Please also check Scenario 3 from R4-2201124 (collected NR-NTN co-existence results), which indicates 2 ACLR requirements (one per GEO and one per LEO) may be possible. There might be 8 dB difference, which is not negligible.  Remark: Implementation with 24 dB ACLR for GEO is also possible. However, we agree that it depends on the satellite design. **For this reason, we suggest to follow the point of view of the operators.** |
| Huawei | Open for discussion, considering higher EIRP. |  |  |
| Qualcomm | Open for discussion |  |  |
| Samsung | Open for discussion |  | Agree with Thales. This depends on the discussion in other part. |
| Moderator | Agreement in GTW (2/23): Option 1 Use separate ACLR values for GEO and LEO SANs. | | |

**Issue 3-4: GEO SAN ACLR value**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Agree with Opt.1?** | **Agree with Opt.2?** | **Comments** |
| Ericsson | If we decide for another ACLR value for GEO, it should come from the coes studies which hopefully should be aligned with the propose value here. | That’s our preference |  |
| ZTE |  | More preferred |  |
| Ligado Networks | Agree; open to using the average value from the co-existence studies |  |  |
| Hughes/EchoStar | Agreed |  |  |
| Inmarsat | Agree |  | Open to using an average value from the coexistence studies, which we expect should fall roughly around 13.5 dB |
| THALES | To be computed from averaging GEO ACIR requirement at 5% throughput loss from R4-2201124 (coexistence results, from RAN4#101-bis-e)  Currently it seems **14-16 dBs,** depending on the averaging method between different companies. | In this case we don’t make 2 SAN classes. | If Option 1, then 2 classes.  If Option 2, then 1 class. |
| Huawei |  |  | More studies and discussion are needed. |
| Qualcomm | Agree with Ericsson |  |  |
| Samsung | Open and agree with Ericsson. |  | Let’s park our discussion to wait Part 1 decision. |
| Moderator | Agreement in GTW (2/23): LEO SAN ACLR: 24dBc  GEO SAN ACLR: Further review the co-existence results collected till this meeting and conclude in this meeting. | | |
| Ligado Networks | GEO SAN ACLR:  Table below summarize GEO SAN ACLR coexistence results for case 3:   |  |  |  |  | | --- | --- | --- | --- | |  | ACLR – GEO SAN | | | | Case 3 results | % degradation > 5% | % degradation < 5% | Interpolated | | QCOM | 14 | 16 | 15 | | Samsung | 12 | 14 | 13 | | MTK | 14 | 16 | 15 | | ZTE | 8 | 10 | 9 | | Ericsson | 12 | 14 | 13 | | CATT | 14 | 16 | 15 | | Xiaomi | 14 | 16 | 15 | |  |  |  |  | | Average | 12.6 | 14.6 | 13.6 |   Propose that GEO SAN ACLR = 14 dB | | |
| Samsung | We also reviewed the submitted results, and the proposal is similar with Ligado, GEO SAN ACLR = 14dBc.  But the intermediate numbers is different, below are the data provided for the meeting to consider.  6.4.3.2 Scenario 3 GEO Class  **Table 6.4.3.2-1 Simulation results for average throughput loss**   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **ACIR[dB]** | **2** | **4** | **6** | **8** | **10** | **12** | **14** | **16** | **18** | **20** | | Qualcomm | 15.65 | 11.48 | 8.25 | 5.96 | 3.67 | 2.70 | 1.74 | 1.09 |  |  | | Samsung | 15.14 | 11.09 | 7.86 | 5.41 | 3.63 | 2.39 | 1.55 | 1.00 | 0.64 | 0.41 | | MTK | 20.35 | 15.03 | 10.74 | 7.33 | 4.79 | 3.15 | 2.05 | 1.32 | 0.84 | 0.53 | | ZTE | 11.39 | 8.09 | 5.58 | 3.76 | 2.48 | 1.62 | 1.04 | 0.67 | 0.42 | 0.27 | | Ericsson |  |  |  |  | 3.9 | 2.5 | 1.6 | 1.0 |  |  | | CATT | 9.73% | 7.94% | 6.42% | 5.15% | 4.08% | 3.20% | 2.48% |  |  |  | | Xiaomi | 22.47 | 16.68 | 11.93 | 8.25 | 5.56 | 3.67 | 2.39 | 1.54 | 0.98 | 0.62 |     **Figure 6.4.3.2-1 Simulation results for average throughput loss**  **Table 6.4.3.2-2 Simulation results for 5%-tile throughput loss**   |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **ACIR[dB]** | **4** | **6** | **8** | **10** | **12** | **14** | **16** | **18** | **20** | **22** | | Qualcomm | 35.59 | 26.64 | 19.54 | 12.44 | 9.23 | 6.02 | 3.81 |  |  |  | | Samsung | 26.43 | 18.68 | 12.77 | 8.49 | 5.55 | 3.58 | 2.30 | 1.46 | 0.93 | 0.59 | | MTK | 42.08 | 31.47 | 22.53 | 15.53 | 10.41 | 6.83 | 4.43 | 2.84 | 1.81 | 1.15 | | ZTE | 14.19 | 9.38 | 6.19 | 4.19 | 2.58 | 1.62 | 1.00 | 0.57 | 0.38 | 0.25 | | Ericsson |  |  |  | 8.3 | 5.6 | 3.5 | 2.2 |  |  |  | | CATT | 20.86 | 19.31 | 14.49 | 13.09 | 7.33 | 5.23 | 4.17 |  |  |  | | Xiaomi | 36.44 | 26.85 | 18.99 | 12.97 | 8.65 | 5.67 | 3.66 | 2.35 | 1.50 |  |     **Figure 6.4.3.2-2 Simulation results for 5%-tile throughput loss**  **Table 6.4.3.2-3 Interpolated ACIR values for Scenario 3 GEO Class to meet the 5% throughput loss criteria**   |  |  |  | | --- | --- | --- | | **Source** | | **Interpolated ACIR[dB]** | | Qualcomm | Average | 8.84 | | 5%-tile | **14.46** | | Samsung | Average | 8.46 | | 5%-tile | **12.56** | | MTK | Average | 9.83 | | 5%-tile | **15.53** | | ZTE | Average | 6.64 | | 5%-tile | **9.2** | | Ericsson | Average |  | | 5%-tile | **12.57** | | CATT | Average | 8.28 | | 5%-tile | **14.43** | | Xiaomi | Average | 10.59 | | 5%-tile | **14.67** |   **Table 6.4.3.2-4 Average ACIR values in the above worse case for Scenario 3 GEO Class**   |  |  | | --- | --- | |  | **Scenario 3 GEO Class** | | ACIR value [dB] | 13.35 | | | |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2204333 | Ericsson: see commented file in the corresponding subfolder |
| Ligado Networks: see commented file in the corresponding subfolder |
|  |
| R4-2205913 | Ericsson: see commented file in the corresponding subfolder |
| Ligado Networks: see commented file in the corresponding subfolder |
| THALES: in previous version, the average between bold (selective) values from Scenario 1 does not give the same result from Average ACIR. |
| R4-2205914 | Ericsson: I don’t think we need those updates here, we should anyway only consider the worst case of “AAS” and “non AAS” to determine ACLR and ACS. But the results should be added in the annex if not already done. |
| THALES: If you take some time to compute the averages, you will see AAS is not always the worst case.  THALES: On the other hand, we can simply keep the non-AAS results there, what’s the difference?  To Ericsson: In any case, during the first day in RAN4#101-bis-e (the GTW session from the first day) we decided the worst case without performing the averaging between the companies/checking the results. It therefore seems that we all were a bit in hurry with driving the conclusions. You can see that there are some differences. For example:  Table 6.5-1 Average ACIR values for each scenario   |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | | Scenario | | 1 | 2 | 3 | 4 | 5 | 6 | | ACIR value [dB] | TN BS with AAS | 23.18 | 28.03 | **23.32** | **28.11** | **26.43** | [TBD] | | TN BS with non-AAS | **27.96** | **29.49** | 22.66 | 21.66 | 4.49 | **[30.68]** |   We therefore think we hurried a bit and that we do not have a clear methodology of performing the averaging.  **In any case, we need to include somewhere the summary (with graphs) of non-AAS methodology.** We simply followed the AAS rules to make this contribution. And the integration is easy, why to refuse such integration?  **And if you want, we don’t say that we selected between AAS and non-AAS worst case, we simply say that we show both AAS and non-AAS results, and that the derived ACIR are based on AAS for scenarios 1-5.**  For example: “The co-ex results from all concerned options in this scenario were evaluated, and it has been agreed to select the NR DL equipped with ~~both~~ AAS ~~and non-AAS~~ antenna interfering the NR-NTN GEO DL that deployed in urban environment as the most stringent case.”, but we keep the non-AAS results in Clause 6.4 and 6.5. **If not, what is the proof for the reader that non-AAS has been really considered when driving the conclusions?** |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary** |
| **Issue 3-1: Case 6 SAN ACS value** | Agreement in GTW (2/23): Case 6 SAN ACS value: 38 dB for both SAN classes (LEO and GEO)  *Candidate options:* N/A  *Recommendations for 2nd round:* N/A |
| **Issue 3-2: Applicability of SAN ACS value** | Agreement in GTW (2/23): There should be a note in TR 38.863 indicating the SAN ACS value applies to both Rural and Urban scenarios.  *Candidate options:* N/A  *Recommendations for 2nd round:* Further discuss the note added in the revised R4-2204333 |
| **Issue 3-3: Consideration of ACLR for GEO and LEO SAN** | Agreement in GTW (2/23): Option 1 Use separate ACLR values for GEO and LEO SANs.  *Candidate options:* N/A  *Recommendations for 2nd round:* Further discuss the corresponding modification in the revised R4-2204333. |
| **Issue 3-4: GEO SAN ACLR value** | Agreement in GTW (2/23): LEO SAN ACLR: 24dBc  *Candidate options:*  Option 1: 14 dBc and capture relative contents in draft TR 38.863, noting that a further check on non-AAS results may be needed.  *Recommendations for 2nd round:* Further discuss Option 1 and the corresponding modification in the revised R4-2204333. |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2204333 | To be revised |
| R4-2205913 | To be revised |
| R4-2205914 | To be revised |

## Discussion on 2nd round

### Open issues and view collection

**Issue 3-4-1 Non-AAS results**

* Proposals
  + Option 1: Include Non-AAS values provided in R4-2205914 in draft TR 38.863
  + Option 2: Do not include Non-AAS values provided in R4-2205914 in draft TR 38.863
* Recommended WF
  + Agree on Option 1 as it seems no harm.

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree with the WF?** | **Comments** |
| Samsung | Option 1. | We’d like to seek clarifications from the proponent of this proposal.  Since the non-AAS values are already in the Annex of TR 38.863, we don’t quite understand where and how exactly they want the non-AAS results to be included in the TR.  If the proposal is to include non-AAS results in the Chapter 6 other than Annex, then can we have additional wordings from the proponent for how to introduce and handling the AAS and non-AAS results to derive ACIR? Because previously, it seems we agreed on some selected option for each Scenario 1~6, and those selected options are happened to be all AAS cases.  The current structure of Chapter 6 does not mean we exclude any non-AAS results in the TR.  We are open to any practical and editorial suggestions so that we can discuss, the current proposal is not very clear to us. |
| Qualcomm |  | Share the similar view as Samsung. In addition, why to select NR TN DL interfering the NTN LEO-600 deployed in rural as the worst case in Case 6? There is no justification how to decide the worst case. Shouldn’t it be GEO with Rural per previous discussion? |
| Samsung | Agree WF. | By further offline discuss with proponent, we understand the intention is to include the non-AAS results in Chapter 6.4, and also the R4-2205914 showed in some Scenario, the non-AAS interpolated ACIR results are worse than AAS.  With that understanding, we can support the general principle to include the non-AAS results, and to conclude the ACIR by taking the worst from AAS and non-AAS in each Scenario. |
| Ericsson | Agree | With the additional motivation provided by Samsung, we could agree adding those results. |

**Issue 3-4-2: GEO SAN ACLR value**

* Proposals
  + Option 1: 14dBc noting that it may be further updated if values of non-AAS suggest a different number once agreed.
* Recommended WF
  + Adopt Option 1.

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree with the WF?** | **Comments** |
| Samsung | Agree | It was derived from current results. |
| Ericsson | Agree |  |
|  |  |  |
|  |  |  |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2204333  (revised) | Ericsson: see commented file |
| Samsung: see commented file. |
|  |
|  |
| R4-2205913  (revised) | Ericsson: It’s difficult to review and check overall consistency. Please merge 5913 and 5914 in one tdoc, that will be much easier. |
| Samsung: Since this is highly related to 5914, we share the same view with Ericsson that please merge the two documents together. |
|  |
|  |
| R4-2205914  (revised) | Ericsson: It’s difficult to review and check overall consistency. Please merge 5913 and 5914 in one tdoc, that will be much easier. |
| Samsung: It seems for Scenario 1 and 2, as concluded in this document, non-AAS results is worse than AAS results. Hence, we are open to take either one of the following approaches to address this TP to include non-AAS results.   1. To keep both AAS and non-AAS results in all sections in Chapter 6.4 and update 6.5 accordingly, and then to explain that we use which results for each Scenario in the summary table 6.5-1. (I think this is what proposed by Thales, and it is agreeable to us.) 2. To replace the current AAS results in Scenario 1 and 2 sections with the worse non-AAS results proposed, and to update the 6.5 accordingly. |
|  |
|  |

## Summary for 2nd round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary** |
| **Issue 3-4-1 Non-AAS results** |  |
| **Issue 3-4-2: GEO SAN ACLR value** |  |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2204333  (revised) |  |
| R4-2205913  (revised) |  |
| R4-2205914  (revised) |  |

# Topic #4: HAPS coexistence scenarios and results

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2204503 | Qualcomm Incorporated | The HAPS and TN coexistence performance were presented with simulation results.  Observation 1: The interference from HAPS to AAS TN is acceptable. Introducing HAPS will not impact current TN deployment.  Observation 2: The edge performance of HAPS is vulnerable. It is difficult to measure the interference’s impact brought by other systems using 5-ile performance loss. The operators’ coordination mechanism is needed to enable the co-coverage of HAPS and TN, e.g., HAPS UE can handover/roam to TN network configured by network in this case.  Proposal 1: The ACLR/ACS for TN UE is also applicable for HAPS UE. HAPS can support existing TN UE.  Proposal 2: The frequency coordination measures are needed to enable HAPS and TN coexistence in the same coverage. The HAPS operator should plan its frequency deployment considering the ACI impact from TN but there is no need to specify the corresponding RAN4 requirements. |
| R4-2205284 | Huawei, HiSilicon | Observation 1: Since current RF module of WA BS working in the IMT bands can be used for HAPS, the RF requirement for WA BS can be used for HAPS.  Observation 2: Based on the simulation assumptions [2] for HAPS co-existence, all of the BS RF parameters for HAPS are same with Macro (WA) BS, e.g. output power, antenna parameter, Noise Figure.  Observation 3: HAPS based on WA BS RF requirements has been deployed in the current field and worked well.  Observation 4: Some of RF requirements are related to the ACLR and ACS. As we have agreed to reuse the other WA BS RF requirements for HAPS, it’s impossible to change the ACLR and ACS requirements for HAPS.  Observation 5: RAN4 should follow the similar baseline assumption that the ACLR/ACS for WA BS is also applicable for HAPS, as we have agreed this assumption for HAPS UE.  Observation 6: Since current RF module of WA BS working in the IMT bands can be reused for HAPS, it’s feasible to achieve current ACLR and ACS requirements for HAPS. In order to maintain the unified industry, it’s better to reuse current WA BS ACLR and ACS requirements for HAPS.  Observation 7: Even if MR or LA BS may need a relaxer requirement, we just specify one value for ACLR and ACS among different BS classes based on the worst case (WA scenario).  Proposal 1: To reuse the current WA BS ACLR and ACS requirements for HAPS. |
| R4-2205556 | Nokia, Nokia Shanghai Bell | Simulation results for HAPS adjacent channel coexistence have been provided.  Observation 1: The required ACIR for the HAPS DL aggressor scenarios is 23.0 dB.  Observation 2: HAPS DL coexistence simulation results indicate the required ACLR for HAPS is about 24 dB.  Observation 3: For HAPS UEs outside the TN coverage, the impact of ACI from TN DL is negligible. For HAPS UEs within the TN coverage, the DL throughput loss due to ACI from TN DL is about 9%.  Observation 4: The impact of HAPS UL ACI is negligible for TN UL.  Observation 5: Imposing a maximum CL of 140 dB makes little difference (≤ 0.3%) in mean throughput loss results for all cases, while it allows to evaluate 5%-tile throughput loss.  Observation 6: For the same ACIR, a higher loss typically occurs at 5%-tile throughput. Using mean throughput alone to determine ACS requirement will result in a more relaxed requirement.  Observation 7: To protect HAPS UL from ACI, simulation results indicate that 0 dB ACIR offset is required if the 5% loss criterion applies to both mean throughput and 5%-tile throughput, while -17 dB ACIR offset is required if only mean throughput is considered.  Proposal 1: Existing TN UE’s ACLR/ACS requirements are applicable to HAPS UE.  Proposal 2: Adopt a maximum CL of 140 dB for HAPS UE in adjacent channel coexistence simulations. |
| R4-2205558 | Nokia, Nokia Shanghai Bell | Proposal 1: The required ACLR for HAPS BS is 27 dB.  Proposal 2: The required ACS for HAPS BS is 46 dB. |

## Open issues summary

### Sub-topic 4-1

**Issue 4-1: HAPS co-existence study results**

* Proposals
  + Option 1: Update the document “Summary of HAPS co-existence study” (R4-2202994) with results from R4-2204503 and R4-2205556.
* Recommended WF
  + Agree with Option 1.

### Sub-topic 4-2

**Issue 4-2: ACLR and ACS for HAPS UE**

* Proposals
  + Option 1(Qualcomm, Nokia): Same requirements of existing TN UE apply to HAPS UE. Meanwhile, a Note should be added in TR 38.863 as following:

Note: The frequency coordination measures are needed to enable HAPS and TN coexistence in the same coverage. The HAPS operator should plan its frequency deployment considering the ACI impact from TN but there is no need to specify the corresponding RAN4 requirements.

* Recommended WF
  + Agree with Option 1.

**Issue 4-3: ACLR and ACS for HAPS BS**

* Proposals
  + Option 1 (Nokia): Use following values

|  |  |
| --- | --- |
| ACLR for HAPS BS | ACS for HAPS BS |
| 27dB | 46dB |

* + Option 2 (Huawei): To reuse the current WA BS ACLR and ACS requirements for HAPS.
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Issue 4-1: HAPS co-existence study results**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree with WF?** | **Comments** |
| Moderator |  | Once agreed, input source company are invited to update the summary document in TMP folder on ftp. |
| Ericsson | Agree |  |
| Qualcomm | Agree |  |
| Nokia | Yes |  |

**Issue 4-2: ACLR and ACS for HAPS UE**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree with WF?** | **Comments** |
| Moderator |  | Wordings of the Note can be further refined. |
| Ericsson | Agree |  |
| Qualcomm | Agree |  |
| Nokia | Yes | Option 1 is in line with HAPS coexistence simulation results. |

**Issue 4-3: ACLR and ACS for HAPS BS**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Agree with Opt.1?** | **Agree with Opt.2?** | **Comments** |
| Ericsson |  |  | To be discussed  Question for clarification to Nokia: With option1, we would need to define new ACLR and OBUE requirements for HAPS, ís that really the intention here? |
| Huawei |  | Agree | For HAPS ACS, it seems that we can reach an agreement to reuse current requirements.  In R4-2205284, we listed 7 observations to support reusing the current WA BS ACLR requirements for HAPS.  Since current RF module of WA BS working in the IMT bands can be reused for HAPS, it’s feasible to achieve current ACLR and ACS requirements for HAPS. In order to maintain the unified industry, it’s better to reuse current WA BS ACLR and ACS requirements for HAPS. |
| Nokia | OK | OK | Option 1 is derived from the results of coexistence study. We understand the importance of protecting TN. However, with HAPS operating in the altitude of 20 km, the DL ACI from HAPS would be attenuated significantly by the propagation loss. Indeed, based on simulation results, we see that 27 dB ACLR for HAPS BS should be sufficient.  It is true that antenna array and parameters are similar to TN BS. However, we need to consider that the stratosphere environment where HAPS BS will operate is drastically different from the environment of TN BS. One example is the -70⁰C temperature that the equipment has to withstand. In addition, there are also constraints of weight and power from the HAPS platform.  That said, we are fine to reuse WA BS 45 dB ACLR requirement in the TS if we clearly state in the TR that there is possibility to relax this based on the co-existence studies if found more stringent than necessary at a later stage. This with the understanding that we then might need to define a new BS class with new ACLR and OBUE requirements for HAPS. |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2205557 |  |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary** |
| **Issue 4-1: HAPS co-existence study results** | *Tentative agreements:* Update the document “Summary of HAPS co-existence study” (R4-2202994) with results from R4-2204503 and R4-2205556.  *Candidate options:* N/A  *Recommendations for 2nd round:* The source company is invited to update the summary document in TMP folder on ftp. |
| **Issue 4-2: ACLR and ACS for HAPS UE** | *Tentative agreements:* Option 1.  *Candidate options:* N/A  *Recommendations for 2nd round:* The Note in Option 1 should be captured in draft TR 38.863. |
| **Issue 4-3: ACLR and ACS for HAPS BS** | *Tentative agreements:* N/A.  *Candidate options:*   * Option 1: Use following values  |  |  | | --- | --- | | ACLR for HAPS BS | ACS for HAPS BS | | 45dB1 | 46dB | | Note 1: This ACLR value could be further relaxed based on co-existence studies if it is found more stringent than necessary. | |   *Recommendations for 2nd round:* Further discuss Option 1. |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2205557 | Agreeable |

## Discussion on 2nd round

### Open issues and view collection

**Issue 4-3: ACLR and ACS for HAPS BS**

* Proposal
  + Option 1: Use following values

|  |  |
| --- | --- |
| ACLR for HAPS BS | ACS for HAPS BS |
| 45dB1 | 46dB |
| Note 1: This ACLR value could be further relaxed based on co-existence studies if it is found more stringent than necessary. | |

* Recommended WF
  + Agree on Option 1.

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree with the WF?** | **Comments** |
| Qualcomm | Agree |  |
| Ericsson | Agree |  |
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|  |  |  |

## Summary for 2nd round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary** |
| **Issue 4-3: ACLR and ACS for HAPS BS** |  |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on [309] NTN\_Solutions\_Part2 | Samsung |  |
| Simulation assumptions for NTN co-existence | Samsung, CATT |  |
| Summary of NTN co-existence study | Samsung |  |
| Summary of HAPS co-existence study | Nokia |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-2204333 | Draft text proposal to update TR 38.863 Chapter 6 | Samsung | Revised |  |
| R4-2205557 | TP to TR 38.863 on HAPS simulation update | Nokia, Nokia Shanghai Bell | Agreeable |  |
| R4-2205913 | Draft text proposal for Clauses 6.4 and 6.5 in TR 38.863 to correct conclusions from simulation results based on AAS antenna assumption | THALES | Revised |  |
| R4-2205914 | Draft text proposal for Clauses 6.4 and 6.5 in TR 38.863 to include simulation results based on Non-AAS antenna assumption | THALES | Revised |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-22xxxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-22xxxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents

# Annex 1 Contact information

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
| Nokia | Johannes Hejselbaek | Johannes.hejselbaek@nokia.com |
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Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Annex 2 TDOC list for Agenda Item 10.13.2

A total of 14 TDOCs have been received for this agenda and listed as below.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***TDoc No.*** | ***Title*** | ***Source*** | ***Type*** | ***For*** | ***Agenda Item*** | ***Status*** |
| R4-2204333 | Draft text proposal to update TR 38.863 Chapter 6 | Samsung | pCR | Approval | 10.13.2 | available |
| R4-2204502 | Coexistence simulation results for TN-NTN case 1 | Qualcomm Incorporated | discussion | Discussion | 10.13.2.1 | available |
| R4-2204503 | Coexistence simulation results for HAPS | Qualcomm Incorporated | discussion | Discussion | 10.13.2.2 | available |
| R4-2205044 | NTN - Coexistence simulation results | Ericsson | discussion | Discussion | 10.13.2.1 | available |
| R4-2205045 | NTN - SAN ACS and case 6 | Ericsson | other | Approval | 10.13.2.3 | available |
| R4-2205104 | Discussion on GEO SAN ACLR | Ligado Networks, Inmarsat | discussion | Approval | 10.13.2.3 | available |
| R4-2205284 | Discussion on HAPS requirements | Huawei, HiSilicon | other | Approval | 10.13.2.2 | available |
| R4-2205556 | HAPS coexistence simulation results | Nokia, Nokia Shanghai Bell | discussion | Approval | 10.13.2.2 | available |
| R4-2205557 | TP to TR 38.863 on HAPS simulation update | Nokia, Nokia Shanghai Bell | pCR | Approval | 10.13.2.2 | available |
| R4-2205558 | HAPS BS ACLR and ACS requirements | Nokia, Nokia Shanghai Bell | discussion | Approval | 10.13.2.3 | available |
| R4-2205913 | Draft text proposal for Clauses 6.4 and 6.5 in TR 38.863 to correct conclusions from simulation results based on AAS antenna assumption | THALES | pCR | Approval | 10.13.2.1 | available |
| R4-2205914 | Draft text proposal for Clauses 6.4 and 6.5 in TR 38.863 to include simulation results based on Non-AAS antenna assumption | THALES | pCR | Approval | 10.13.2.1 | available |
| R4-2205924 | On the ACIR selection and ACIR average computation between companies | THALES | discussion | Decision | 10.13.2.1 | available |
| R4-2205925 | On the applicability of rural SAN ACS requirements for urban TN deployment in the case of GEO | THALES | discussion | Decision | 10.13.2.3 | available |