**3GPP TSG-RAN WG4 Meeting # 99-e R4-210XXXX**

**Electronic Meeting, 19th – 27th May 2021**

**Agenda item:** 13.2

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [99-e][337] 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 RAN4#98, 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-field OTA testing of unwanted emission.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2109392  R4-2111019 | Nokia, Nokia Shanghai Bell | Observation 1: Test signal does not guarantee accurate measurement of unwanted emissions in the field.  Observation 2: Test signal for emission measurement in the field may have impacts across 3GPP working groups, impact on network performance and network energy consumption  Observation 3: Multiple alternative options exist which could enable similar possible benefits as a dedicated test signal but without associated drawbacks  Observation 4: It is preferable not the specify a test signal  Proposal 1: Agree the draft LS provided in the Annex. |
| R4-2109873 | Ericsson | Observation 1-1: Experience related to measure TRP would be of great interest for in-field testing.  Observation 2-1: The proposed test signal breaks the idea to have a lean carrier.  Observation 2-2: Already available signals can be used to allocate resources in the frequency domain.  Observation 2-3: The test signal will potentially limit scheduling to generate multiple layers transmission.  Observation 3-1: Maximum configured base station output power can be generated by downloading dummy data.  Observation 3-2: This approach provides more flexibility in terms of measurement time required to measure unwanted emission TRP levels.  Some detailed issues regarding the proposed test signal have been identified together with some alternative approaches. At the end of the contribution a draft LS to ITU-R WP 1C is prepared for discussion. |
| R4-2110613 | ZTE Corporation | Observation 1: Both option 3 and option 4 are feasible in practice and have no impacts on other group.  Observation 2: In-filed OTA testing will introduce much larger testing uncertainty compared with OTA testing in controlled anechoic chamber; |
| R4-2110637 | Huawei, HiSilicon | Proposal 1: It is recommended that normal operation in peak traffic approach and provoking traffic approach are used for in-field TRP test. |

## 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**

* Proposals
  + Option 1: Define a standardized test signal
  + Option 2: Use proprietary test signal
  + Option 3: Use traffic data
* Recommended WF
  + Collect background information together with RAN4 view on preferred solution to be captured in LS to ITU-R WP 1C.

### Sub-topic 1-2

Sub-topic description: In relation to the request from ITU-R WP 1C, some alternative solutions relevant for measuring unwanted emission have been proposed in RAN4. The intention with this sub-topic is to collect feedback and maybe even more alternative approaches.

**Issue 1-2: Alternative approaches not requiring dedicated test signal**

* 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 to ITU-R WP 1C

## Companies views’ collection for 1st round

### Open issues

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

### CRs/TPs comments collection

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

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

## Summary for 1st round

### Open issues

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

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

### 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 the meeting RAN4#98 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** |
| R4-2107607 | Qualcomm | Observation 1: The extended sub-array antenna model is compatible with the defined RF requirements derived in RAN4 for FR2 deployments.  Observation 2: The extended sub-array antenna model leads to same radiated energy as the baseline model.  Observation 3: The extended sub-array antenna model is compatible with the defined RF requirements derived in RAN4 for FR1 deployments. |
| R4-2108900 | Spark NZ | Based on the above simulations, the following conclusions are made:  1. The elevation pattern of a URA with sub arrays will suffer from grating lobes.  2. On the other hand if the intention of the sub arrays is to increase array gain and reduce elevation beamwidth then an equivalent array (12x8) that is based on equal number of vertical antenna elements has a very close correspondence to the ( 4x8) URA made from sub arrays . This equivalent array does not suffer from grating lobes.  3. ITU R M 2101 at present does not account for an array that is made from sub arrays. No matter how trivial or substantial a modification is, to do so this recommendation will have to undergo modified the 5D process of modifying recommendations and if opened for modification there will be many unforeseen and unintended consequences. It is strongly advised that we do not proceed along this line.  4. We should instead adopt the equivalent model as per (2) above.  5. The terminology of sub arrays is misleading and confusing. Consider a MxN URA made from cross pol elements, this could also be two sub arrays one per polarization. Here the word sub array has a different meaning from the use of sub array as given in [1]. It is best to call the sub array in [1] as a logical element. |
| R4-2109872 | Ericsson, Nokia, Qualcomm | AAS base stations have evolved since the introduction of support for AAS in 3GPP specifications. Consequently, a model extension is considered to capture radiation pattern characteristics for different types of AAS base stations. The model extension adds an intermediate stage where vertical sub-arrays are modelled before the array factor applied.  The parameterized antenna model with the proposed extension together with the appropriate parameters provides a method for flexible modelling of different base stations including sub-array solutions.  At the end of this contribution a draft LS to ITU-R WP 5D and ECC PT1 is prepared to give additional information on antenna parameters for the frequency range 1710 to 4990 MHz and frequencies around 6 GHz. |
| R4-2110648 | Huawei, HiSilicon | Observation 1: For the sub-array with fixed tilt implementation, the model extension proposed in [2] can represent the antenna characteristics better.  Observation 2: For the sub-array with phase controller implementation, the existing single element model can be reused with some clarification since it can represent the antenna characteristics well. |

## Open issues summary

The current antenna model defined in TR 37.840 models only array 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 to support sub-array geometries.

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

* Proposals
  + Clarify unclear definitions in antenna model extension
  + Agree on antenna model extension to support sub-array geometries
* Recommended WF
  + Capture antenna model extension in LS to ITU-R WP 5D

### 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 sets**

* Proposals
  + Agree on antenna parameters for Macro Rural, Macro Suburban and Macro Urban
* Recommended WF
  + Capture antenna parameter sets in LS to ITU-R WP 5D

## Companies views’ collection for 1st round

### Open issues

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

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| 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 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 |  |
| R4-2109392  R4-2111019 | Draft reply LS to TSG RAN on unwanted emission field testing | Nokia, Nokia Shanghai Bell |  |  |
| R4-2109873 | Draft LS on feedback on LS from ITU-R WP 1C related to in-field unwanted emission testing | Ericsson |  |  |
| R4-2110613 | Discussion on in-field OTA testing | ZTE Corporation |  |  |
| R4-2110637 | AAS TRP in-field test | Huawei, HiSilicon |  |  |
| R4-2107607 | On the impact of sub-array antenna modelling in coexistence studies | Qualcomm CDMA Technologies |  |  |
| R4-2108900 | Comments on Antenna Model | Spark NZ Ltd |  |  |
| R4-2109872 | Draft LS to ITU-R and CEPT on extension of IMT array antenna model to support sub-array structures | Ericsson, Nokia, Qualcomm |  |  |
| R4-2110648 | AAS model extension | Huawei, HiSilicon |  |  |

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