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

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

**Agenda item:** 12.2

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [98-bis-e][328] LS\_reply\_ITU-R

**Document for:** Information

# Introduction

This e-mail thread covers two ongoing LS exchanges with different ITU-R WPs:

1. At last RAN plenary RAN4 was tasked (RP-210789) to consider a test signal proposed by ITU-R WP 1C in R4-2100004.
2. At last RAN4, antenna parameters were sent in LS to ITU-R WP 5D. In R4-2106354 additional information is provided to better reflect base stations deployed in networks. The intention is to send the information to ITU-R WP 5D.

This thread is split up into two corresponding topics:

1. Test signal
2. Antenna model extension

# Topic #1: Test signal

In R4-2100004, ITU-R WP 1C request RAN4 to consider the feasibility to introduce a test signal to facilitate in-filed OTA testing of unwanted emission.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2106356 | Ericsson | The intention with this contribution is to initiate the discussion in RAN4 about the request from ITU-R. A collection of RAN4 aspects to consider before responding to ITU-R WP 1C is presented in the contribution. At the end on the contribution a draft LS is provided to stimulate the discussion. |

## Open issues summary

### Sub-topic 1-1

Sub-topic description: Collect more relevant technical information required to better understand the test signal concept to be able to analyze the RAN4 impact.

**Issue 1-1: RAN4 specific issues related to proposed test signal**

* Identify any additional information to be requested from ITU-R WP 1C by RAN4, in order to better understand the test signal
  + Comments are welcome
* Recommended WF
  + Collect questions and open issued in a draft LS response.

### Sub-topic 1-2

Sub-topic description: In relation to the request from WP1C, some alternative solutions relevant for measuring unwanted emission are proposed in R4-2106356. The intention with this sub-topic is to collect feedback and maybe even more alternative approaches.

**Issue 1-2: Alternative approaches**

* Proposals
  + Option 1: Normal operation
  + Option 2: Normal operation and fixed measurement location
  + Option 3: Proprietary test configuration
  + Option 4: Provoking traffic
* Recommended WF
  + Collect information in a draft LS response.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Sub topic 1-1: RAN4 can analyse technical aspects only from the point of view of doing measurements in controlled environment. RAN4 cannot analyse measurement uncertainties in the field. In addition to RAN1 impact, there would likely be impact also elsewhere to be able to enable/disable proposed test signal. It would be therefore better to send LS first to RAN plenary to clarify what would need to be done and what would be the impacted WGs/specifications, in case a dedicated test signal would in the end be seen as preferred option compared to the alternative approaches. RAN can forward the message to ITU-R WP 1C in June meeting.  Sub topic 1-2: Comments for alternative approaches:   * Option 1: Good approach to schedule measurement at peak traffic hours * Option 2: Represent well the normal operation * Option 3: Has similar issues identified earlier for test mode. By enabling a test mode, the BS normal network operation will be disrupted * Option 4: Good approach using test UEs to provoke BS to schedule full carriers   In addition, option 1, 2, 4 could even be combined, i.e. averaging over the peak hours could be performed while traffic is simultaneously being provoked.  ….  Others: Overall, we see the alternative approaches more preferable, given the issues and open items surrounding the test signal definition. |
| ZTE | Sub topic 1-1:  To design some dedicated signal for OTA testing in field, it’s better to avoid the impacts on other group, otherwise we cannot reply LS in June RAN-P meeting.  Sub topic 1-2:  Since BS scheduler algorithm is unknown in practice, to provoking BS to schedule full carrier is also unknown.  For normal operation, then there is no guarantee the full carrier scheduled. |
| Huawei | Sub topic 1-1: Questions about test signal. Is the test signal intended to be transmitted all the time or initiated by some sort of request? If it is on all the time then it may force BS to abandon any power saving modes as it has to be prepared to transmit full power at all times. Interference with systems based on random distribution of UE in aggressor and victim system may suffer additional interference due to any sort of non-random persistent interferer, is the intention that the test signal is consistent in all BS synchronously? What is the intended beam pattern for the test signal (high gain correlated – if so in which direction, or de-correlated).  Another question that’s comes to mind is, is this just an AAS problem, the measurement aspects certainly are tougher for AAS, but of the signal has no guaranteed full power signal, the worst case emission case will also not occur for non-AAS BS  Sub topic 1-2:  It seems unlikely that normal operation in option 1 or 2 would produce a worst case scenario – however it would give an idea of average emission levels, whilst not the same as the specified levels it may give an indication of possible interference issues? Vendor specific test modes may result in diverse solutions to the same problem and make it difficult to compare measurements from different vendors. Initiating a test may be carried out by vendor specific approach but the signal itself should perhaps be consistent across vendors, however due to the problems of measurement if the test were to be vendor specific it may allow manipulation of eh beam to allow for available measurement locations which of course will be different for each installation. Provoking traffic seems an interesting approach as it does not require a specific test interface (although maybe a test mode would be useful when the test UE is attached?). It is assumed that the wanted signal will be in the form of a beam pointed at the test UE, however that will only occur if the UE is in the BS beam steering range (close to the BS where LOS is possible the BS may not be able to tilt that far!). In which case the measurement location(s) will either be separate from the test UE or not in the main beam. Both options raise issues, if they are separate (especially if a drone for example is used) then the test UE will need to be synchronized to the measurement to ensure the measurement is take when traffic is directed at the UE. If the measurement UE is not in the main beam then estimate of beam roll off etc will greatly add to MU.  The discussion seems to be based around assumption that emissions close to carrier or harmonics are the main unwanted emissions to be measured and that they will be correlated to the wanted signal. If this is true then assumptions on beam gain based on the wanted signal can be made (although this will introduce significant MU). If this is the assumption then the test signal should be set so that unwanted emission are less likely to be pointing in different directions (i.e. single carrier, single beam, as multiple carriers/beams can result in 3rd order beams in different directions eve with correlated emissions) |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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

### CRs/TPs

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

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

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

## Discussion on 2nd round (if applicable)

# Topic #2: Antenna model extension

At last RAN4 meeting antenna parameters was provided in LS to ITU-R WP 5D in R4-2103104. The antenna parameters do not reflect AAS base stations deployed in networks. Therefore, additional information has been provided in R4-2106354 with the intention to send an additional LS to ITU-R WP 5D with information more relevant for sharing studies.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2106354 | Ericsson, Nokia, Qualcomm | Proposal 1: An extension to current antenna model is proposed to model antennas using sub-arrays  Proposal 2: A parameter set for an antenna using sub-arrays is proposed |

## Open issues summary

The current antenna model defined in TR 37.840 models only antennas with single element configurations. Now when ITU-R WP 5D is evaluating measurement results from real base stations there is a need to update the antenna model to better reflect AAS base station deployed in networks.

### Sub-topic 2-1

Sub-topic description: An antenna model extension is proposed in R4-2106354 to include the sub-array impact on the composite antenna pattern.

**Issue 2-1: Antenna model extension**

* Proposals
  + Extend the antenna model to support sub-array geometries
* Recommended WF
  + Send LS to ITU-R WP 5D with additional information relevant for AAS base station modelling

### Sub-topic 2-2

Sub-topic description: For sharing studies in ITU-R WP 5D relevant antenna parameters are required. A relevant and representable parameter set for wide area base station using sub-arrays have been presented.

**Issue 2-2: Antenna parameter set**

* Proposals
  + Option 1: Model the sub-array antenna characteristics using provided parameters in R4-2106354
* Recommended WF
  + Include parameters set in LS to WP 5D.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Sub topic 1-1: Support the proposal.  Sub topic 1-2: Support the proposal.  ….  Others: |
| Qualcomm | Sub-topic 1-1: We support the proposal.  Sub-topic 1-2: We support the proposal. |
| Spark | We support both proposals for sub topics 1-1 and 1-2. There will be an impact in 5D to revise ITU R M 2101 and this could be problematic.  The antenna arrays shown in R4 2106354 are cross pol arrays yet the antenna models are for co polarized elements. This may also be improved in M 2101.  Spark NZ will be happy to work with RAN 4 colleagues to do the above. |
| ZTE | Sub-array is still not considered for Weighting factor Wm,n and Vm,n, more discussions are needed.  In addition, it’s better to resolve FR2 antenna array with sub-array together instead of going with FR1 only. |
| Huawei | Sub topic 1-1:  We need more time to check the model extension and relevant aspects, e.g. FR1 co-existence.  Sub topic 1-2:  We need more time to check the proposed parameters. Meanwhile we have some comments for clarification. Compared to previous LS R4-2103104 we agreed in last meeting, the vertical coverage range and mechanical down-tilt have been updated, what is the justification? |



## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Notes:

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

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

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