**3GPP TSG-RAN WG4 Meeting # 100-e R4-210XXXX**

**Electronic Meeting, 16 - 27 August, 2021**

**Agenda item:** 9.1

**Source:** Moderator (Samsung)

**Title:** Email discussion summary for [100-e][331] NR\_MIMO\_OTA

**Document for:** Information

# Introduction

*Contributions submitted to AI 9.1 NR MIMO OTA WI and AI 6.1.9.5 MIMO OTA SI maintenance are captured in this email discussion.*

*In the RAN4#99-e meeting, next steps of NR MIMO OTA WI were captured in the WF.*

*Next steps:*

* + *Further Discuss the pass/fail limit and reference figure of channel model validation*
  + *Further discuss the Maximum downlink RS-EPRE for FR2*
  + *Further discuss FR2 blocking issue*
  + *Further discuss FR2 simulation activity*
  + *Further discuss whether RAN4 should consider the case that more than 18 points can not reach 70%TP for FR2 MIMO OTA*

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

* 1st round: agree draft CRs in AI 6.1.9.5, finalize the time plan of FR1 lab alignment, and discuss open issues of NR MIMO OTA WI.
* 2nd round: agree TPs, make decisions on the open issues.

# Topic #1: General and Testing methodologies

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2112977**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112977.zip) | vivo | Rapporteur input to TS38.151  This paper provides the rapporteur input to TS38.151 for essential corrections and editorial issue. |
| [**R4-2114381**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114381.zip) | Keysight Technologies UK Ltd | TP on Channel Model and DUT Positioning Clarifications |
| [**R4-2112978**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112978.zip) | vivo,CAICT | TP to TS38.151 on BS beam configuration |
| [**R4-2114528**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114528.zip) | Huawei, HiSilicon | TP to TS 38.151 on FR1 2x2 BS beam selection |
| [**R4-2114529**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114529.zip) | Huawei, HiSilicon | update simulation results on FR1 2x2 channel models |
| [**R4-2114534**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114534.zip) | Huawei, HiSilicon | Discussion on probe weight  **Proposal 1:** An initial reference set of probe weight is published to performance requirements for FR2 and aligning simulation, and feedback from TE/CE vendors is encouraged to reach a consensus on a set of weights. |
| [**R4-2114535**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114535.zip) | Huawei, HiSilicon | TP to TS38.151 v0.4.0 on FR2 Base Station beam configuration |
| [**R4-2112862**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112862.zip) | CMCC | Consideration on Probe#3 of FR2 MIMO OTA  **Proposal.** The blocking issue of probe#3 should be closed due to the fact that the optimized weight of Probe#3 is almost zero. |
| [**R4-2112979**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112979.zip) | vivo | TP to TS38.151 on Minimum Number of Slots and Power Control |
| [**R4-2113915**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113915.zip) | OPPO | The FR2 blocking issue  **Proposal:**  **Probe 3’s blocking issue can be ignored when the following situation is satisfied.**  **The improved three-step approach gives the results that Probe 3 experiences blocking small enough.**  **Or**  **A declaration of the weight of Probe 3 is small enough in the implementation of the selected FR2 MIMO OTA channel model.** |
| [**R4-2114380**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114380.zip) | Keysight Technologies UK Ltd | On Blocking Issue for FR2 MIMO OTA  **Observation 1: From a visual perspective, blocking from Probe #1 is worse than from Probe #3.**  **Observation 2: The CST asymptotic solver accurately predicts the theoretical S21 between mm-wave horn antennas.**  **Observation 3: Issues with CST’s asymptotic solver currently prevent the evaluation of Step 2 and 3 simulations regardless of reference antenna position.**  **Observation 4: The probe weights of Probe #1 are significantly higher than those of Probe #3.**  **Proposal 1: If the blocking effects still need to be quantified to resolve this blocking issue, keep this discussion open and interested parties are encouraged to provide simulation results.** |
| [**R4-2113854**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113854.zip) | Spirent Communications | Channel Model Targets  Proposal 1. Use the targets presented in this contribution for the different spatial channel model parameters validation. |
| [**R4-2113858**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113858.zip) | CAICT, CMCC | Reference Channel Emulation Curves for FR1  In this contribution spatial channel model validation targets for FR1 are proposed. |
| [**R4-2114382**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114382.zip) | Keysight Technologies UK Ltd | Reference Channel Emulation Curves  **Proposal 1: take the presented FR1 reference curves into account to determine the validation reference curves and pass/fail limits.** |
| R4-2114025  (reserved) | CAICT, Keysight Technologies UK Ltd, Spirent Communications, CMCC | Reference curves for FR1 CDL-C Uma |
| [**R4-2114383**](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_100-e/Docs/R4-2114383.zip) | Keysight Technologies UK Ltd, Spirent Communications, CMCC, CAICT | Reference Channel Emulation Curves for Validation Purposes |
| R4-2112976  (reserved) | vivo | 3GPP TS 38.151 v0.5.0 |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1 Base Station beam configuration

*FR1 and FR2 Base Station beam configuration was clarified and agreed in last meeting. Accordingly TPs to capture these agreements have been submitted to this meeting. Since multiple TPs are contributing to the same clause, it is suggested to discuss here as open issue before agreeing final TP.*

**Issue 1-1: Base Station beam configuration**

* Proposals
  + TP in R4-2112978 on FR1 and FR2 (vivo, CAICT)
  + TP in R4-2114381 on FR1 and FR2 (Keysight)
  + TP in R4-2114528 on FR1 (Huawei, HiSilicon)
  + TP in R4-2114535 on FR2 (Huawei, HiSilicon)
* Recommended WF
  + Single merged TP (Revision of R4-2114381) is recommended

### Sub-topic 1-2 Channel model validation for FR1

*Companies shared the reference targets of FR1 channel models validation in R4-2113854, R4-2113858 and R4-2114382, including target values and reference curves for PDP, Temporal and Spatial correlation, V/H Ratio for CDL-C UMa and CDL-C UMi respectively. Alignment among companies is needed so that we can approve a set of reference values for channel model validation.*

**Issue 1-2: Reference validation targets for FR1**

* Proposals
  + Option 1: R4-2113854 (Spirent)
  + Option 2: R4-2113858 (CAICT, CMCC)
  + Option 3: R4-2114382 (Keysight)
  + Joint TDoc R4-2114383 for CDL-C UMa
* Recommended WF
  + for CDL-C Uma, it is recommended to agree R4-2114383;
  + for CDL-C UMi, it is encouraged to align the reference curve in this meeting.

### Sub-topic 1-3 FR2 probe blocking issue

**Issue 1-3: FR2 probe blocking issue**

* Proposals
  + Option 1: The blocking issue of probe#3 should be closed due to the fact that the optimized weight of Probe#3 is almost zero.(CMCC)
  + Option 2: Probe 3’s blocking issue can be ignored when the following situation is satisfied: Either “The improved three-step approach gives the results that Probe 3 experiences blocking small enough” or “A declaration of the weight of Probe 3 is small enough in the implementation of the selected FR2 MIMO OTA channel model.” (OPPO)
  + Option 3: If the blocking effects still need to be quantified to resolve this blocking issue, keep this discussion open and interested parties are encouraged to provide simulation results. (Keysight)
* Recommended WF
  + it is highly encouraged to conclude this issue in this meeting

### Sub-topic 1-4 FR2 probe weights

**Issue 1-4: FR2 probe weights**

* Proposals
  + Proposal 1: An initial reference set of probe weight is published to performance requirements for FR2 and aligning simulation, and feedback from TE/CE vendors is encouraged to reach a consensus on a set of weights. (R4-2114534)
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1 Base Station beam configuration

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | For FR1 BS beam configuration, the wording in R4-2112978 (vivo, CAICT) is preferred. |
| Keysight | Draft revision of R4-2114381 was harmonized between Keysight, vivo, CAICT, Huawei |
| CAICT | Draft revision of R4-2114381 was harmonized between Keysight, vivo, CAICT, Huawei. The wordings in both R4-2112978 and Revision of R4-2114381 are acceptable. |

Sub topic 1-2 Channel model validation for FR1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | The averaged CDL-C UMa curves in R4-2114383 can be agreed.  PDP and temporal correlation curves from three contributors have perfectly coincided. For spatial correlation, there are some deviations when fc > 1GHz. Fortunately, most of deviations happen on points with spatial correlation < 0.3, and experiences tell us that throughput performance has minor impact on those kind of points. |
| Keysight | Agree to R4-2114383 |
| CMCC | Agree to R4-2114383 |
| CAICT | For CDL-C UMa, support the proposed reference channel emulation curves in R4-2114383.  For CDL-C UMi, offline alignment between CAICT/CMCC, Keysight, and Spirent is in progress. |
| Spirent | Agree to R4-2114383. For CDL-C UMi spatial correlation is the only parameter that is not completely aligned. A revision of R4-2114383 can capture PDP, Autocorrelation, V/H agreements for CDL-C UMi. We propose to have another round of harmonization to minimize the differences in spatial correlation. |

Sub topic 1-3 FR2 probe blocking issue

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | Considering the inputs from R4-2112862(CMCC) and R4-2114534(Huawei, HiSilicon), we agree to close the blocking issue based on that the weight of Probe 3 is small enough to be ignored. |
| Keysight | Supporting closing this issue (Option 1) |
| CMCC | Support Option1 due to that the optimized weight of Probe#3 is almost zero from CMCC side. More CE vendors are encouraged to clarify whether weight of Probe#3 is small enough to ignore blocking issue. |
| Qualcomm | Support option 1. |
| CAICT | If it is the consensus of CE vendors that the weight of Probe#3 is small enough, we can support closing the blocking issue (Option 1). |
| Spirent | Support closing this issue |
| Samsungng | Support closing this issue (Option 1) |

Sub topic 1-4 FR2 probe weights

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Keysight | The best way to evaluate the applicability of the given probe weights, would be to check that the simulated PSP with the proposed weights is matching with the earlier PSP simulation alignment results from TE/CE vendors. |
| Huawei, HiSilicon | With only 2 decimal place, the PSP is almost 90%, but it obviously not accurate enough for real chamber. We have concern that chamber with even the similar PSP but different probe weight, UE could behave different performance level. Considering UE verification currently is processed by authorized agency. If the weight cannot be unified within 3GPP, the conformance among different OTA chambers may be not consistent.  Thus, we proposed to go with the probe weight in R4-2114534 as RAN4 assumption. Or we are open to accept more input and analysis. |

### 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** |
| [**R4-2112977**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112977.zip) | vivo: as suggested by Moderator, single merged big TP for channel model related topic is better. So this TP can be marked as “merged”. |
| Company B |
|  |
| [**R4-2112978**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112978.zip) | Company A |
| Company B |
|  |
| [**R4-2112979**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112979.zip) | Company A |
| Company B |
|  |
| [**R4-2114381**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114381.zip) | Company A |
| Company B |
|  |
| [**R4-2114528**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114528.zip) | Company A |
| Company B |
|  |
| [**R4-2114535**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114535.zip) | Company A |
| Company B |
|  |
| R4-2112976  (3GPP TS 38.151 v0.5.0) | 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: Performance requirement

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2112573**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112573.zip) | Samsung | Discussion on FR1 performance requirements  **Proposal 1: for TRMS derivation based on CDF approach per-band, a higher percentile value than 85%-tile is expected and 95%-tile is a candidate.**  **Observation 1: Uncertainty of CDF data processing can be reduced by increasing the minimum device number, or applying high order interpolation in data processing.**  **Proposal 2: further discuss the interpolation method in CDF data processing, and one candidate is linear interpolation.** |
| [**R4-2112980**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112980.zip) | vivo,CAICT | Proposal on preliminary FR1 MIMO OTA MU value assessment  **Observation 1:** For LTE SISO OTA and LTE MIMO OTA test, the example/estimation of measurement uncertainty is done in RAN4 before defining the TRP/TRS and TRMS requirements.  **Observation 2:** The definition of LTE TRP/TRS and LTE MIMO OTA performance requirements, preliminary measurement uncertainty assessment and test tolerances is a package which is developed in RAN4, since each component directly impacts the UE RF core requirements. The final values are recommended to RAN5 via LS for OTA test requirements in [7][8].  **Observation 3:** Due to the workload and time sensitive issue, the FR2 OTA MU and TT are defined in RAN5 based on the agreed work split between RAN4 and RAN5. However, the example MU assessment for RF requirements MOP and REFSENS have still be defined in RAN4.  **Observation 4:** NR MIMO OTA MU value assessment and potential TT has not been discussed in RAN4.  **Proposal: RAN4 should discuss the MU assessment for FR1 MIMO OTA, example expanded uncertainty should be analysed.** |
| [**R4-2113312**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113312.zip) | CAICT, OPPO | Time plan for FR1 lab alignment and requirement development  **Proposal: Adopt the above time plan and corresponding actions for FR1 MIMO OTA lab alignment and performance requirement development, and update the progress in the following RAN4 meetings.** |
| [**R4-2113914**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113914.zip) | OPPO | Refinement on lab alignment activity  **Proposal: Adopt the above PADs roaming scheme to guarantee the lab alignment activity performed effectively and on-time.** |
| [**R4-2112245**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112245.zip) | Qualcomm Incorporated | Discussion on FR2 MIMO OTA performance requirements  **Proposal 1: Specify maximum downlink power at the center of QZ rather than RS-EPRE for FR2 MIMO OTA testing.**  **Proposal 2: RAN4 to agree -66dBm/120kHz as FR2 maximum downlink power for the frequency up to 43.5GHz.**  **Proposal 3: RAN4 to agree the pass criterion for PC3 UE to be 18 or more test points meeting or greater than 70% maximum throughput. The additional criterion, e.g., 90% TP outage level is FFS.**  **Proposal 4: If the UE could not meet the criterion in proposal 3 due to the limitation on the parameter of maximum downlink power, the measurement channel bandwidth can be revisited, e.g., from 100MHz to 50MHz, to achieve higher downlink Pmax power. The additional criterion, e.g., 90% TP outage level is FFS.**  **Proposal 5: TE/CE vendors to share the variation range for AoA/ZoA, PAS, power, delay, etc., those impacting by 6 probes which is also necessary for FR2 channel validation.** |
| [**R4-2113033**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2113033.zip) | MediaTek Beijing Inc. | Proposal on FR2 MIMO simulator alignment  ***Proposal:*** *Do a fundamental scenario simulation as Fig 1 firstly, for FR2 MIMO OTA simulator alignment.* |
| [**R4-2114504**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2114504.zip) | Huawei, HiSilicon | Discussion on FR2 MIMO OTA simulation  **Proposal 1:** If the time window severely affects the UE throughput, it is helpful for the channel simulator vendors to provide some useful information about the length of the time window.  **Proposal 2:** CE/TE vendors are encouraged to provide helpful information for FR2 MIMO OTA simulation. |

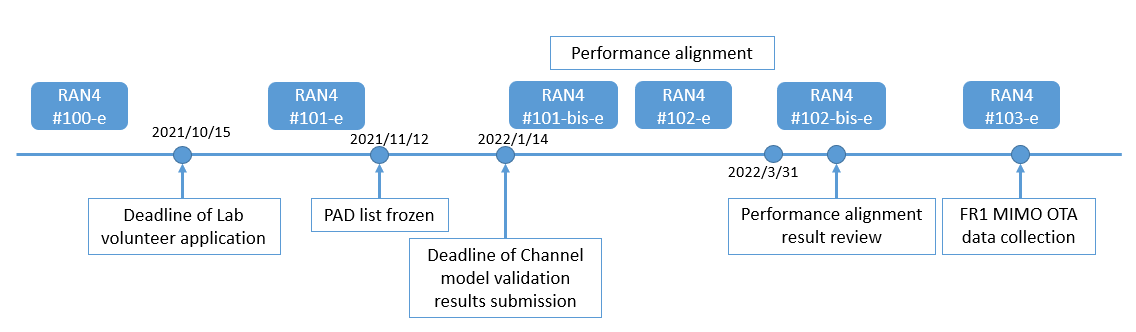
## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1 Time plan for FR1 lab alignment and requirement development

*In contribution R4-2113312, a time plan for FR1 lab alignment and requirement development is provided:*

|  |  |  |
| --- | --- | --- |
| **Lab alignment & requirement development activities** | **Action required** | **Action deadline** |
| Lab volunteer application | Lab volunteer submits application to Rapporteur | 2021/10/15 |
| PAD list frozen | RAN4 decides PAD list from PAD candidates | 2021/11/12 |
| Channel model validation | Lab volunteer submits channel model validation results to RAN4 for review | 2022/1/14 |
| Performance alignment start | PADs arrive at lab volunteers | 2022/1/14  Note: Performance alignment can start before the date once the lab volunteer is approved |
| Performance alignment finish | Lab volunteers should finish the PADs measurement in 7 days and send the measurement results to Rapporteur | 2022/3/31 |
| Performance alignment result review | RAN4 review the performance alignment results | RAN4 #102-bis-e |
| FR1 MIMO OTA measurement data collection | Aligned labs share results into data pool | RAN4 #103-e |



*Lab volunteers and Performance alignment device (PAD) providers should note the deadline.*

**Issue 2-1: Time plan for FR1 lab alignment and requirement development**

* Proposals
  + Adopt the above time plan and corresponding actions for FR1 MIMO OTA lab alignment and performance requirement development, and update the progress in the following RAN4 meetings.
* Recommended WF
  + TBA

### Sub-topic 2-2 measurement device handling

**Issue 2-2: measurement device handling**

* Proposals
  + Adopt the PADs roaming scheme to guarantee the lab alignment activity performed effectively and on-time. (R4-2113914)
    - Every PAD should be measured in three laboratory volunteers or more;
    - Every delivery of PADs (including customs clearance) should be not extend 14 days;
    - Every PAD should have a backup sample which will be measured in the first lab volunteer and then delivered together with the PAD during the following round robin test.
  + other
* Recommended WF
  + It is encouraged to further discuss on measurement device handling in lab alignment and test campaign.

### Sub-topic 2-3 data processing in FR1 TRMS derivation

**Issue 2-3-1: percentile value of CDF**

* Proposals
  + For TRMS derivation based on CDF approach per-band, a higher percentile value than 85%-tile is expected and 95%-tile is a candidate. (R4-2112573)
  + other
* Recommended WF
  + TBA.

**Issue 2-3-2: interpolation method in CDF data processing**

* Proposals
  + Further discuss the interpolation method in CDF data processing, and one candidate is linear interpolation. (R4-2112573)
  + other
* Recommended WF
  + TBA.

### Sub-topic 2-4 FR1 MU assessment

**Issue 2-4: FR1 MU assessment**

* Proposals
  + RAN4 should discuss the MU assessment for FR1 MIMO OTA, example expanded uncertainty should be analysed (R4-2112980)
  + other
* Recommended WF
  + TBA.

### Sub-topic 2-5 FR2 maximum downlink power and Figure of Merit

*Maximum downlink power and Figure of Merit are correlated, so it is better to be discussed under the same sub-topic.*

**Issue 2-5-1: FR2 maximum downlink power**

* Proposals
  + Proposal 1: Specify maximum downlink power at the center of QZ rather than RS-EPRE for FR2 MIMO OTA testing. (R4-2112245)
  + Proposal 2: RAN4 to agree -66dBm/120kHz as FR2 maximum downlink power for the frequency up to 43.5GHz. (R4-2112245)
  + other
* Recommended WF
  + TBA.

**Issue 2-5-2: FR2 Figure of Merit**

* Proposals
  + Proposal 3: RAN4 to agree the pass criterion for PC3 UE to be 18 or more test points meeting or greater than 70% maximum throughput. The additional criterion, e.g., 90% TP outage level is FFS. (R4-2112245)
  + Proposal 4: If the UE could not meet the criterion in proposal 3 due to the limitation on the parameter of maximum downlink power, the measurement channel bandwidth can be revisited, e.g., from 100MHz to 50MHz, to achieve higher downlink Pmax power. The additional criterion, e.g., 90% TP outage level is FFS. (R4-2112245)
  + other
* Recommended WF
  + TBA.

### Sub-topic 2-6 FR2 simulation

**Issue 2-6-1: information for FR2 simulation**

* Proposals
  + Proposal 1: If the time window severely affects the UE throughput, it is helpful for the channel simulator vendors to provide some useful information about the length of the time window. (R4-2114504)
  + Proposal 2: CE/TE vendors are encouraged to provide helpful information for FR2 MIMO OTA simulation. (R4-2114504)
  + Proposal 3: TE/CE vendors to share the variation range for AoA/ZoA, PAS, power, delay, etc., those impacting by 6 probes which is also necessary for FR2 channel validation. (R4-2112245)
  + other
* Recommended WF
  + TBA.

**Issue 2-6-2: FR2 simulator alignment**

* Proposals
  + Proposal: Do a fundamental scenario simulation as Fig 1 firstly, for FR2 MIMO OTA simulator alignment. (R4-2113033)
  + other
* Recommended WF
  + TBA.

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1 Time plan for FR1 lab alignment and requirement development

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | Support the proposal. |
| CMCC | Support the proposal. |
| CAICT | Support the proposal.  Another issue is when collecting the measurement data, how to avoid the same UE model being measured in several test labs. It will affect defining requirements. A possible solution is to share the device list. Further discussion is suggested. |
| Samsung | Support the proposal.  Agree with CAICT on the consideration of device. In requirement stage, device allocation among labs should be considered. Time plan information for device related is also encouraged. |
| vivo | It is a good idea to define a clear time plan for lab alignment and measurement results collection activity. Some detailed aspects should be considered to make the whole progress transparent and controllable.   1. Rapporteur initiate the lab alignment activity in the NR MIMO OTA reflector to call for volunteers for lab alignment, interested companies provide feedback in the reflector. 2. Interested companies share volunteered device for alignment activity in the NR MIMO OTA reflector, frozen the PAD list. 3. The channel model validation limits should be defined first, if the channel model validation results can not meet the criteria, the test lab can not join the lab alignment activity. 4. Delivery the PAD to each permitted test lab, the progress in each lab should be shared in the NR MIM OTA reflector for easy tracing, when PAD comes in and testing is finalized. 5. Based on previous experience, the PAD measurement results should NOT be shared to anyone, before submitting to the following RAN4 meeting. Comparison and alignment analyses should only be done in RAN4 meeting. 6. In case, labs fail to reach alignment for specific test case or test band, there should be one chance for the lab to optimize/check the test system for re-alignment. So one more meeting cycle for failed lab is allowed.   Further discuss how to select the device for final measurement results collection, avoid that the same UE model is measured in several test labs and the performance plays dominate role in the CDF cure which is analyzed just from limited number (i.e. 15) of devices. |
| Xiaomi | Support the proposal. |

Sub topic 2-2 measurement device handling

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | Support the proposal. The delivery of PADs will be a big challenge for the round robin test under current situation. It should be carefully and seriously considered. |
| CMCC | Support this proposal, considering the efficiency. |
| CAICT | We support to adopt a PAD roaming scheme, but more details should be taken into account.  E.g., It is difficult to determine how many lab volunteers can be permitted before the “Lab volunteer application” and “Channel model validation” stages. So it may not be guaranteed that each PAD can be measured in at least 3 lab volunteers.  Thus, we suggest to further discuss the PAD roaming scheme and freeze it in the next RAN4 #101-e meeting. |
| Samsung | It is good to adopt a PAD roaming scheme. Ideally, the same PAD is better to be measured in all labs, but some trade-off may be also acceptable considering limited time. For the 14days delivery time, not sure if it is a controllable item. Agree to also prepare back up PAD but it should be carefully distinguished between reference UE and backup UE. |
| vivo | The intension is good and helpful. Several aspects need to consider:   1. How many labs can join the lab alignment activity depends on the channel model validation results. Prefer not limit the number of labs at this stage, further discuss the minimum number of labs for alignment activity, when the channel model validation results are submitted and checked. 2. For each PAD, there should NO backup sample selected, to ensure the same UE is measured in each lab. If something happens for a device in any of the test labs, e.g. can not connect or test, then that device is removed out of the PAD list finally. |

Sub topic 2-3 Sub-topic 2-3 data processing in FR1 TRMS derivation

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | **Issue 2-3-1: percentile value of CDF**  The analysis in R4-2112573 is reasonable. Therefore, higher percentile value is expected. The proper XX%-tile can be further discussed.  **Issue 2-3-2: interpolation method in CDF data processing**  Linear interpolation is acceptable for CDF data processing. |
| MediaTek | **Issue 2-3-1: percentile value of CDF**  The proposal concept is made sense.  **Issue 2-3-2: interpolation method in CDF data processing**  The proposal concept is made sense. |
| Huawei, Hisilicon | **Issue 2-3-1: percentile value of CDF**  Support the proposal to have higher percentile value than 85%-tile, 95%-tile is a good candidate |
| CAICT | **Issue 2-3-1: percentile value of CDF**  Considering the lack of enough measurement results at present, we suggest to further discuss the percentile value of CDF.  **Issue 2-3-2: interpolation method in CDF data processing**  Support the proposal. |
| Samsung | **Issue 2-3-1: percentile value of CDF**  Support the proposal to have higher percentile value than 85%-tile, 95%-tile is a good candidate.  **Issue 2-3-2: interpolation method in CDF data processing**  Support the proposal and linear interpolation is acceptable |
| vivo | **Issue 2-3-1: percentile value of CDF**  It is good to consider the potential percentile of the CDF, however it is so early to make decision before reviewing the measurement results.  **Issue 2-3-2: interpolation method in CDF data processing**  Linear interpolation is a good starting point. |

Sub topic 2-4 FR1 MU assessment

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | Support the proposal. The MU assessment should be discussed in RAN4. |
| Keysight | The WID states: “The Measurement Uncertainty (MU) aspects, including potentially test tolerances, and test procedures will be handled in RAN WG5.” and it should therefore be understood that the previous approach, i.e., determine MU and TT in RAN4 and suggest RAN5 to implement those, is no longer applicable. However, a very preliminary MU assessment could be considered in RAN4 with the understanding that RAN5 is responsible to work on and finalize the MU/TT. |
| Huawei, Hisilicon | Support the proposal. The common understanding of MU/TT is important for requirement discussion.  We had proposed the same at the beginning of WI, still support. |
| CAICT | Support the proposal to discuss the MU assessment in RAN4. |
| Samsung | We also support the proposal given MU is correlated with requirement. |
| vivo | Given RAN5 is responsible for the Conformance testing spec, indeed, the final MU value and TT is decided by RAN5. However, as discussed in the paper R4-2112980, the example MU assessment and potential assumed TT should be discussed in RAN4 before companies decide the final TRMS requirements. The WID would need to be updated to reflect this aspect. |

Sub topic 2-5 FR2 maximum downlink power and Figure of Merit

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Keysight | Issue 2-5-1: At this point, we cannot agree to the proposed max DL power in proposal 2 based on offline discussions with QC on the missing cable losses and an adjusted backoff with fading. |
| Qualcomm | **Issue 2-5-1: FR2 maximum downlink power**  We are OK to consider the additional cable losses of -8dB. For the backoff, now we are referring to the value in specified TR38810. The input from companies on the backoff are welcome**.**  **Issue 2-5-2: FR2 Figure of Merit**  The FR2 MIMO OTA requirements were agreed to calculate with 18 test points for PC3 so we support proposal 1 and proposal 2. We have already discussed FR2 FoM for many meetings. It is encouraged to have the agreement for FR2 FoM. |
| MediaTek | **Issue 2-5-2: FR2 Figure of Merit**  **To Qualcomm:**  Could you clarify proposal4 meaning? Does it mean that we may define “channel bandwidth is 50MHz directly”, while we observe feasible maximum downlink power is too low, during test method/requirement discussion stage? |
| Samsung | **Issue 2-5-1: FR2 maximum downlink power**  Agree with Qualcomm that maximum downlink power is specified at centre of QZ, it seems the same as FR1. Further discussion is needed whether to change the EPRE term.  **Issue 2-5-2: FR2 Figure of Merit**  Our understanding is that FoM depends on the finalization of FR2 maximum downlink power. |
| Huawei, HiSilicon | **Issue 2-5-1: FR2 maximum downlink power**  We are fine to further discuss max DL power based on -66dBm/120kHz at center of QZ. For the cable loss, more input and analysis from TE vendor is encouraged .  **Issue 2-5-2: FR2 Figure of Merit**  Agree with Samsung. |
| Xiaomi | **Issue 2-5-1: FR2 maximum downlink power**  Agree to specify the max downlink power at centre of QZ. How to translate this with EPRE term needs further study.  **Issue 2-5-2: FR2 Figure of Merit**  Agree that to finalize the max downlink power first and then further discuss the FoM. |

Sub topic 2-6 FR2 simulation

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | Specifying scenario simulation is helpful to alignment. Detail discussion is needed. |
| Qualcomm | **Issue 2-6-1: information for FR2 simulation**  We support proposal 2 and 3. It would be helpful to move forward if we can get the confirmation from TE/CE vendors in this meeting.  **Issue 2-6-2: FR2 simulator alignment**  Agree with the proposal. The simulation results in our paper of R4-2112245 is in line with the proposed scenario. |
| MediaTek | **Issue 2-6-1: information for FR2 simulation**  In principle, we prefer to have more complete condition definition for simulation alignment purpose. Hence, we think all proposal 1 & 2 & 3 are fine in simulator alignment stage.  **Issue 2-6-2: FR2 simulator alignment**  As proponent, we support the proposal. If interested companies can do this fundamental scenario simulation, it would be easier to clarify & mitigate potential difference. The whole simulator is really a large system with many parameters and assumptions. And we are glad to know R4-2112245 is already in line with the proposed scenario. |
| Huawei, HiSilicon | **Issue 2-6-1: information for FR2 simulation**  Both Proposal 2 and Proposal 3 illustrate the importance of TE/CE vendors inputs. We provide probe weight in test methodology section. If no information could be provided by TE vendors, we propose to use the weights in R4-2114534, and also apply test assumption with the weighs which can be added into TS 38.151. Thus, the test and simulation can be highly aligned. And we believe it can accelerate simulation work.  For Proposal 1, feedback from CE vendors about the time window is expected.  A clarifying question to QC: how long is the time window for the simulation results in R4-2114504?  **Issue 2-6-2: FR2 simulator alignment**  Agree with MediaTek. |

### 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”.*

# Topic #3: TR38.827 maintance

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2112981**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112981.zip) | vivo | Draft CR to TR38.827:correct Positioning ambiguities |
| [**R4-2112982**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112982.zip) | vivo | Draft CR to TR38.827:power validation |

## Open issues summary

*No open issues. Please comment to section 3.3.2 directly.*

## Companies views’ collection for 1st round

### Open issues

### 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** |
| [**R4-2112981**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112981.zip) | Company A |
| Company B |
|  |
| [**R4-2112982**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112982.zip) | 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 |  |
| R4-2112245 | Discussion on FR2 MIMO OTA performance requirements | Qualcomm Incorporated |  | discussion |
| R4-2112573 | Discussion on FR1 performance requirements | Samsung |  | discussion |
| R4-2112862 | Consideration on Probe#3 of FR2 MIMO OTA | CMCC |  | discussion |
| R4-2112976 | 3GPP TS 38.151 v0.5.0 | vivo |  | draft TS |
| R4-2112977 | Rapporteur input to TS38.151 | vivo |  | pCR |
| R4-2112978 | TP to TS38.151 on BS beam configuration | vivo,CAICT |  | pCR |
| R4-2112979 | TP to TS38.151 on Minimum Number of Slots and Power Control | vivo |  | pCR |
| R4-2112980 | Proposal on preliminary FR1 MIMO OTA MU value assessment | vivo,CAICT |  | discussion |
| R4-2113033 | Proposal on FR2 MIMO simulator alignment | MediaTek Beijing Inc. |  | discussion |
| R4-2113312 | Time plan for FR1 lab alignment and requirement development | CAICT, OPPO |  | discussion |
| R4-2113854 | Channel Model Targets | Spirent Communications |  | other |
| R4-2113858 | Reference Channel Emulation Curves for FR1 | CAICT, CMCC |  | discussion |
| R4-2113914 | Refinement on lab alignment activity | OPPO |  | discussion |
| R4-2113915 | The FR2 blocking issue | OPPO |  | discussion |
| R4-2114025 | Reference curves for FR1 CDL-C Uma | CAICT, Keysight Technologies UK Ltd, Spirent Communications, CMCC |  | discussion |
| R4-2114380 | On Blocking Issue for FR2 MIMO OTA | Keysight Technologies UK Ltd |  | other |
| R4-2114381 | TP on Channel Model and DUT Positioning Clarifications | Keysight Technologies UK Ltd |  | pCR |
| R4-2114382 | Reference Channel Emulation Curves | Keysight Technologies UK Ltd |  | other |
| R4-2114383 | Reference Channel Emulation Curves for Validation Purposes | Keysight Technologies UK Ltd, Spirent Communications, CMCC, CAICT |  | other |
| R4-2114503 | Discussion on FR2 channel model validation | Huawei, HiSilicon |  | other |
| R4-2114504 | Discussion on FR2 MIMO OTA simulation | Huawei, HiSilicon |  | other |
| R4-2114528 | TP to TS 38.151 on FR1 2x2 BS beam selection | Huawei, HiSilicon |  | pCR |
| R4-2114529 | update simulation results on FR1 2x2 channel models | Huawei, HiSilicon |  | discussion |
| R4-2114534 | Discussion on probe weight | Huawei, HiSilicon |  | other |
| R4-2114535 | TP to TS38.151 v0.4.0 on FR2 Base Station beam configuration | Huawei, HiSilicon |  | pCR |
|  |  |  |  |  |
| [R4-2112981](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112981.zip) | Draft CR to TR38.827:correct Positioning ambiguities | vivo |  | draftCR |
| [R4-2112982](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112982.zip) | Draft CR to TR38.827:power validation | vivo |  | draftCR |

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

# Annex

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
| MediaTek Inc. | Ting-Wei Kang | ting-wei.kang@mediatek.com |
| CAICT | Xuan Yi  Siting Zhu | [yixuan@caict.ac.cn](mailto:yixuan@caict.ac.cn)  [zhusiting@caict.ac.cn](mailto:zhusiting@caict.ac.cn) |
| Spirent Communications | Alfonso Rodriguez-Herrera | [Alfonso.Rodriguez@spirent.com](mailto:Alfonso.Rodriguez@spirent.com) |
| Samsung | Bozhi Li | bozhi.li@samsung.com |

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)