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

**Electronic Meeting, February 21 – March 3, 2022**

**Agenda item:** 10.2.1

**Source:** Moderator (vivo)

**Title:** Email discussion summary for [102-e][335] FR1\_TRP\_TRS\_Part1

**Document for:** Information

# Introduction

This email summary covers the discussion for General aspects, SA test methodology and configuration, EN-DC test methodology and configuration, and performance requirement related work of TRP TRS WI, i.e., AI 10.2.1, 10.2.2.1, 10.2.2.2, 10.2.3.

# Topic #1: General and Work plan

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2204952 | vivo | Reserved for 3GPP TS 38.161 v0.2.0 |
| R4-2204953 | vivo, Apple, CAICT | **Observation 1: The overall full package of Anechoic Chamber based test method for specifying TRP TRS requirement can be finalized in Feb RAN4 meeting. RAN is expected to conclude the core part of TRP TRS WI in Mar 2022 with TR 38.834 being formally released.****Observation 2: TxD test method is not applicable and has no impacts on concluding core part work of TRP TRS WI, given the core requirement of TxD is not finalized and this UE feature is not fully defined.** **Observation 3: It is agreed that “TAS ON” test method is out of working scope for specifying TRP TRS performance requirement, which has been deprioritized. Unfinished TAS ON based testability aspects, if any, do not impact completing the core part of the WI.****Observation 4: Test methods for TxD or Tx antenna switching are nice to have in RAN4, but have no impacts on RAN4 TRP TRS requirement definition work and RAN5 conformance testing work.****Observation 5: Alternative test method development does not follow the workplans in both RAN4 and RAN5, starting the new test methods aiming for performance requirement at the last meeting of core part would most likely delay the whole progress of WI.****Observation 6: RAN5 is not involved in MU assessment discussion for alternative test method aiming for conformance requirement, a full package of alternative test method can not be finalized in Feb RAN4 meeting.****Proposal 1: RAN4 conclude the basic principle of reducing TRP TRS testing time with the exception that further discussions on other TRP TRS testing time reduction methods are allowed.****Proposal 2: RAN4 can further discuss the test methods for UE supporting TxD till the end of WI, unfinished part, if any, do not impact the completion of Rel-17 TRP TRS WI.** **Proposal 3: RAN4 can further discuss “TAS ON” test method till the end of WI, unfinished part, if any, do not impact the completion of Rel-17 TRP TRS WI.** **Proposal 4: RAN4 should discuss whether alternative test method aiming for performance requirement should be considered or not in Rel-17, and whether RAN decision on this working scope should be involved due to potential impacts on WI progress.****Proposal 5: Alternative test method, if proposed in Feb RAN4 meeting, should not impact the completion of core part.** **Proposal 6: If RAN4 agree to develop alternative test method, both RAN4 and RAN5 should define a clear workplan to ensure the completion of test methods before the end of TRP TRS WI, i.e., Aug. meeting 2022, and guarantee that the smooth progress of the TRP TRS performance requirement related work is not impacted.****Proposal 7: RAN4 should select anechoic chamber based methodology as the reference for lab alignment and TRP TRS requirements. Harmonized results should be confirmed if alternative test methodologies can be developed in RAN4.** **Proposal 8: RAN4 further discuss the applicability of alternative test methodologies after the full-package of the corresponding test method is finalized and the harmonization is confirmed.**  |
| R4-2204954 | vivo | Editorial input to TR 38.834 |
| R4-2204988 | OPPO | **Proposal 1: Express EIRP in the form of EIRPθ and EIRPϕ as below.**Where EIRPθ and EIRPϕ are the actually transmitted power-levels in the corresponding polarizations.**Proposal 2: Define the expression of TRS with θ and ϕ, rather than with Ω, as below.**Where EISθ and EISϕ are the effective isotropic sensitivities (EIS) in the corresponding polarizations.**Proposal 3: Add the summation form of the definition of TRP and TRS to TR 38.834.**In these formulas, N and M are the number of sampling intervals for θ and ϕ. θn and ϕm are the measurement angles.A corresponding TP is included |
| R4-2205174 | Apple, vivo | TP on general aspects, mainly for UE mechanical modes description |
| R4-2205175 | Apple, Huawei, HiSilicon, OPPO, vivo | TP on minimum requirements description |
| R4-2205237 | SRTC, Bluetest | **Proposal 1: To add RC descriptions in TR 38.834.** |
| R4-2205491 | OPPO | Reserved for TR 38.834 v0.4.0 |
| R4-2205826 | ROHDE & SCHWARZ | Reserved for RAN5 outcome on MU assessment in Annex B (Moderator: no discussion is needed in RAN4) |

## Open issues summary

### Sub-topic 1-1 General discussion for TRP TRS WI working scope

*Moderator: core part completion deadline is March RAN#95 meeting, this is the last meeting in RAN4 for core part discussion, the following core part related work should be concluded*

**Issue 1-1-1: TRP TRS testing time reduction objective**

* Proposal
	+ Proposal: RAN4 conclude the basic principle of reducing TRP TRS testing time with the exception that further discussions on other TRP TRS testing time reduction methods are allowed.
* Recommended WF

**Issue 1-1-2: TxD test method objective**

* Proposal
	+ Proposal: RAN4 can further discuss the test methods for UE supporting TxD till the end of WI, unfinished part, if any, do not impact the completion of Rel-17 TRP TRS WI.
* Recommended WF

**Issue 1-1-3: TAS ON test method objective**

* Proposal
	+ Proposal: RAN4 can further discuss “TAS ON” test method till the end of WI, unfinished part, if any, do not impact the completion of Rel-17 TRP TRS WI.
* Recommended WF

**Issue 1-1-4: Working scope for Alternative test method**

* Proposal
	+ Proposal 1: RAN4 should discuss whether alternative test methods, e.g. RC-based test method, aiming for performance requirement should be considered or not in Rel-17, and whether RAN decision on this working scope should be involved due to potential impacts on WI progress.
	+ Proposal 2: Alternative test method, if proposed in Feb RAN4 meeting, should not impact the completion of core part.
* Recommended WF
	+ Conclude it in the 1st round

**Issue 1-1-5: Project management for Alternative test method**

* Proposal
	+ Proposal 1: If RAN4 agree to develop alternative test method, both RAN4 and RAN5 should define a clear workplan to ensure the completion of test methods before the end of TRP TRS WI, i.e., Aug. meeting 2022, and guarantee that the smooth progress of the TRP TRS performance requirement related work is not impacted.
	+ Proposal 2: Alternative test method, if proposed in Feb RAN4 meeting, should not impact the completion of core part.
* Recommended WF
	+ Conclude it in the 1st round

### Sub-topic 1-2 TRP TRS definition description

**Issue 1-2-1: TRP definition refinement**

* Proposals
	+ **Proposal 1: Express EIRP in the form of EIRPθ and EIRPϕ as below.**

 Where EIRPθ and EIRPϕ are the actually transmitted power-levels in the corresponding polarizations.

* + **Proposal 2: Add the summation form of the definition of TRP to TR 38.834.**

 In these formulas, N and M are the number of sampling intervals for θ and ϕ. θn and ϕm are the measurement angles.

* Recommended WF

**Issue 1-2-2: TRS definition refinement**

* Proposals
	+ **Proposal 1: Define the expression of TRS with θ and ϕ, rather than with Ω, as below.**

 Where EISθ and EISϕ are the effective isotropic sensitivities (EIS) in the corresponding polarizations.

* + **Proposal 2: Add the summation form of the definition of TRS to TR 38.834.**

 In these formulas, N and M are the number of sampling intervals for θ and ϕ. θn and ϕm are the measurement angles.

* Recommended WF

### Sub-topic 1-3 UE mechanical modes description

**Issue 1-3-1: UE mechanical modes description**

Moderator: Provide comments directly in the TP comments collection part, i.e., section 1.3.2.

### Sub-topic 1-4 UE minimum requirement description

**Issue 1-4-1: UE minimum requirement description**

Moderator: Provide comments directly in the TP comments collection part, i.e., section 1.3.2.

## Companies views’ collection for 1st round

### Open issues

Sub-topic 1-1 General discussion for TRP TRS WI working scope

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| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilcon | **Issue 1-1-1: TRP TRS testing time reduction objective****Issue 1-1-2: TxD test method objective** **Issue 1-1-3: TAS ON test method objective****Issue 1-1-4: Working scope for Alternative test method** If text proposal for alternative method is agreed to be included in TS 38.834, then alternative method should be part of this activity.**Issue 1-1-5: Project management for Alternative test method**If text proposal for alternative method is agreed to be included in TS 38.834, then alternative method should be part of this activity.  |
| OPPO | **Issue 1-1-1: TRP TRS testing time reduction objective**Support the proposal.**Issue 1-1-2: TxD test method objective** Support the proposal.**Issue 1-1-3: TAS ON test method objective**Support the proposal.**Issue 1-1-4: Working scope for Alternative test method** We echo with Huawei’s view. And it seems that there is no need to change the working scope of WID, because RC is already the approved test method captured in TR37.902. What we should focus on is whether the TP provides the whole package of test method and procedure for SA and EN-DC TRP & TRS measurement.**Issue 1-1-5: Project management for Alternative test method**The MU work for RC needs to be well aligned. |
| Samsung | **Issue 1-1-1: TRP TRS testing time reduction objective**Support the proposal.**Issue 1-1-2: TxD test method objective** Support the proposal.**Issue 1-1-3: TAS ON test method objective**Support the proposal.**Issue 1-1-4: Working scope for Alternative test method** About whether alternative test methods can join in performance campaign, we think it depends on if the lab with alternative methods could meet the pass/fail limit in the lab alignment. It can be further discussed if reference value for lab alignment pass fail limit is only based on AC chambers or not, if yes, harmonization is needed.**Issue 1-1-5: Project management for Alternative test method**Different test method have different advantages. Generally we are positive to alternative methods. From project management perspective, the proposals seems reasonable. |
| Qualcomm | **Issue 1-1-1: TRP TRS testing time reduction objective**OK the proposal.**Issue 1-1-2: TxD test method objective** OK the proposal. But whether there is impact the completion of Rel-17 TRP TRS WI should be decided by RAN-P?**Issue 1-1-3: TAS ON test method objective**Support the proposal. But whether there is impact the completion of Rel-17 TRP TRS WI should be decided by RAN-P?**Issue 1-1-4: Working scope for Alternative test method** We are open for the alternative methods. But it is not clear what is the criteria for the alternative methods harmonization. It should be clearly stated.**Issue 1-1-5: Project management for Alternative test method**In general, we are ok with proposals. Clarification question: is RAN5 getting involved due to the MU work for alternative test methods? Any other aspects? |
| CAICT | **Issue 1-1-1: TRP TRS testing time reduction objective**Support the proposal.**Issue 1-1-2: TxD test method objective** Support the proposal.**Issue 1-1-3: TAS ON test method objective**Support the proposal.**Issue 1-1-4: Working scope for Alternative test method** In general, we think it's OK to introduce RC-based test method as the alternative test method, it should be considered in Rel-17.**Issue 1-1-5: Project management for Alternative test method**Considering the limited Rel-17 timeline and to guarantee smooth progress of the WI, we support the two proposals. |
| CMCC | **Issue 1-1-1: TRP TRS testing time reduction objective**Support the proposal.**Issue 1-1-2: TxD test method objective** Support the proposal.**Issue 1-1-3: TAS ON test method objective**Support the proposal.**Issue 1-1-4: Working scope for Alternative test method** We support to introduce RC to Rel-17 . |
| Apple | **Issue 1-1-1: TRP TRS testing time reduction objective**We are fine with the proposal**Issue 1-1-2: TxD test method objective** We are fine with the proposal; we also suggest to consider transferring the unfinished parts, if any, of the TxD TRP method to Rel-18 continuation of TRP/TRS.**Issue 1-1-3: TAS ON test method objective**We are fine with the proposal**Issue 1-1-4: Working scope for Alternative test method**Agree with both proposals |
| Vivo | **Issue 1-1-1: TRP TRS testing time reduction objective**Support the proposal**Issue 1-1-2: TxD test method objective** Agree with Qualcomm, formal decision is RAN discussion, this is RAN4 recommendation. We also agree with Apple, and the suggested wording are good for us.**Issue 1-1-3: TAS ON test method objective**Same comment for Issue 1-1-2. We should treat TxD and TAS ON similarly, and this is RAN decision.**Issue 1-1-4: Working scope for Alternative test method**We are also supportive for RC-based test method for FR1 TRP TRS. In the WID, the TR37.902 is the LTE basis for NR discussion, and there was a workplan to organize the discussion from the starting time, but not means any part of 902 can be started any time but do not respect RAN4 agreed workplan. Second, in March RAN meeting, core part status should be reported, and RAN plenary can formally decide whether this can be completed or not. Therefore, how to manage this work after Feb RAN4 meeting is RAN decision, also including TxD, TAS-ON and testing time reduction work.If RAN4 agrees this alternative working scope, the decision and workplan should be endorsed and provided to RAN, as part of reasonable justification (including TxD and TAS-OFF work) of core part work extension. Final decision on whether these works should be finalized in Rel-17 or Rel-18, depends on RAN formal discussion, based on the overall consideration of workload, timeline, TUs, and potential impact of requirement work, but RAN4 can share recommendations to RAN.**Issue 1-1-5: Project management for Alternative test method**A workplan is needed. To Qualcomm, RAN5 is not involved in any RC-related discussion currently. |
| Xiaomi | **Issue 1-1-1: TRP TRS testing time reduction objective**Support the proposal.**Issue 1-1-2: TxD test method objective** Support the proposal.**Issue 1-1-3: TAS ON test method objective**Support the proposal. Furthermore, we would like to emphasize that no new requirement should be defined for the TAS ON which has been agreed in the WID.**Issue 1-1-4: Working scope for Alternative test method** Agree with OPPO that considering additional test method which is already in LTE SISO OTA is already included in the WID hence no WID update is needed. The best way to move forward is try to agree the TP in this meeting.**Issue 1-1-5: Project management for Alternative test method**Agree with the proposals. |

Sub-topic 1-2 TRP TRS definition description

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| **Company** | **Comments** |
| OPPO | **Issue 1-2-1: TRP definition refinement**Support the proposals.**Issue 1-2-2: TRS definition refinement** Support the proposals. |
| Samsung | **Issue 1-2-1: TRP definition refinement**Support the proposals for AC method. Just one question, if RC method is introduced, separated definition will be defined, is that correct understanding?**Issue 1-2-2: TRS definition refinement**Support the proposals for AC method. Just one question, if RC method is introduced, separated definition will be defined, is that correct understanding? |
| Qualcomm | **Issue 1-2-1: TRP definition refinement**OK with proposals (for AC)**Issue 1-2-2: TRS definition refinement**OK with proposals (for AC) |
| Apple | **Issue 1-2-1: TRP definition refinement**We are fine with both proposals; it would be vauable to capture both the integral and the sum in the TR. The approach is similar to Clause 6.1 of TR25.914.One question: the sinθ weights apply to constant step size grid definitions; how to accommodate constant density grids?**Issue 1-2-2: TRS definition refinement**Similar comments as for TRP |
| AT&T | **Issue 1-2-1: TRP definition refinement**We support the proposal but we would also like to see an additional option for TRP to be based on the Clenshaw-Curtis quadrature integral approximation as done for FR2 in TR38.810. This option would also allow for alignment with CTIA approach moving forward.**Issue 1-2-2: TRS definition refinement**Similar comments as for TRP. |
| vivo | **Issue 1-2-1: TRP definition refinement**Proposa1 is OK, proposal 2 is only for constant angular intervals, need to further check whether the n value should be started from n=1 (CTIA/CCSA); also agree with AT&T, other TRP integral approximation can also be considered.**Issue 1-2-2: TRS definition refinement**Similar comments as for TRP. |
| OPPO | **Issue 1-2-1: TRP definition refinement**Response to Apple: The cause of only introducing the definition for constant step size is that the test methodology in Clause 8&9 only specifies measurement with constant sampling step. We are open for introducing both constant step size and constant density together in relevant clauses. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| R4-2204954(editorial input to TR38.834) |  |
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| R4-2204988(refinement of TRP TRS definition) | Apple: this TP depends on the outcome of Issues 1-2-1 and 1-2-2 |
| Vivo: can be revised to accommodate discussion outcome. |
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| R4-2205174(UE mechanical modes description) |  |
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| R4-2205175(UE Minimum requirements description) | OPPO: regarding the wording of “[For UEs which do not support NR FR1 in stand-alone mode, EN-DC mode requirements apply.]”, an agreement is needed. We are positive to remove the square brackets. |
| Samsung: Our understanding is that PC2 and PC3 are still in bracket in the framework. And if we integrate different power classes into one table, it seems not easy to extend in future when more PCs are to be added. It is suggested that one table is only for one power class, and only capture already agreed power class and not necessarily the same for SA and ENDC. |
| Apple: would like to highlight the following statement in square brackets in the TP:[For UEs which do not support NR FR1 in stand-alone mode, EN-DC mode requirements apply.] EN-DC test methodology is defined in TR38.834 [1] clause 9.*<Editor's note: an agreement is needed on the applicability of EN-DC mode requirements>*Would it be possible to resolve this issue during the meeting and then to revise the TP in order to capture the outcome?To Samsung: it should be OK to separate PC requirements into separate tables, and we can work on a revision |
| Vivo: The positioning guideline will be defined in the Annex, the corresponding clause reference should be updated. Given this table is for Handheld, PC3 and PC2 are sufficient, not sure which new power class should be considered. Other devices type may need new tables. |

## 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.*

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|  | **Status summary**  |
| **Sub-topic #1-1** **General discussion for TRP TRS WI working scope** |  **Issue 1-1-1: TRP TRS testing time reduction objective** *Moderator: 8 companies share views, all companies are supportive.* *Agreements:* RAN4 conclude the basic principle of reducing TRP TRS testing time with the exception that further discussions on other TRP TRS testing time reduction methods are allowed.*Recommendations for 2nd round:** N/A

**Issue 1-1-2: TxD test method objective***Moderator: 8 companies share views, all companies are supportive. One company also suggests consider transferring the unfinished parts to Rel-18 continuation of TRP/TRS. With the understanding that final decision will be RAN discussion, the following agreements can be reached in RAN4.**Agreements:* RAN4 can further discuss the test methods for UE supporting TxD till the end of WI, unfinished part, if any, do not impact the completion of Rel-17 TRP TRS WI.*Recommendations for 2nd round:** N/A

**Issue 1-1-3: TAS ON test method objective***Moderator: 8 companies share views, all companies are supportive. With the understanding that final decision will be RAN discussion, the following agreements can be reached in RAN4.**Agreements:* RAN4 can further discuss “TAS ON” test method till the end of WI, unfinished part, if any, do not impact the completion of Rel-17 TRP TRS WI. No requirement work for TAS ON.*Recommendations for 2nd round:** N/A

**Issue 1-1-4: Working scope for Alternative test method** *Moderator: 9 companies share views, no objections for alternative test methods discussion.* *Agreements:* RAN4 agree to discuss alternative test methods, e.g. RC-based test method, in Rel-17, with the understanding that core part completion is not impacted. RAN decision is needed for guidance on working scope for alternative test methods, TxD test method, and TAS-ON test method items. *Recommendations for 2nd round:** N/A

**Issue 1-1-5: Project management for Alternative test method** *Moderator: 7 companies share views, all companies are supportive for the proposals. Companies also notice that RAN5 has not started any discussion for alternative test method.**Agreements:* If RAN4 agree to develop alternative test method, both RAN4 and RAN5 should define a clear workplan to ensure the completion of test methods before the end of TRP TRS WI, i.e., Aug. meeting 2022, and guarantee that a full package of test method should be defined and the smooth progress of the TRP TRS performance requirement related work is not impacted.*Recommendations for 2nd round:** N/A
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| **Sub-topic #1-2** **TRP TRS definition description**  | **Issue 1-2-1: TRP definition refinement***Moderator: Companies are supportive for the proposals. Companies also suggest to add constent step and Clenshaw-Curtis quadrature integral approximation for TRP.**Agreements:* * + **Proposal 1: Express EIRP in the form of EIRPθ and EIRPϕ as below.**

 Where EIRPθ and EIRPϕ are the actually transmitted power-levels in the corresponding polarizations.*Recommendations for 2nd round:** Further check whether update for Proposal 2 is needed
	+ **Proposal 2: Add the summation form of the definition of TRP to TR 38.834.**

 In these formulas, N and M are the number of sampling intervals for θ and ϕ. θn and ϕm are the measurement angles.**Issue 1-2-2: TRS definition refinement***Moderator: similar comments as TRP.**Agreements:* * + **Proposal 1: Define the expression of TRS with θ and ϕ, rather than with Ω, as below.**

 Where EISθ and EISϕ are the effective isotropic sensitivities (EIS) in the corresponding polarizations.*Recommendations for 2nd round:** Further check whether update for Proposal 2 is needed
	+ **Proposal 2: Add the summation form of the definition of TRS to TR 38.834.**

 In these formulas, N and M are the number of sampling intervals for θ and ϕ. θn and ϕm are the measurement angles. |

### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2204954(editorial input to TR38.834) | *agreeable* |
| R4-2204988(refinement of TRP TRS definition) | *To be revised* |
| R4-2205174(UE mechanical modes description) | *agreeable* |
| R4-2205175(UE Minimum requirements description) | *To be revised* |

## Discussion on 2nd round

### CRs/TPs

Moderator: for 2nd round discussion, provide comments directly for the revised TP

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| **CR/TP number** | **Comments collection** |
| Rev of R4-2204988(refinement of TRP TRS definition) |  |
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# Topic #2: TRP TRS test methodology

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2203638 | Huawei  | **Proposal 1:** use DC\_13A\_n78A and DC\_5A\_n79A for n78 and n79 measurement.**Proposal 2**: if pre-selected ENDC combinations without MSD and/or cross band isolation impact for TRP TRS tests are not available in regional versions of devices, the TRS value in another ENDC combination with MSD and/or cross band isolation should be estimated as TRS value without MSD and/or cross band isolation plus MSD and/or cross band isolation. |
| R4-2203639 | Huawei  | TP to TS 38.161 on Temperature and Voltage |
| R4-2203640 | Huawei  | TP to TS 38.161 on frequency bands |
| R4-2203694 | Apple | **Proposal 1:** **It is proposed to capture the list of example EN-DC band combination to include the combinations considered in the WF [4] and any operator-requested band combinations which match the EN-DC band combination principle.****Proposal 2:** **The EN-DC TRP/TRS test procedure shall include a procedure to allow the OEM to declare which configuration it shall use for the test (under the condition that the declared configuration matches the EN-DC band combination principle).** |
| R4-2204573 | Samsung | Proposal 1: Adopt E-UTRA band B1 as the anchor for NR band n78 and n79 in ENDC configuration. Proposal 2: For one ENDC combination, the measurement parameters for NR Low Mid High ranges correspond to E-UTRA Low Mid High ranges respectively. Based on proposal 1 and 2, the measurement parameter table for ENDC could be as following:

| EN-DCconfiguration | E-UTRA configurations | NR configurations |
| --- | --- | --- |
| DC\_3A\_n28A | Note1 | Note2 |
| DC\_2A\_n41A | Note1 | Note2 |
| DC\_1A\_n78A | Note1 | Note2 |
| DC\_1A\_n79A | Note1 | Note2 |
| Note 1: As per TR 37.902 [10], Section 6.4 (Measurement frequencies).Note 2: As per Table 4.3-1 and Table 4.3-2 in this technical report. The measurement parameters for NR Low Mid High ranges correspond to E-UTRA Low Mid High ranges respectively. |

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| R4-2204959 | vivo, CTIA Certification | TP to TR 38.834 on Phantom definition |
| R4-2204960 | vivo | TP to TR 38.834 on Environmental condition |
| R4-2204982 | OPPO | **Proposal 1: It is proposed to provide a decision procedure to ultimately determine the EN-DC combination to be tested, when the example EN-DC combination is not supported by DUT.****Proposal 2: It is proposed to select the EN-DC combination with the largest frequency interval between the NR band to be tested and the LTE band from the UE supported EN-DC combination list.****Proposal 3: The proposed decision procedure to determine the EN-DC combination to be tested is illustrated below.** |
| R4-2205645 | ETS-Lindgren, vivo, Keysight | TP to TR 38.834 on ripple test procedure |
| R4-2205731 | ROHDE & SCHWARZ, vivo | TP to TR 38.834 on TRP-TRS test procedure refinement |
| R4-2205814 | ROHDE & SCHWARZ, vivo | TP to TR 38.834 on Measurement distance |

## Open issues summary

### Sub-topic 2-1 General for SA and EN-DC testability

**Issue 2-1-1: voltage condition for TRP TRS OTA**

*Moderator: Aligned normal temperature condition is proposed in both R4-2204960 and R4-2203639, while the Voltage condition is different. Group should decide the voltage condition for TRP TRS OTA testing and minimum requirement.*

*For information: In 37.544, there is a following description*

O.2.2 Voltage

*The UE or MS shall be equipped with a real battery that is fully charged (in the beginning of the Test).*

* Proposal
	+ RAN4 decide the voltage condition for TRP TRS should be “ Normal voltage with battery” or “ full voltage range”
* Recommended WF
	+ Make decision in the 1st round, and update the TPs accordingly, if needed.

**Issue 2-1-2: operation bands in TS 38.161**

*Moderator: operation bands are listed in TP R4-2203640. Provide comments directly in the TP comments collection part, i.e., section 2.3.2.*

**Issue 2-1-3: Ripple Procedure for SA and EN-DC test system**

*Moderator: The detailed ripple test procedure is provided in R4-2205645. Please provide comment in TP comments collection part, i.e. Section 2.3.2, directly.*

**Issue 2-1-4: Phantom definition**

*Moderator: The detailed phantom definition and positioning guideline based on collaboration between 3GPP and CTIA certification is provided in R4-2204959. Please provide comment in TP comments collection part if any, i.e. Section 2.3.2, directly.*

### Sub-topic 2-2 EN-DC configuration

**Issue 2-2-1: EN-DC example band**

* Proposals
	+ Proposal 1: single example band combination approach:
		- use DC\_13A\_n78A and DC\_5A\_n79A for n78 and n79 measurement. (Huawei)
		- use DC\_1A\_n78A and DC\_1A\_n79A for n78 and n79 measurement. (Samsung)
	+ Proposal 2: multiple example band combination approach: (Apple)
		- It is proposed to capture the list of example EN-DC band combination to include the combinations considered in the WF [4] and any operator-requested band combinations which match the EN-DC band combination principle.
		- And, the EN-DC TRP/TRS test procedure shall include a procedure to allow the OEM to declare which configuration it shall use for the test (under the condition that the declared configuration matches the EN-DC band combination principle)

**Issue 2-2-2: Hot to treat EN-DC example band combination is not supported by regional UE**

* Proposals
	+ Proposal 1: if pre-selected ENDC combinations without MSD and/or cross band isolation impact for TRP TRS tests are not available in regional versions of devices, the TRS value in another ENDC combination with MSD and/or cross band isolation should be estimated as TRS value without MSD and/or cross band isolation plus MSD and/or cross band isolation (Huawei)
	+ Proposal 2: It is proposed to provide a decision procedure to ultimately determine the EN-DC combination to be tested, when the example EN-DC combination is not supported by DUT (OPPO)

**Issue 2-2-3: Decision tree for EN-DC combinations selection of a UE**

* Proposals
	+ Proposal 1: Based on UE declaration from the defined example EN-DC band combinations. (Apple)
	+ Proposal 2: It is proposed to select the EN-DC combination with the largest frequency interval between the NR band to be tested and the LTE band from the UE supported EN-DC combination list. (OPPO)
		- The proposed decision procedure based on frequency range to determine the EN-DC combination



**Issue 2-2-4: measurement frequencies mapping for EN-DC combinations**

* Proposals
	+ Proposal: For one EN-DC combination, the measurement parameters for NR Low Mid High ranges correspond to E-UTRA Low Mid High ranges respectively

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1 General for SA and EN-DC testability

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilicon | Issue 2-1-1: voltage condition for TRP TRS OTAWe are fine with both proposals.Issue 2-1-2: operation bands in TS 38.161  |
| OPPO | Issue 2-1-1: voltage condition for TRP TRS OTAFirstly, OTA measurement should be done under battery powered mode. Secondly, the voltage of battery is getting lower during the OTA measurement, so specify the beginning status of the battery voltage (i.e. fully charged) is an achievable approach.Issue 2-1-2: operation bands in TS 38.161  |
| Samsung | Issue 2-1-1: voltage condition for TRP TRS OTAAgree with OPPO that OTA test should be started with fully charged battery.  |
| Keysight | Specifying that the beginning status of the battery shall be fully charged seems impractical. Often, labs warm up the transmitters for a few minutes before testing, i.e., at the beginning of the test, the battery might not be fully charged, i.e., 100%. This specification might also imply that after each test, the device needs to be charged to 100% again which would prevent executing tests sequentially. The proposal in R4-2204960 “For FR1 TRP TRS, test cases shall be performed with the DUT operated in stand-alone battery powered mode at nominal voltage.” seems most suitable.  |
| Apple | Issue 2-1-1: voltage condition for TRP TRS OTAWe prefer to take the same approach as 37.544. |
| vivo | Issue 2-1-1: voltage condition for TRP TRS OTANormal voltage with battery |

Sub-topic 2-2 EN-DC configuration

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilicon | **Issue 2-2-1: EN-DC example band** **Issue 2-2-2: How to treat EN-DC example band combination is not supported by regional UE**As the proponent, we support the proposal. If available ENDC combinations cannot avoid MSD, then the impact of MSD on TRS should be taken into account if the TRS limit is derived from ENDC combinations without MSD impact.**Issue 2-2-3: Decision tree for EN-DC combinations selection of a UE** We support proposal 1.**Issue 2-2-4: measurement frequencies mapping for EN-DC combinations** We are fine with the proposal. |
| OPPO | **Issue 2-2-1: EN-DC example band** P1: we support to use Band 1 as the anchor band, which is more popular LTE band implemented by most UEs.P2: support the proposal.**Issue 2-2-2: Hot to treat EN-DC example band combination is not supported by regional UE**Support P1 and P2. Can we smooth the procedure like this: if the pre-selected EN-DC combinations are not available by DUT, then use the decision tree in P2 to select the EN-DC combination for test. If the finally selected EN-DC combinations can not satisfy the requirement of w/o MSD and/or cross band isolation impact, P1 shall be applied.**Issue 2-2-3: Decision tree for EN-DC combinations selection of a UE** We support the proposal as the proponent.**Issue 2-2-4: measurement frequencies mapping for EN-DC combinations** Support the proposal. |
| Samsung | **Issue 2-2-1: EN-DC example band** P1: we support to use Band 1 as the LTE anchor band for NR n78/79. Middle frequency bands (B1/2/3) are widely used and supported, it is more typical one. If LTE B1 combination with n78/79 is not supported by DUT, a decision tree could be applied so that the low frequency bands (e.g. B5/13 etc.) will apply according to proposal 2 in Issue 2-2-3.P2: we think proposal 1 and proposal 2 are contradicted with each other. Comparing the two, we think proposal 1 is better than proposal 2. In our view, example band is unique for each NR band. If multiple example bands are listed, that is similar situation as no example band. Moreover, it is not necessary to make a list copied from TS 38.101-3. It is also a burden to maintain the list in OTA spec from time to time when there is band combination updates in TS38.101-3. So we think proposal 1 is the practical way to go.**Issue 2-2-2: Hot to treat EN-DC example band combination is not supported by regional UE**The merged proposal from OPPO in above comments looks reasonable in principle. In case all the UE supported ENDC combinations all have MSD issue, we can further discuss how to treat this scenario further.**Issue 2-2-3: Decision tree for EN-DC combinations selection of a UE** This issue is related with Issue 2-2-1. We support Option 2 because the decision rule is unique and certain.**Issue 2-2-4: measurement frequencies mapping for EN-DC combinations** Support the proposal. |
| Apple | **Issue 2-2-1: EN-DC example band** As the proponent, we prefer Proposal 2 (example combinations based on operator inputs and based on UE declaration; the previously agreed principle of selecting the EN-DC band combiation shall apply).One question about the technical validity of the following band combinations which were proposed last meeting:DC\_13A\_n78A: this is not a US configuration; where in the world is this deployed?DC\_5A\_n79A: where in the world is this configuration deployed?If there is no operator interest, then we suggest to not consider these configurations as example configurations in the TRP/TRS work. **Issue 2-2-2: Hot to treat EN-DC example band combination is not supported by regional UE**How is this issue different from 2-2-1? If we agree Proposal 2 in Issue 2-2-1, then Issue 2-2-2 is no longer an issue.**Issue 2-2-3: Decision tree for EN-DC combinations selection of a UE** We prefer Proposal 1 (based on UE declaration)**Issue 2-2-4: measurement frequencies mapping for EN-DC combinations**The proposal is not clear, since NR and E-UTRA bands are not interchangeable. Low, Mid, High test points shall correspond to the lowest, middle, and highest channels in the band under test. Moreover, since the focus is on measurement of the NR channel, it may not be necessary repeat test across multiple E-UTRA (low/mid/high) channels for same E-UTRA band as it is primarily utilized as an anchor to verify NR carrier performance. Perhaps more discussion could help to understand the intention here. |
| AT&T | **Issue 2-2-2: Hot to treat EN-DC example band combination is not supported by regional UE**We agree with the merged proposal from OPPO.**Issue 2-2-3: Decision tree for EN-DC combinations selection of a UE** We support Proposal 2. However, we think that the decision tree needs to add a checkpoint for any MSD issues. We agree with the comments from Samsung that this provides a more deterministic outcome as to which EN-DC combination will be used for devices with similar EN-DC BC support. |
| vivo | **Issue 2-2-1: EN-DC example band** No strong view on which EN-DC combination in P1, but we prefer single example EN-DC combination in the table and a decision tree for other conditions, in the TR. **Issue 2-2-2: How to treat EN-DC example band combination is not supported by regional UE**Currently, the assumption for FR1 OTA test is that the combination with MSD issue should not be tested.**Issue 2-2-3: Decision tree for EN-DC combinations selection of a UE** We prefer UE declaration. We are open to further discuss P2.**Issue 2-2-4: measurement frequencies mapping for EN-DC combinations** Support the proposal. |

### CRs/TPs comments collection

*For the suggested wording of TPs, please share comments in the table below.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2203639 (environment Annex for TS38.161) | Apple: we are fine with all aspects in the TP other than voltage; we should follow the same voltage environment conditions as we already have in 37.544: "The UE or MS shall be equipped with a real battery that is fully charged (in the beginning of the Test)." |
| Vivo: suggest to update the voltage condition, alignment with TR 38.834 is good. |
|  |
| R4-2203640(frequency bands for TS38.161) | Apple:It would be cleaner to list in the TS only the bands for which the requirements are specified in a given phase of the work; in Rel-17 we have prioritized TRP/TRS requirements for bands n28, n41, n78, and n79. We also don't think the term "FR1 standalone operating bands" is consistent with the core RF specifications and recommend dropping the "standalone" term.Regarding the EN-DC band combination section, we suggest a different approach for consideration: We recommend reaching agreement on whether the following principle is acceptable: For UEs which do not support NR FR1 in stand-alone mode, EN-DC mode requirements apply as this aligns with existing EN-DC FR1 (conducted) and EN-DC FR2 principles.We also recommend to capture the above along with the already agreed EN-DC band combination principle in the TS and then reference TR38.834 for the example list. We are concerned that the TS could become unwieldy with potentially hundreds of example EN-DC band combinations being added and maintained. |
|  |
|  |
| R4-2204959 (Phantom Definition and positioning) | Apple:Analyzing the content of this contribution in comparison with CTIA recently released:CTIA 01.71, Device Setup and Positioning Guidelines, v4.0, February 2022CTIA 01.72, Near-Field Phantoms, v 4.0, February 2022It seems that the body of work produced by CTIA on these topics could be better represented in 3GPP. R4-2204959 has in some parts new text descriptions and drawings that have better versions available on CTIA test plan.Considering that there are sensitivities of the CTIA/3GPP scope of cooperation. We would like to suggest a revision of this document to better align with CTIA content. CTIA had developed Phantom technologies with a phantom manufacturing partner since inception, and have a dedicated sub-working group to maintain and improve phantom requirements.This TP can be considered as a very preliminary place holder for more detailed and aligned definitions. |
| Vivo: to apple, thanks for the information and suggestion. We fully understand the motivation to reference more content and drawings to make it better, but further update the wording, figures and new version can be achieved after additional cooperation with CTIA based on copyright agreements.Current version is the outcome of coordination between 3GPP and CTIA, we strongly suggest to endorse this version as it is, given this is the last meeting for core part. New drawings reference may need further check between CTIA and 3GPP with some offline discussions, we can do that work in future meetings.  |
|  |
| R4-2204960(environment Annex for TR38.834) | Apple: could this TP be merged with R4-2203639? We agree with different aspects in the two TPs. |
| Vivo: to Apple, these are TPs for different spec, TR38.834 and TS 38.151. Aligned content will be used, but separated TPs. |
|  |
| R4-2205645(ripple test procedure) | R&S: A list of ripple test frequencies with the corresponding band applicability is recommended in order to limit the amount of testing require to characterize the quality of the quiet zone.  |
| Apple:We agree with the text and definitions in this TP to TR, in fact it harmonizes the content with CTIA 01.73 Supporting Procedures v4.0, sections 4.6, 5 |
| vivo: many thanks to ETS-Lindgren for this TP. The frequencies for ripple test can be added based on the offline discussions. |
| R4-2205731 (TRP TRS test procedure improvement) | Apple: we are fine with these changes |
| Vivo: we are OK with the update. |
|  |
| R4-2205814 (Measurement distance) | Keysight: would it make sense to align the cutoff frequency at which Drad decreases with CTIA, i.e., 1GHz instead of 1.5GHz? |
| Vivo: thanks for the TP. we are OK to reuse 1.5Ghz, as this is used for FR1 MIMO OTA. We also think it would be better to add previous agreements to reuse the legacy system as much as possible, 1.2m is agreed as the minimum distance for FR1 TRP TRS test, in WF R4-2108620. |
|  |

## 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.*

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| --- | --- |
|  | **Status summary**  |
| **Sub-topic#2-1 General for SA and EN-DC testability**  | **Issue 2-1-1: voltage condition for TRP TRS OTA** *agreements:*For FR1 TRP TRS, test cases shall be performed with the DUT operated in stand-alone battery powered mode at nominal voltage.*Recommendations for 2nd round:** Further discuss whether “fully charged (in the beginning of the Test)” should be added or not, for FR1 OTA testing
* Further clarify nominal voltage, if needed
* Further discuss whether fully charge DUT in the beginning of the Test (not each test) can be a recommended action added in the test procedure part as a note.
 |
| **Sub-topic#2-2** **EN-DC configuration** | **Issue 2-2-1: EN-DC example band** *Moderator: 4 companies support B1 for LTE (Samsung, OPPO, Apple, vivo), one company support multi-example bands;**agreements:*Use DC\_1A\_n78A and DC\_1A\_n79A for n78 and n79 measurement

| EN-DCconfiguration | E-UTRA configurations | NR configurations |
| --- | --- | --- |
| DC\_3A\_n28A | Note1 | Note2 |
| DC\_2A\_n41A | Note1 | Note2 |
| DC\_1A\_n78A | Note1 | Note2 |
| DC\_1A\_n79A | Note1 | Note2 |
| Note 1: As per TR 37.902 [10], Section 6.4 (Measurement frequencies).Note 2: TBD |

*Recommendations for 2nd round:** Further discuss whether more example EN-DC band combination for single NR carrier is needed

**Issue 2-2-2: Hot to treat EN-DC example band combination is not supported by regional UE****Issue 2-2-3: Decision tree for EN-DC combinations selection of a UE** *Moderator: companies view for issue 2-2-2 and 2-2-3 are correlated, so suggest to treat them together. The follow proposals are two approaches to handle the condition:* *if the UE does not support the example EN-DC band combination in table* *4.3.3-3. Then* *proposal 1: The tested EN-DC band combination is from UE declaration**proposal 2: The tested EN-DC band combination is from a decision procedure performed by test lab, with the decision tree like* * *Option 2-a: select the EN-DC combination with the largest frequency interval between the NR band to be tested and the LTE band from the UE supported EN-DC combination list. If no band combination can be found without MSD, then select an EN-DC combination with MSD issue for testing to present NR carrier performance.*
* *Option 2-b: select the EN-DC combination with the largest frequency interval between the NR band to be tested and the LTE band from the UE supported EN-DC combination list. If no band combination can be found without MSD, then no testing for this NR carrier under EN-DC mode is needed.*

*Recommendations for 2nd round:** Further check the above proposals

**Issue 2-2-4: measurement frequencies mapping for EN-DC combinations** *Moderator: 4 companies support the proposal, one company comment that it may not be necessary repeat test across multiple E-UTRA (low/mid/high) channels for same E-UTRA band;**Recommendations for 2nd round:** Further discuss the following options

For one EN-DC combination, the measurement parameters for NR Low Mid High channels, the LTE frequency should be:* Option 1: correspond to E-UTRA Low Mid High channels respectively
* Option 2: single E-UTRA channel, e.g. always mid channel
 |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2203639 (environment Annex for TS38.161) | *To be revised* |
| R4-2203640(frequency bands for TS38.161) | *To be revised* |
| R4-2204959 (Phantom Definition and positioning) | *Endorsed* |
| R4-2204960(environment Annex for TR38.834) | *To be revised* |
| R4-2205645(ripple test procedure) | *To be revised* |
| R4-2205731 (TRP TRS test procedure improvement) | *Endorsed* |
| R4-2205814 (Measurement distance) | *To be revised* |

## Discussion on 2nd round

### Open issues

**Issue 2-1-1: voltage condition for TRP TRS OTA**

*agreements:*

For FR1 TRP TRS, test cases shall be performed with the DUT operated in stand-alone battery powered mode at nominal voltage.

*Recommendations for 2nd round:*

* Further discuss whether “fully charged (in the beginning of the Test)” should be added or not, for FR1 OTA testing
* Further clarify nominal voltage, if needed
* Further discuss whether fully charge DUT in the beginning of the Test (not each test) can be a recommended action added in the test procedure part as a note.

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| **Company** | **Comments** |
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**Issue 2-2-1: EN-DC example band**

*agreements:*

Use DC\_1A\_n78A and DC\_1A\_n79A for n78 and n79 measurement

| EN-DCconfiguration | E-UTRA configurations | NR configurations |
| --- | --- | --- |
| DC\_3A\_n28A | Note1 | Note2 |
| DC\_2A\_n41A | Note1 | Note2 |
| DC\_1A\_n78A | Note1 | Note2 |
| DC\_1A\_n79A | Note1 | Note2 |
| Note 1: As per TR 37.902 [10], Section 6.4 (Measurement frequencies).Note 2: TBD |

*Recommendations for 2nd round:*

* Further discuss whether more example EN-DC band combination for single NR carrier is needed

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| **Company** | **Comments** |
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**Issue 2-2-2: Hot to treat EN-DC example band combination is not supported by regional UE**

**And Issue 2-2-3: Decision tree for EN-DC combinations selection of a UE**

*Moderator: companies view for issue 2-2-2 and 2-2-3 are correlated, so suggest to treat them together. The follow proposals are two approaches to handle the condition:*

 *if the UE does not support the example EN-DC band combination in table* *4.3.3-3. Then*

*proposal 1: The tested EN-DC band combination is from UE declaration*

*proposal 2: The tested EN-DC band combination is from a decision procedure performed by test lab, with the decision tree like*

* *Option 2-a: select the EN-DC combination with the largest frequency interval between the NR band to be tested and the LTE band from the UE supported EN-DC combination list. If no band combination can be found without MSD, then select an EN-DC combination with MSD issue for testing to present NR carrier performance.*
* *Option 2-b: select the EN-DC combination with the largest frequency interval between the NR band to be tested and the LTE band from the UE supported EN-DC combination list. If no band combination can be found without MSD, then no testing for this NR carrier under EN-DC mode is needed.*

*Recommendations for 2nd round:*

* Further check the above proposals

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| **Company** | **Comments** |
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**Issue 2-2-4: measurement frequencies mapping for EN-DC combinations**

*Moderator: 4 companies support the proposal, one company comment that it may not be necessary repeat test across multiple E-UTRA (low/mid/high) channels for same E-UTRA band;*

*Recommendations for 2nd round:*

* Further discuss the following options

For one EN-DC combination, the measurement parameters for NR Low Mid High channels, the LTE frequency should be:

* Option 1: correspond to E-UTRA Low Mid High channels respectively
* Option 2: single E-UTRA channel, e.g. always mid channel

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| **Company** | **Comments** |
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### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Comments collection**  |
| Revised R4-2203639 (environment Annex for TS38.161) |  |
| Revised R4-2203640(frequency bands for TS38.161) |  |
| R4-2204960(environment Annex for TR38.834) |  |
| Revised R4-2205645(ripple test procedure) |  |
| Revised R4-2205814 (Measurement distance) |  |

# Topic #3: TRP TRS Performance requirement

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2203641 | Huawei  | **Proposal 1**: if devices with width less than 72mm are to be tested, all 11 device models need to be included in the tests.**Proposal 2**: the minimum number of devices for defining requirement for each band should be 50.**Proposal 3**: all device models either 16 (with n79) or 39 (without n79) in the markets should be included in EN-DC tests for device with width larger than 72mm.**Proposal 4**: the minimum number of devices requirement applies to both PC2 and PC3 devices.**Proposal 5**: if the number of device models for PC2 or PC3 available in the markets is fewer than 50, all the PC2 or PC3 device models should be included in the tests. |
| R4-2203693 | Apple | **Observation 1:** **The passing rate computed from the means of each UE type's TRP distribution overestimates the passing rate computed from the actual population.****Observation 2:** **By defining a manufacturing tolerance, which is used to relax the population pass/fail limit, a similar passing rate as expected from the average TRP statistics can be obtained.****Proposal 1:** **RAN4 should agree to select Option 1 from the WF in [2], with the framework to take manufacturing tolerances into account for OTA requirements defined as: 1) It is assumed that nominal UEs are used to collect radiated performance data in the performance phase of the work; 2) A candidate value X to achieve a passing rate of Y% is derived from the radiated performance data; 3) An offset Z is defined to relax X, such that the resulting OTA requirement reflects a passing rate of Y% in the full population of devices withing a certain confidence interval****Proposal 2:** **The value Z can be determined by consensus among interested companies in RAN4 during the performance phase of the work.****Proposal 3:** **Request companies submitting TRP/TRS limit proposals to also submit manufacturing tolerance per device type based on manufacturers' best knowledge. The value Z can be determined from the submitted data on manufacturing tolerances as part of the performance phase of the work.****Proposal 4:** **The performance test campaign framework compiles list of contacts for OEMs (across the [25] or [50] commercial devices collected for this phase). This is for the labs to directly obtain OEM assistance for device settings (TAS off). This shall happen at the discretion of the OEMS; which should be factored into the process.****Proposal 5:** **Include a verification procedure (detailed below) during lab alignment and performance test phase that enables the labs to baseline and verify the TAS off setting prior to testing the planned scope.****Proposal 6:** **Results shall not be shared between labs before submitting to RAN4 meetings or sharing in the RAN4 reflector. Comparison and lab alignment analysis should only be done in RAN4 meetings/discussions.****Proposal 7:** **The available LADs can be split among labs to multiplex the testing effort.** |
| R4-2204574 | Samsung | Observation 1: antenna performance among bands are not independent but the TRP TRS spec limit derivation approach is independent per-band. Observation 2: JBPR could be dropped, however, the technical know-how behind JBPR should not be dropped, i.e., the multiple band impact should be considered under the umbrella of per-band approach. Observation 3: large number of devices in test campaign could not eliminate the multiple band impact because the overall pass rate (JBPR) is always worse than per-band pass rate. Proposal 1: Multiple band impact issue (JBPR) is to be addressed in TRP TRS spec limit derivation process under the umbrella of per-band approach.Proposal 2: X dB relaxation on top of the per-band CDF derived data can be considered as final TRP TRS spec limit |
| R4-2204953 | vivo, Apple, CAICT | **Proposal 7: RAN4 should select anechoic chamber based methodology as the reference for lab alignment and TRP TRS requirements. Harmonized results should be confirmed if alternative test methodologies can be developed in RAN4.** **Proposal 8: RAN4 further discuss the applicability of alternative test methodologies after the full-package of the corresponding test method is finalized and the harmonization is confirmed.**  |
| R4-2204955 | vivo | **Proposal: Approve the updated part proposed in this contribution to refine the working procedure for TRP TRS performance requirement related work.** |
| R4-2204957 | vivo | **Proposal: Confirm the Test lab and Device information in Table 1 for FR1 TRP TRS lab alignment activity.** |
| R4-2204983 | OPPO | **Proposal 1: The UE positioning guidelines should be specified and the corresponding text proposal should be merged to TR 38.834 during RAN4 #102-e.** **Proposal 2: It is proposed that LAD handling scheme include the following recommendations.*** **Lab volunteers should finish the PADs measurement in 4 workdays, and is highly recommended to send the LAD to the next lab volunteer as soon as possible.**
* **The progress in each lab should be shared in the FR1 TRP TRS OTA reflector for easy tracing, when LAD comes in and the test is finalized.**
* **Consider transfer LADs initially among labs located in China, and then abroad.**

**Proposal 3: It is proposed that the average of the LAD measurement results submitted on or before 16th May 2022 will be treated as the reference value of the LAD based on the condition at least 3 labs’ results collected.** |
| R4-2204990 | OPPO | TP to TS 38.161 on TRP and TRS test condition |
| R4-2205037 | CAICT, SAICT | **Proposal 1: The labs inform RAN4 their locations (cities). Arrange the LAD delivery order according to the cities, e.g., transfer the LADs** **initially among labs located in City 1, then labs located in City 2, …, and finally among labs in City n. Conclude an efficient LAD delivery scheme in this meeting.** |
| R4-2205132 | Xiaomi | **Observation 1: For EN-DC PC2, both PC3 of NR and PC2 of NR requirements will be defined based on the UE PA capability.****Proposal 1: It is proposed to agree with both PC2 and PC3 with 1TX for power class as test campaign.****Proposal 2: It is suggested to apply 8 as maximum number of results that each lab can submit per each band.****Proposal 3: It is suggested to apply 50 as minimum number of devices for defining requirements.** |

## Open issues summary

### Sub-topic 3-1 Framework update for TRP TRS Performance requirement

**Issue 3-1-1: Framework for Lab Alignment Campaign**

*Moderator: the proposal combines views from contribution R4-2204955, R4-2203641, R4-2204574, R4-2204983,* *R4-2205037 and R4-2205132; changes based on proposal in R4-2204955 are highlighted.*

* Proposal

**Working procedure update for Lab Alignment Campaign**

1. Lab alignment criteria:
* The pass/fail criteria are defined as the maximum deviation between the measurement result and the reference value
* The reference value is derived based on the per-band per-PC averaging approach of lab alignment data pool from ≥ 3 labs submitted before 16th May 2022, whether apparent outliers will be considered in averaging process, or not, is FFS
* Pass/fail limit for lab alignment should be defined as [0.5\*MU~1\*MU], MU value will use RAN5 MU outcome of NR FR1 UE TRP/TRS system directly
1. Test results submitting:
	1. Using the same worksheet template to submit the measurement results (the TRP/TRS Lab Alignment Campaign Template will be shared later)
	2. The measurement results should be submitted to RAN4 by anonymous approach (the UE model should not be disclosed)
	3. Results shall not be shared between labs before submitting to RAN4 meetings or sharing in the RAN4 reflector. Comparison and lab alignment analysis should only be done in RAN4 meetings/discussions
2. Test lab procedures (need to be confirmed in this meeting):
	1. LAD delivery scheme
		* Decide LAD delivery scheme after all the test lab and LAD information being confirmed (this meeting).
		* The available LADs can be split among labs to multiplex the testing effort
	2. LAD measurement time in each test lab: finalize LAD measurement within 4 workdays, and deliver to next lab ASAP with LAD delivery In/Out information shared in reflector.
* Recommended WF
	+ Companies share views based on the above proposal, finalize the framework this meeting

**Issue 3-1-2: Framework for Performance Test Campaign**

*Moderator: the proposal combines views from contribution R4-2204955, R4-2203641, R4-2204574, R4-2204983,* *R4-2205037 and R4-2205132; changes based on proposal in R4-2204955 are highlighted.*

* Proposal

**Working procedure update for TRP TRS Performance Test Campaign**

1. Test cases for TRP TRS Performance Test Campaign:
* Test bands: focus on n41 and n78 (first stage); measurements results submission for other bands listed as 1st priority in the WID are also allowed, if companies have interests
* d. Operation mode: NR Standalone (SA) (first stage);
	+ if NSA is considered, all device models either 16 (with n79) or 39 (without n79) in the markets should be included in EN-DC tests for device with width larger than 72mm
1. Commercial Device (Smartphone) selection criteria for TRP TRS Performance Test Campaign:
* a. DUT size: Size 1(width >72mm and ≤92mm) and Size 2(width ≥56mm and ≤72mm); separate set of requirements;
	+ if devices Size 2 are to be tested, all 11 device models need to be included in the tests
* e. Power Class: Both PC2 and PC3 with 1Tx;
1. Test results submitting:
* The allowed maximum number of submitted devices from each lab is [10-15] (vivo), or [8] (xiaomi)
1. Specify TRP TRS requirements:
* Minimum number of devices for defining requirements for each band, each device size, and each power class: [25], [30] (vivo), or [50] (Huawei, xiaomi)
* The value at [80%] percentile of the CDF curve could be selected as the starting point for minimum requirement discussion;
	+ [X] dB relaxation on top of this value can be considered as final TRP TRS spec limit (Samsung)
* Recommended WF
	+ Companies share views based on the above proposal, finalize the framework this meeting

### Sub-topic 3-2 Test methodologies applicability for TRP TRS requirements

**Issue 3-2-1: Applicability of test method already defined in TR 38.834**

*Moderator: In the agreed working procedure R4-2203074, anechoic-chamber-based methodology is the single test method in TR 38.834 for TRP TRS Performance Test Campaign.*

* Proposals
	+ Proposal: RAN4 should select anechoic chamber based methodology as the reference for lab alignment and TRP TRS requirements. Harmonized results should be confirmed if alternative test methodologies can be developed in RAN4

**Issue 3-2-2: Applicability of new alternative methodologies if defined in the future**

* Proposals
	+ Proposal: RAN4 further discuss the applicability of alternative test methodologies after the full-package of the corresponding test method is finalized and the harmonization is confirmed

### Sub-topic 3-3 Test lab, LAD, and OEM contact information confirmation

**Issue 3-3-1: Test lab and LAD information confirmation**

* Proposals
	+ Proposal 1: confirm the test lab and LAD information in the table below:
* Table 1: Test lab and device information for lab alignment activity

|  |  |
| --- | --- |
| **Activities** | **Volunteers** |
| TRP TRS lab alignment Campaign | 1. CAICT, contact: Xuan Yi, yixuan@caict.ac.cn (test lab City: Beijing, China)2. Sporton, Contact: Alex Ho (Alexander@sporton.com.tw), Will Ni (WillNi@sporton-usa.com) (test lab City: Milpitas, CA)3. Huawei, contact: Hai Zhou, hai.zhou1@huawei.com, Li Jinxing, lijinxing3@huawei.com (test lab City: )4.ELEMENT Materials Technology DC LLC (Previously dba PCTEST Engineering Laboratory LLC), Contact: Nik Bankov*, (**Nik.Bankov@element.com**)* (test lab City: San Jose, CA)5. vivo, contact: Ruixin Wang, ruixin.wang@vivo.com (test lab City: )6.CMCC, contact: Yichen Zhao, zhaoyichen@cmdc.chinamobile.com (test lab City:Beijing, China )7. SRTC, Contact: Gong Jian, gongjian1@srtc.org.cn (test lab City: )8. OPPO, contact: Qifei Liu, liuqifei@oppo.com (test lab City: ) |
| Lab Alignment Device (LAD) provider | 1.vivo, contact: Ruixin Wang, ruixin.wang@vivo.comLAD information:  1~2 devices, PC2 and/or PC3 both OK; Wide size >72mm; support at least n41&n78, full band information will be shared later; TAS OFF with primary antenna locked.2.  |

It should be noted that, the location (city) of test lab should be added.

**Issue 3-3-2: Contacts list of OEMs support test lab TAS-OFF control**

* Proposals
	+ Proposal 1: The performance test campaign framework compiles list of contacts for OEMs (across the [25] or [50] commercial devices collected for this phase). This is for the labs to directly obtain OEM assistance for device settings (TAS off). This shall happen at the discretion of the OEMS; which should be factored into the process.
* Recommended WF

### Sub-topic 3-4 other aspects related to requirement definition

**Issue 3-4-1: Manufacturing tolerances**

* Proposals
	+ Proposal 1 (Moderator): As discussed in RAN4#101-bis-e GTW session, if the minimum number of each band for each power class and each Size is decided as 50, then the Manufacturing tolerances aspects should not be considered.
	+ Proposal 2: consider Manufacturing tolerances approach. (Apple)
		- RAN4 should agree to select Option 1 from the WF in [2], with the framework to take manufacturing tolerances into account for OTA requirements defined as:
			* 1) It is assumed that nominal UEs are used to collect radiated performance data in the performance phase of the work;
			* 2) A candidate value X to achieve a passing rate of Y% is derived from the radiated performance data;
			* 3) An offset Z is defined to relax X, such that the resulting OTA requirement reflects a passing rate of Y% in the full population of devices withing a certain confidence interval
		- The value Z can be determined by consensus among interested companies in RAN4 during the performance phase of the work.
		- Request companies submitting TRP/TRS limit proposals to also submit manufacturing tolerance per device type based on manufacturers' best knowledge. The value Z can be determined from the submitted data on manufacturing tolerances as part of the performance phase of the work.

**Issue 3-4-2: Multiple band impacts**

*Moderator: JBPR was not considered in the WID as an approach to derive requirements, due to the limited number of bands, from the beginning of the WI.*

* Proposals
	+ Proposal: Multiple band impact issue (JBPR) is to be addressed in TRP TRS spec limit derivation process under the umbrella of per-band approach.

**Issue 3-4-3: TAS OFF verification procedure**

* Proposals
	+ Proposal: Include a verification procedure (detailed below) during lab alignment and performance test phase that enables the labs to baseline and verify the TAS off setting prior to testing the planned scope.
		- TAS OFF verification/sanity procedure:
			* Perform OTA baseline test with display oriented at phi (azimuth) 0° 
			* Benchmark with similar OTA test with display orientated at phi (azimuth) 180° 
		- Expectation: The magnitude of the OTA teste being equal; Similar 2D and/or 3D radiation pattern is expected (with 180° rotation). This provides non-intrusive confirmation that the device indeed is tested with TAS OFF
* Recommended WF

## Companies views’ collection for 1st round

### Open issues

Sub topic 3-1 Framework update for TRP TRS Performance requirement

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei, HiSilicon | **Issue 3-1-1: Framework for Lab Alignment Campaign** **Issue 3-1-2: Framework for Performance Test Campaign** On point 5, [80%] on CDF means [20%] failure rate, which is too high and could cause market access issues. We propose to use [95%] on CDF or [5%] failure rate. |
| OPPO | **Issue 3-1-1: Framework for Lab Alignment Campaign** The framework is agreeable.**Issue 3-1-2: Framework for Performance Test Campaign** According to bullet 4, we support vivo’s proposal that the maximum number of submitted devices is 10-15. Furthermore, it should be clarified that this number is specified as the submitted data for one combination of band, DUT size, Power class and operation mode. |
| Samsung | **Issue 3-1-1: Framework for Lab Alignment Campaign** Support moderator proposed framework**Issue 3-1-2: Framework for Performance Test Campaign** About the newly added sub-bullets in 2d and 3a, we think the minimum number for NSA or for Size 2 should also satisfy the minimum number of devices for defining requirements. If the device number in performance campaign is too small, the uncertainty will be large. If the available devices are not enough in the market so far, we could just focus on the cases which have enough devices for now.About power classes in sub-bullet 3e, if both PC2 and PC3 are included, does that mean PC2 for SA and PC3 for ENDC? If it is intended to include both PC2 and PC3 for SA mode, it is needed to check the variety of SA PC3 devices. Maybe only consider PC2 for SA is better for now.About bullet 4 on max number per lab, it is related with bullet 5 on minimum total devices. If minimum number is agreed as 50, then max number per-lab should at least follow vivo proposal. About bullet 5 on minimum total device number, generally speaking we prefer larger value since we have agreed that devices should account for varieties in production year, brand, price range, and so on…About bullet 5 on the CDF percentile value, we support Huawei proposal to replace [80%] with [95%], and also add our proposed sub-bullet to account for multiple bands impact. |
| Qualcomm | **Issue 3-1-2: Framework for Performance Test Campaign** For the minimum number of devices, e.g., [25], [30] (vivo), or [50] (Huawei, xiaomi), how to decide the requirements if the sample number is less than the required min. number of devices? 50 seems a big number.For CDF percentile value, we prefer [80%] which has been used in LTE MIMO OTA and TRP/TRS requirements development in other SDOs such as CCSA. |
| CAICT | **Issue 3-1-1: Framework for Lab Alignment Campaign** Basically support the framework except minor comments on sub-bullet 11b. As calculated in our contribution R4-2205037, the average period of the LAD testing and delivering in each lab is about 9 days. So we think more time can be allowed for each lab to test the LADs and suggest to “finalize LAD measurement within 6 workdays”. A clarification question: Will two LADs be tested? |
| R&S | **Issue 3-1-1: Framework for Lab Alignment Campaign** It would be recommended to request, or at least encourage, the participating labs to share the resulting combined MU based on their own systems. |
| Huawei | **Issue 3-1-2: Framework for Performance Test Campaign** **Feedback on questions from Qualcomm on minimum number of devices:****Case 1: currently there are only about 11 models with width less than 72mm. In this case, all 11 models should be included. Implying that 11 models are sufficient because all device types in the market are included.****Case 2: if for practical reasons, the number of devices this test activity could obtain is well below 30. Then we need to look into possible inclusion of manufacturing tolerance to account for the wide performance variations for devices available in the markets.** |
| Element | **Issue 3-1-1: Framework For Lab Alignment Campaign**We have concerns regarding 4 workdays to complete all testing. While the scope can be completed during this time, Lab availability may be an issue. Previously with CTIA interlab testing, we have allotted 1 week for testing and 1 week for shipping on a smaller test scope. Given a need to generate a granular timeline, we suggest one week/5 workdays to complete testing and ship by the end of the 7th workday. Assuming 2 days of shipping, and an inability to receive or begin testing on a non-workday, the proposed timeframe would allow testing to complete in just under 13 weeks. |
| Apple | Issue 3-1-1: Regarding 7, it is unlikely that RAN5 will complete final MU assessment in time for use in the lab alignment campaign. RAN4 might have to discuss an estimated MU value to factor into lab alignment Pass/Fail requirements.Issue 3-1-2 :Regarding 2d, The scope of current phase is also determined as focused on SA so this additional statement on NSA is not required as it may cause ambiguity.Regarding 4, [15] devices per lab to ensure sufficient devices across aligned labs into overall device poolRegarding 5, the %-tile of CDF curve reference can be left as [TBD] for framework purposes as additional analysis and discussion is needed to establish the same. |
| Telecom Italia | Issue 3-1-2:Regarding 2d, we support Apple proposal to remove the statement on NSA since for the first stage the operation mode has been agreed to be SA.Regarding 3a, we do not have a strong position about Size 2 devices, but we tend to agree with Samsung that we should focus on the cases for which there is a consistent number of devices in the market.Regarding 5, we support Huawei and Xiaomi proposal to have 50 as the minimum number of devices for defining requirements for each band (considering around 400 device models supporting n41 and n78 on the market). We are ok to consider 80% percentile as the starting point for minimum requirement discussion. We do not agree in having additional X dB relaxation due to multi-band support. |
| SoftBank | **Issue 3-1-2: Framework for Performance Test Campaign** We support [80%] as a starting point. It does not look so good esp., from outside that values are different among similar projects. And as pointed out by Qualcomm, the alignment with existing regulations would be important if someone expects reference (at least) from some regulatory requirements in the long run. |
| Xiaomi | **Issue 3-1-1: Framework for Lab Alignment Campaign** Support moderator proposed framework**Issue 3-1-2: Framework for Performance Test Campaign** For the power class issue, if only band n41 and band n78 are considered, we are OK to only have PC2 for this test campaign.For the max number of data that each lab can submit, we refer to MIMO OTA as 8 but we are OK with VIVO’s proposal.For the min number of data to derive requirement, we see 10—15 data per lab with 8 labs which means around 100 results will be submitted hence 50 is proposed while 20 to 30 is too small. |
| Sporton | **Issue 3-1-1: Framework for Lab Alignment Campaign****From a lab perspective, we would ask when the spreadsheet template will be avaibale and how to review it before approval. Also seeing benefit to split LAD, given the location of labs mainly located in China and the US.** |
| AT&T | **Issue 3-1-2: Framework for Performance Test Campaign** OK with the framework. We would not like to see the test campaign limited to PC2 only as suggested by some companies. In the worst case, if only a sufficient number of PC2 devices are available, it could be possible to also signal p-Max of 23dBm to test PC3 performance on the same PC2 device(s) in accordance with the MOP test procedures. |
| vivo | **Issue 3-1-1: Framework for Lab Alignment Campaign** 2 LADs for testing, from my understanding 2 workday is enough for testing, so total 4~5 workdays would be a quite sufficient condition for test labs to do some flexible test re-source arrangement. We are open to further discuss.**Issue 3-1-2: Framework for Performance Test Campaign** Both PC2 and PC3, measurement data for each or both, are contribution driven from interested companies.Maximum number of submitted devices from each lab is suggested as 12, and the Minimum number of devices for defining requirements for each band is suggested as 30, assuming at least 3 labs are interested to provide measurement results. Given this is only minimum number, more devices are not precluded and encouraged. |

Sub-topic 3-2 Test methodologies applicability for TRP TRS requirements

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| --- | --- |
| **Company** | **Comments** |
| OPPO | **Issue 3-2-1: Applicability of test method already defined in TR 38.834** As long as the alternative methodologies are endorsed in TR38.834, the should be allowed to participate the campaign activity. We do not think defining reference methodology is needed. Otherwise, the definition and how the reference methodology to be used need to be clarified.**Issue 3-2-2: Applicability of new alternative methodologies if defined in the future**The same view with Issue 3-2-1 |
| CAICT | **Issue 3-2-2: Applicability of new alternative methodologies if defined in the future**RAN4 can start discussing the applicability of alternative test methodologies after RAN4 agrees to introduce alternative test methods. |
| Apple | Issue 3-2-1: agree with the proposalIssue 3-2-2: agree with the proposal |
| vivo | **Issue 3-2-1: Applicability of test method already defined in TR 38.834** support**Issue 3-2-2: Applicability of new alternative methodologies if defined in the future**support |

Sub-topic 3-3 Test lab, LAD, and OEM contact information confirmation

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| --- | --- |
| **Company** | **Comments** |
| OPPO | **Issue 3-3-1: Test lab and LAD information confirmation** We confirm OPPO’s application information. In addition, the test lab city is Dongguan, Guangdong Province, China.**Issue 3-3-2: Contacts list of OEMs support test lab TAS-OFF control** |
| Element | **Issue 3-3-2: Contacts list of OEMs support test lab TAS-OFF control**Element endorses the proposition. In the event that assistance is needed in correctly configuring the DUT, it is ideal to have a contact or a repeatable method in ensuring the configuration such that TAS is off with primary antenna locked. We suggest the ability for the labs to uniformly reach each OEM to facilitate support if required i.e. OEM POC list shared with the test procedure to ensure each laboratory reaches the same contact and receives consistent direction from each OEM.Element asks what the process should be if no response is received from the OEM and/or the method of verification results in unsuccessful verification that TAS setting is off. |
| Sporton | **Issue 3-3-2: Contacts list of OEMs support test lab TAS-OFF control****Besides TAS-OFF, we also aware of some devices (in the US market) may support a time-averaging-algorithm that can vary TX power in real time, we hope this shall also be clarified (yes/no) when OEMs preparing devices to labs** |
| vivo | **Issue 3-3-1: Test lab and LAD information confirmation** City information should be updated.**Issue 3-3-2: Contacts list of OEMs support test lab TAS-OFF control**Better to have, but this list will not force the OEMs to provide the help to test labs for the UEs those are not shared to test labs by themselves; |

Sub-topic 3-4 other aspects related to requirement definition

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| --- | --- |
| **Company** | **Comments** |
| OPPO | **Issue 3-4-1: Manufacturing tolerances** **Issue 3-4-2: Multiple band impacts**We agree that multiple band impact should be taken into account when deriving spec limit.**Issue 3-4-3: TAS OFF verification procedure**It is good proposal to verify TAS OFF during measurement. However, a detail should be further discussed on “the magnitude of the OTA test being equal”. In actual testing, the result can not be equal exactly. How much deviation is allowed? |
| Samsung | **Issue 3-4-1: Manufacturing tolerances** **Issue 3-4-2: Multiple band impacts**Support the proposal as proponent. [X] dB relaxation on top of CDF derived value can be considered as final TRP TRS spec limit to account for multiple band impacts.**Issue 3-4-3: TAS OFF verification procedure**It is good idea to check TAS off status. It seems more consideration is needed. For example, UE triggers transmit antenna switching depending on many conditions, if OTA results of two orientation are equal, not sure it is caused by TAS off or by TAS not triggered under TAS on mode. If it is the latter case, TAS OFF status for other test angle still could not be guaranteed. |
| Element | **Issue 3-4-3 TAS OFF verification procedure**We agree that a verification procedure would ensure the best set of radiated data is captured from each laboratory. Suggest the below edits and setup configuration diagrams to the verification procedure be considered for discussion. **TAS OFF verification/sanity procedure:** * Perform OTA baseline test with top of device pointing towards +Z and display oriented at phi (azimuth) 0°, - following the traditional alignment method;Diagram  Description automatically generated
* Benchmark with similar OTA test with top of device pointing towards -Z and display oriented at phi (azimuth) 0°, The point equivalently spaced from the bottom of the device as the original reference point is spaced from the top of the device will be positioned at the center of the quiet zone. Diagram  Description automatically generated

Element asks, if the lab is unable to verify TAS is off, what would be the next steps? Skipping the device would reduce the data set but ensure compliance with required configuration.  |
| Apple | Issue 3-4-1: as the proponent, we prefer Proposal 2Issue 3-4-2: we are fine with the proposalIssue 3-4-3: As proponent, we agree with this proposal. We further clarify the proposed procedure as follows:**TAS OFF verification/sanity procedure:**-  Perform OTA TRP measurement  with display oriented at phi (azimuth) 0, -  Benchmark with similar TRP measurement  with display orientated at phi (azimuth) 180.**Expectation:** The magnitude of the TRP measurement being equal; Similar 2D and/or 3D radiation pattern is expected (with 180 rotation). This provides non-intrusive confirmation that the device indeed is tested with TAS OFF.An additional alignment option to perform the above verification procedure is to orient the display in vertical alignment (along z-axis) flip the DUT upside down (vary theta) and perform the comparison of radiation pattern as described above. |
| Telecom Italia | Issue 3-4-1In general, it is not clear which is the number of devices below which the manufacturing tolerances approach should apply. This is not clear from the proposal. Independently of this, as a normative example, ETSI defined LTE TRP/TRS OTA requirements based on 21 devices without considering any manufacturing tolerance. On such basis, we do not support Proposal 2.Issue 3-4-2In line with the comment on Issue 3-1-2, we think that multi-band impacts are included in the TRP/TRS performances of the devices that will be measured on per-band basis. So, we do not support the proposal from Samsung. |
| SoftBank | **Issue 3-4-1: Manufacturing tolerances** We’d like to keep our position on Proposal-2 from Apple: we do not agree and prefer the alternative in the previous WF. **Issue 3-4-2: Multiple band impacts**It does not sound rational to give X[dB] autonomously.If I understand the nature of JBPR correctly, on the necessity of this item, how about checking the correlation of test campaign data to be obtained? If there is a strong positive correlation of UE performance among bands (i.e. a good UE tends to be good in any bands and a bad UE is always bad), we do not have to mind so much about this it seems. |
| AT&T | **Issue 3-4-2: Multiple band impacts**We would prefer to not introduce JBPR at this stage as it has not been discussed as part of the WID. This concept resulted in the inability to complete the LTE TRP/TRS WI. We support the comments made by Telecom Italia concerning this issue. |
| vivo | **Issue 3-4-2: Multiple band impacts**We do not support JBPR approach given this out of working scope, but we are OK to consider multi-band impacts of antenna performance.**Issue 3-4-3 TAS OFF verification procedure**It is good to provide a guidance for test labs to check TAS-OFF status and further communicate with OEMs, but given this is UE declaration aspect, manufactures should take the responsibility of ensuring TAS-OFF. Another thing is the accuracy of this method, whether the measurement result is sufficient and what is the criteria to challenge the declared the information from manufacture. Further discussion on the detailed test procedure and applicability of this verification is needed. |
| Samsung | **Issue 3-4-2: Multiple band impacts**We would like further clarify this issue to avoid misunderstanding. We are not suggesting to introduce JBPR approach. As the WID indicates, per-band approach is adopted rather than JBPR approach. However, per-band approach will overestimate the overall pass rate in case some UEs has good performance in one band but has bad performance in another band. As SoftBank commented, if all the good UEs in performance campaign all have good performance for all bands, all bad UEs vice versa, then multiple band impacts could be ignored, but in practice such ideal situation is not always true. So we think the multiple band impacts are not fully reflected with per-band approach. It is needed to take this issue into account when deriving TRP TRS spec limit. |

### CRs/TPs comments collection

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2204990 | Vivo: many thanks to OPPO for this TP. Given the test method for TR is not finalized, and the whole structure consideration on how to accommodate test methodology into TS Annex is not clear, we suggest to postpone this TP. |
|  |
|  |

## 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#3-1 Framework update for TRP TRS Performance requirement** | **Issue 3-1-1: Framework for Lab Alignment Campaign** *Moderator: 9 companies share views, all supportive for the update framework. Several detailed aspects should be further checked:**To be noted, based on RAN5 workplan and discussion status, the MU assessment for AC-system will be finalized this meeting, and all MU related TPs will be merged into RAN4 TR with post meeting approval process.* *Tentative agreements:***Working procedure update for Lab Alignment Campaign** 1. Lab alignment criteria:
* The pass/fail criteria are defined as the maximum deviation between the measurement result and the reference value
* The reference value is derived based on the per-band per-PC averaging approach of lab alignment data pool from ≥ 3 labs submitted before 16th May 2022, whether apparent outliers will be considered in averaging process, or not, is FFS
* Pass/fail limit for lab alignment should be defined as [0.5\*MU~1\*MU], MU value will use RAN5 MU outcome of NR FR1 UE TRP/TRS system directly
1. Test results submitting:
	1. Using the same worksheet template to submit the measurement results (the TRP/TRS Lab Alignment Campaign Template will be shared in 2nd round for confirmation)
	2. The measurement results should be submitted to RAN4 by anonymous approach (the UE model should not be disclosed)
	3. Results shall not be shared between labs before submitting to RAN4 meetings or sharing in the RAN4 reflector. Comparison and lab alignment analysis should only be done in RAN4 meetings/discussions
2. Test lab procedures (need to be confirmed in this meeting):
	1. LAD delivery scheme
		* Decide LAD delivery scheme after all the test lab and LAD information being confirmed (this meeting).
		* The available LADs can be split among labs to multiplex the testing effort
	2. LAD measurement time in each test lab: finalize LAD measurement within [5] workdays, and deliver to next lab ASAP with LAD delivery In/Out information shared in reflector.
	3. Encourage test labs to share resulting combined MU based on their own systems

*Recommendations for 2nd round:** Further discuss and confirm the highlighted parts
* Provide suggestions for Pass/fail limit

**Issue 3-1-2: Framework for Performance Test Campaign***Moderator: based on the comment, there are following changes* *NSA is removed based on operator request and the agreed SA as 1st stage in WID.* *Device size selection is based on test labs interests but encourage to focus on test cases which have enough devices**Tentative agreements:***Working procedure update for TRP TRS Performance Test Campaign** 1. Test cases for TRP TRS Performance Test Campaign:
* Test bands: focus on n41 and n78 (first stage); measurements results submission for other bands listed as 1st priority in the WID are also allowed, if companies have interests
* d. Operation mode: NR Standalone (SA) (first stage);
	+ NSA mode is not considered in Rel-17
1. Commercial Device (Smartphone) selection criteria for TRP TRS Performance Test Campaign:
* a. DUT size: Size 1(width >72mm and ≤92mm) and Size 2(width ≥56mm and ≤72mm); separate set of requirements;
	+ encourage test labs to focus on test cases which have enough devices for now
* e. Power Class: Both PC2 and PC3 with 1Tx;
1. Test results submitting:
* The allowed maximum number of submitted devices from each lab is [12]
1. Specify TRP TRS requirements:
* Minimum number of devices for defining requirements for each band, each device size, each power class, and each operation mode (requirement will not be specified if measurement results is less than): [30] or [50]?
* The value at [TBD] percentile of the CDF curve could be selected as the starting point for minimum requirement discussion;
	+ FFS additional relaxation on top of this value

*Recommendations for 2nd round:** Further discuss and confirm the highlighted parts
* Provide suggestions for Minimum number of devices
 |
| **Sub-topic#3-2 Framework update for TRP TRS Performance requirement** | **Issue 3-2-1: Applicability of test method already defined in TR 38.834** *Moderator: 2 companies support the proposal. One company suggest do not define reference methodology and if defined, how to use reference should be clarified.**Given only a full package of AC-system would be finalized, it reasonable select this single method as reference, if alternatives are going to be defined. If further alternative work will not be done in RAN4, no reference discussion is needed.* *Tentative agreements:*Anechoic chamber based methodology is the single methodology for lab alignment and TRP TRS requirements activity by now. It can be selected as the reference, if alternative test methodologies are going to be fully defined in RAN4, and harmonized results should be confirmed. *Recommendations for 2nd round:** Confirm the above tentative agreements

**Issue 3-2-2: Applicability of new alternative methodologies if defined in the future** *Moderator: companies suggest to further discuss after the methodology is fully defined.**Tentative agreements:*Applicability of alternative test methodologies after the full-package of the corresponding test method is finalized and the harmonization is confirmed, can be further defined.*Recommendations for 2nd round:** Confirm the above tentative agreements
 |
| **Sub-topic#3-3 Test lab, LAD, and OEM contact information confirmation** | **Issue 3-3-1: Test lab and LAD information confirmation** *Moderator: the test lab information is updated. The new information will be updated in the revision of R4-2204957**Recommendations for 2nd round:** Add additional information, if any

**Issue 3-3-2: Contacts list of OEMs support test lab TAS-OFF control** *Moderator: no objection for the proposal. One company mention how to treat time-averaging-algorithm. One company mentioned how to treat no response from OEMs for TAS setting.**Tentative agreements:*The performance test campaign framework can add a list of contacts for OEMs. This is for the labs to directly obtain OEM assistance for device settings (TAS off). This list will not force the OEMs to provide the assistance to test labs for the UEs those are not shared to test labs by themselves.*Recommendations for 2nd round:** Further discuss UE with time-averaging-algorithm
* Further discuss how to treat the condition if test lab can not get assistance for TAS-OFF from OEMs
 |
| **Sub-topic#3-4 other aspects related to requirement definition** | **Issue 3-4-1: Manufacturing tolerances** *Moderator: 3 operators object the proposal 2 of manufacturing tolerance approach. Given this has been discussed for several meeting with no progress, suggest to close the discussion of this aspect.**Recommendations for 2nd round:** Further check whether RAN4 should close the discussion of this aspect

**Issue 3-4-2: Multiple band impacts***Moderator: companies show interests on multi-band impacts but do not agree JBPR approach.**Recommendations for 2nd round:** Further check whether multi-band impacts of antenna performance should be considered when specify TRP TRS requirements

**Issue 3-4-3: TAS OFF verification procedure** *Tentative agreements:*Include a verification procedure during lab alignment and performance test phase that enables the labs to baseline and verify the TAS off setting prior to testing the planned scope. *Recommendations for 2nd round:** Further check the above tentative agreements
* Further discuss the detailed test procedure
* Further discuss the applicability and criteria of this verification
 |

### CRs/TPs

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

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2204990 | *To be revised* |
|  |  |

## Discussion on 2nd round

### Open issues

**Issue 3-1-1: Framework for Lab Alignment Campaign**

*Tentative agreements:*

**Working procedure update for Lab Alignment Campaign**

1. Lab alignment criteria:
* The pass/fail criteria are defined as the maximum deviation between the measurement result and the reference value
* The reference value is derived based on the per-band per-PC averaging approach of lab alignment data pool from ≥ 3 labs submitted before 16th May 2022, whether apparent outliers will be considered in averaging process, or not, is FFS
* Pass/fail limit for lab alignment should be defined as [0.5\*MU~1\*MU], MU value will use RAN5 MU outcome of NR FR1 UE TRP/TRS system directly
1. Test results submitting:
	1. Using the same worksheet template to submit the measurement results (the TRP/TRS Lab Alignment Campaign Template will be shared in 2nd round for confirmation)
	2. The measurement results should be submitted to RAN4 by anonymous approach (the UE model should not be disclosed)
	3. Results shall not be shared between labs before submitting to RAN4 meetings or sharing in the RAN4 reflector. Comparison and lab alignment analysis should only be done in RAN4 meetings/discussions
2. Test lab procedures (need to be confirmed in this meeting):
	1. LAD delivery scheme
		* Decide LAD delivery scheme after all the test lab and LAD information being confirmed (this meeting).
		* The available LADs can be split among labs to multiplex the testing effort
	2. LAD measurement time in each test lab: finalize LAD measurement within [5] workdays, and deliver to next lab ASAP with LAD delivery In/Out information shared in reflector.
	3. Encourage test labs to share resulting combined MU based on their own systems

*Recommendations for 2nd round:*

* Further discuss and confirm the highlighted parts
* Provide suggestions for Pass/fail limit

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| --- | --- |
| **Company** | **Comments** |
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**Issue 3-1-2: Framework for Performance Test Campaign**

*Tentative agreements:*

**Working procedure update for TRP TRS Performance Test Campaign**

1. Test cases for TRP TRS Performance Test Campaign:
* Test bands: focus on n41 and n78 (first stage); measurements results submission for other bands listed as 1st priority in the WID are also allowed, if companies have interests
* d. Operation mode: NR Standalone (SA) (first stage);
	+ NSA mode is not considered in Rel-17
1. Commercial Device (Smartphone) selection criteria for TRP TRS Performance Test Campaign:
* a. DUT size: Size 1(width >72mm and ≤92mm) and Size 2(width ≥56mm and ≤72mm); separate set of requirements;
	+ encourage test labs to focus on test cases which have enough devices for now
* e. Power Class: Both PC2 and PC3 with 1Tx;
1. Test results submitting:
* The allowed maximum number of submitted devices from each lab is [12]
1. Specify TRP TRS requirements:
* Minimum number of devices for defining requirements for each band, each device size, each power class, and each operation mode (requirement will not be specified if measurement results is less than): [30] or [50]?
* The value at [TBD] percentile of the CDF curve could be selected as the starting point for minimum requirement discussion;
	+ FFS additional relaxation on top of this value

*Recommendations for 2nd round:*

* Further discuss and confirm the highlighted parts
* Provide suggestions for Minimum number of devices

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| **Company** | **Comments** |
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**Issue 3-2-1: Applicability of test method already defined in TR 38.834**

*Tentative agreements:*

Anechoic chamber based methodology is the single methodology for lab alignment and TRP TRS requirements activity by now. It can be selected as the reference, if alternative test methodologies are going to be fully defined in RAN4, and harmonized results should be confirmed.

*Recommendations for 2nd round:*

* Confirm the above tentative agreements

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| **Company** | **Comments** |
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**Issue 3-2-2: Applicability of new alternative methodologies if defined in the future**

*Tentative agreements:*

Applicability of alternative test methodologies after the full-package of the corresponding test method is finalized and the harmonization is confirmed, can be further defined.

*Recommendations for 2nd round:*

* Confirm the above tentative agreements

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| **Company** | **Comments** |
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**Issue 3-3-1: Test lab and LAD information confirmation**

*Moderator: the test lab information is updated. The new information will be updated in the revision of R4-2204957*

*Recommendations for 2nd round:*

* Add additional information, if any

**Issue 3-3-2: Contacts list of OEMs support test lab TAS-OFF control**

*Recommendations for 2nd round:*

* Further discuss UE with time-averaging-algorithm
* Further discuss how to treat the condition if test lab can not get assistance for TAS-OFF from OEMs

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| **Company** | **Comments** |
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**Issue 3-4-1: Manufacturing tolerances**

*Moderator: 3 operators object the proposal 2 of manufacturing tolerance approach. Given this has been discussed for several meeting with no progress, suggest to close the discussion of this aspect.*

*Recommendations for 2nd round:*

* Further check whether RAN4 should close the discussion of this aspect

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| **Company** | **Comments** |
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**Issue 3-4-2: Multiple band impacts**

*Moderator: companies show interests on multi-band impacts but do not agree JBPR approach.*

*Recommendations for 2nd round:*

* Further check whether multi-band impacts of antenna performance should be considered when specify TRP TRS requirements

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| **Company** | **Comments** |
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**Issue 3-4-3: TAS OFF verification procedure**

*Tentative agreements:*

Include a verification procedure during lab alignment and performance test phase that enables the labs to baseline and verify the TAS off setting prior to testing the planned scope.

*Recommendations for 2nd round:*

* Further check the above tentative agreements
* Further discuss the detailed test procedure
* Further discuss the applicability and criteria of this verification

**Updated TAS OFF verification/sanity procedure:**

-  • Perform OTA TRP measurement baseline test with top of device pointing towards +Z and display oriented at phi (azimuth) 0, - following the traditional alignment method;

-  • Benchmark with similar TRP measurement   OTA test with top of device pointing towards -Z and display oriented at phi (azimuth) 0, The point equivalently spaced from the bottom of the device as the original reference point is spaced from the top of the device will be positioned at the center of the quiet zone.

**Expectation:** The magnitude of the TRP measurement being equal; Similar 2D and/or 3D radiation pattern is expected (with 180 rotation). This provides non-intrusive confirmation that the device indeed is tested with TAS OFF.

An additional alignment option to perform the above verification procedure is to orient the display in vertical alignment (along z-axis) flip the DUT upside down (vary theta) and perform the comparison of radiation pattern as described above.

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| **Company** | **Comments** |
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### CRs/TPs comments collection

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| **CR/TP number** | **CRs/TPs Comments collection**  |
| Revised R4-2204990 (TP to TS Annex A test method) |  |

# Topic #4: Work plan for TRP TRS Alternative test methods

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2204956 | vivo | **Proposal 1: If RAN4 agrees to introduce alternative test methods, approve the above workplan to ensure the smooth progress.****Proposal 2: RAN5 can decide their MU workplan based on the above timeline of RAN4.** |
| R4-2205234 | SRTC, Bluetest | TP to TR 38.834 for alternative RC-based TRP TRS test method |

## Open issues summary

### Sub-topic 4-1 Work plan for TRP TRS Alternative test methods

*Moderator: if the working scope and project management in Topic#1 for alternative test method are agreeable, then companies can further discuss the detailed workplan and other related technical aspects based on the agreements.*

**Issue 4-1-1: Workplan in RAN4 for TRP TRS Alternative test methods**

* Proposal
* **Proposal 1: If RAN4 agrees to introduce alternative test methods, approve the following workplan to ensure the smooth progress.**

Based on the whole workplan for TRP TRS WI [2], the workplan for alternative test methods (if agreed to be introduced in RAN4), can be prepared as following:

1. RAN4 #102-e (2022 Feb)
* Discuss whether RAN4 will work on alternative test methods and make conclusion

RAN-Plenary #95-e (2022 Mar)

* Further check RAN decision on the working scope
1. RAN4 #103-e (2022 May)
* Discuss the test procedure for alternative test methods
* RAN5 can start the MU work for alternative methods
1. RAN4 #104-e (2022 Aug)
* Finalize the full package of alternative test methods
* RAN5 MU outcome should be included in the full package of alternative test methods
* Recommended WF
	+ Companies share further views on the above proposal, if alternative working scope in Topic#1 is agreeable

**Issue 4-1-2: Workplan in RAN5 for TRP TRS Alternative test methods**

* Proposal
	+ RAN5 can decide their MU workplan based on the above timeline of RAN4.
* Recommended WF

### Sub-topic 4-2 Alternative test methods

**Issue 4-2-1: RC-based alternative test method**

*Moderator: after concluding the working scope, project management and workplan for alternative test methods after 1st round, the corresponding technical discussion on alternative methodologies can started.*

## Companies views’ collection for 1st round

### Open issues

Sub topic 4-1 Work plan for TRP TRS Alternative test methods

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| **Company** | **Comments** |
| CAICT | **Issue 4-1-1: Workplan in RAN4 for TRP TRS Alternative test methods** Support to introduce the RC-based test method as the alternative test method, and basically OK with the workplan.**Issue 4-1-2: Workplan in RAN5 for TRP TRS Alternative test methods**  |
| R&S | **Issue 4-1-1: Workplan in RAN4 for TRP TRS Alternative test methods** The workplan seems reasonable, under the condition that RAN4 agrees to introduce the alternative method(s). The aspects related to RAN5 work need final confirmation though as mentioned on Issue 4-1-2. |

### CRs/TPs comments collection

*For the suggested wording of reply LS, please share comments in the table below.*

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2205234 (Text Proposals for RC-based alternative test method) | *Moderator: further discuss the content after concluding the working scope, project management and workplan for alternative test method after 1st round* |
| Apple: we should follow the workplan for alternative methods and also ensure that the alternative methods can be aligned with the reference methodology. |
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## 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.*

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|  | **Status summary**  |

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| **Sub-topic#4-1 Work plan for TRP TRS Alternative test methods** | **Issue 4-1-1: Workplan in RAN4 for TRP TRS Alternative test methods***Moderator: no objection for the workplan. Several aspects related to workplan agreed in Topic#1 and Topic#3 should be reflected in the workplan. The workplan should be updated to accommodate the outcomes.**Recommendations for 2nd round:** Further discuss the revised workplan and conclude

**Issue 4-1-2: Workplan in RAN5 for TRP TRS Alternative test methods** *Moderator: RAN5 workplan for alternative method MU discussion should be confirmed by RAN5 group.**Recommendations for 2nd round:** N/A
 |

### CRs/TPs

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

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| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2205234 (Text Proposals for RC-based alternative test method) | *Postponed*(according to the workplan, start this discussion in RAN4#103-e meeting) |

## Discussion on 2nd round

### Open issues

**Issue 4-1-1: Workplan in RAN4 for TRP TRS Alternative test methods**

*Recommendations for 2nd round:*

* Further discuss the revised workplan and conclude

The updated work plan:

1. RAN4 #102-e (2022 Feb)
* Discuss whether RAN4 will work on alternative test methods and make conclusion

RAN-Plenary #95-e (2022 Mar)

* Further check RAN decision on the working scope
1. RAN4 #103-e (2022 May)
* Discuss the test procedure, system verification, potential update due to FR1 frequency range and bandwidth for alternative test methods
* RAN5 can start the MU work for alternative methods
1. RAN4 #104-e (2022 Aug)
* Finalize the full package of alternative test methods
* RAN5 conclude MU assessment and outcome should be included as part of full package of alternative test methods
* Discuss and conclude the harmonized outcome and applicability of alternative test methods

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| **Company** | **Comments** |
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# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on FR1 TRP TRS | vivo | General WF for WI |
| TRP/TRS Lab Alignment Campaign Template  | vivo | Template for measurement results collection |
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**Existing tdocs**

|  |  |  |  |  |
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| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-2203638 | On ENDC selection | Huawei Tech.(UK) Co.. Ltd | Noted |  |
| R4-2203639 | TP on environment Annex for TS38.161 | Huawei Tech.(UK) Co.. Ltd | To be revised |  |
| R4-2203640 | TP to TS 38.161 on frequency bands | Huawei Tech.(UK) Co.. Ltd | To be revised |  |
| R4-2203641 | on number of test devices | Huawei Tech.(UK) Co.. Ltd | Noted |  |
| R4-2203693 | Remaining issues with the performance framework | Apple | Noted |  |
| R4-2203694 | Remaining issues with EN-DC configuration for TRP/TRS | Apple | Noted |  |
| R4-2204573 | Discussion on ENDC combination and measurement parameters | Samsung | Noted  |  |
| R4-2204574 | Discussion on FR1 TRP TRS performance requirement derivation | Samsung | Noted  |  |
| R4-2204952 | 3GPP TS 38.161 v0.2.0 | vivo | For email approval |  |
| R4-2204953 | Proposals for concluding the core part work of TRP TRS WI | vivo, Apple, CAICT | Noted  |  |
| R4-2204954 | Rapporteur input to TR 38.834 | vivo | Agreed |  |
| R4-2204955 | Updated Working procedure for TRP TRS requirement development | vivo | To be revised  |  |
| R4-2204956 | Workplan for altenative test methods | vivo | To be revised  |  |
| R4-2204957 | Test lab and device information for lab alignment activity | vivo | To be revised  |  |
| R4-2204959 | TP to TR 38.834 on Phantom Definition | vivo,CTIA Certification | Agreed |  |
| R4-2204960 | TP to TR 38.834 on Environmental requirements | vivo | To be revised  |  |
| R4-2204982 | On EN-DC combinations | OPPO | Noted  |  |
| R4-2204983 | On Framework for lab alignment activity | OPPO | Noted  |  |
| R4-2204988 | Discussion and TP on performance metrics | OPPO | To be revised |  |
| R4-2204990 | TP to TS 38.161 on Annex A: Test methodology | OPPO | To be revised |  |
| R4-2205037 | On TRP TRS Lab Alignment Campaign | CAICT, SAICT | Noted  |  |
| R4-2205132 | On Performance test campaign | Xiaomi | Noted  |  |
| R4-2205174 | TP to 38.161 on general aspects | Apple, vivo | Agreed |  |
| R4-2205175 | TP to 38.161 on TRP aspects | Apple, Huawei, HiSilicon, OPPO, vivo | To be revised |  |
| R4-2205234 | TP to TR 38.834: addition of RC in test methodology | SRTC, Bluetest | Postponed  |  |
| R4-2205237 | Discussion on the addition of RC in test methodology | SRTC, Bluetest | Noted  |  |
| R4-2205491 | TR 38.834 v0.4.0 | OPPO | For email approval |  |
| R4-2205645 | TP to TR 38.834 on Ripple test procedure | ETS-Lindgren Europe | To be revised  |  |
| R4-2205731 | TP to TR 38.834 on TRP-TRS test procedure | ROHDE & SCHWARZ, vivo | Agreed |  |
| R4-2205814 | TP to TR 38.834 on Measurement distance | ROHDE & SCHWARZ, vivo | To be revised  |  |
| R4-2205826 | TP to TR 38.834 on contents for Annex B | ROHDE & SCHWARZ | For email approval |  |
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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

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| --- | --- | --- | --- | --- |
| **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 |  |
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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

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|  |  |  |
| --- | --- | --- |
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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)