**3GPP TSG-RAN WG4 Meeting #102-e R4-210XXXX**

**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

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

|  |  |
| --- | --- |
| **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. |
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Sub-topic 1-2 TRP TRS definition description

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| --- | --- |
| **Company** | **Comments** |
|  | **Issue 1-2-1: TRP definition refinement**  **Issue 1-2-2: TRS definition refinement** |
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### 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) |  |
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| R4-2205174  (UE mechanical modes description) |  |
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| R4-2205175  (UE Minimum requirements description) |  |
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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.*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

# Topic #2: TRP TRS test methodology

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **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-DC  configuration | 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**

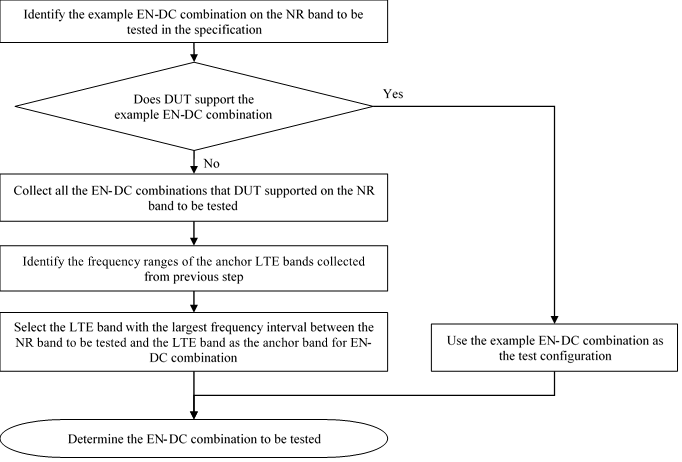
* Proposals
  + Proposal 1: single example band combination approach:
    - use DC\_13A\_n78A and DC\_5A\_n79A for n78 and n79 measurement. (Huawei)
    - use DC\_1A\_n78A and DC\_1A\_n79A for n78 and n79 measurement. (Samsung)
  + Proposal 2: multiple example band combination approach: (Apple)
    - 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 OTA  We are fine with both proposals.  Issue 2-1-2: operation bands in TS 38.161 |
|  |  |

Sub-topic 2-2 EN-DC configuration

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| --- | --- |
| **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. |
| xxx |  |

### 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) |  |
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| R4-2203640  (frequency bands for TS38.161) |  |
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| R4-2204959 (Phantom Definition and positioning) |  |
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| R4-2204960  (environment Annex for TR38.834) |  |
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| R4-2205645  (ripple test procedure) |  |
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| R4-2205731 (TRP TRS test procedure improvement) |  |
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| R4-2205814 (Measurement distance) |  |
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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.*

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

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

# Topic #3: TRP TRS Performance requirement

## Companies’ contributions summary

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| --- | --- | --- |
| **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](mailto:yixuan@caict.ac.cn) (test lab City: )  2. Sporton, Contact: Alex Ho ([Alexander@sporton.com.tw](mailto:Alexander@sporton.com.tw)), Will Ni ([WillNi@sporton-usa.com](mailto:WillNi@sporton-usa.com)) (test lab City: )  3. Huawei, contact: Hai Zhou, [hai.zhou1@huawei.com](mailto:hai.zhou1@huawei.com), Li Jinxing, [lijinxing3@huawei.com](mailto: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*](mailto:Nik.Bankov@element.com)*)* (test lab City: San Jose, CA)  5. vivo, contact: Ruixin Wang, [ruixin.wang@vivo.com](mailto:ruixin.wang@vivo.com) (test lab City: )  6.CMCC, contact: Yichen Zhao, [zhaoyichen@cmdc.chinamobile.com](mailto:zhaoyichen@cmdc.chinamobile.com) (test lab City: )  7. SRTC, Contact: Gong Jian, [gongjian1@srtc.org.cn](mailto:gongjian1@srtc.org.cn) (test lab City: )  8. OPPO, contact: Qifei Liu, [liuqifei@oppo.com](mailto:liuqifei@oppo.com) (test lab City: ) |
| Lab Alignment Device (LAD) provider | 1.vivo, contact: Ruixin Wang, [ruixin.wang@vivo.com](mailto:ruixin.wang@vivo.com)  LAD 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
  + 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.

### 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
  + Element agrees 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.

## 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. |

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

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 3-2-1: Applicability of test method already defined in TR 38.834**  **Issue 3-2-2: Applicability of new alternative methodologies if defined in the future** |
| xxx |  |

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

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 3-3-1: Test lab and LAD information confirmation**  **Issue 3-3-2: Contacts list of OEMs support test lab TAS-OFF control** |
| xxx |  |

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

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 3-4-1: Manufacturing tolerances**  **Issue 3-4-2: Multiple band impacts**  **Issue 3-4-3: TAS OFF verification procedure** |
| xxx |  |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2204990 |  |
|  |
|  |

## Summary for 1st round

### Open issues

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

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

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

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

## Companies’ contributions summary

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

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 4-1-1: Workplan in RAN4 for TRP TRS Alternative test methods**  **Issue 4-1-2: Workplan in RAN5 for TRP TRS Alternative test methods** |
|  |  |

### CRs/TPs comments collection

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

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

## Summary for 1st round

### Open issues

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

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

### CRs/TPs

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

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

## Discussion on 2nd round (if applicable)

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

# Recommendations for Tdocs

## 1st round

**New tdocs**

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

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-2203637 | on tests with TAS on | Huawei Tech.(UK) Co.. Ltd |  |  |
| R4-2203638 | On ENDC selection | Huawei Tech.(UK) Co.. Ltd |  |  |
| R4-2203639 | TP on environment Annex for TS38.161 | Huawei Tech.(UK) Co.. Ltd |  |  |
| R4-2203640 | TP to TS 38.161 on frequency bands | Huawei Tech.(UK) Co.. Ltd |  |  |
| R4-2203641 | on number of test devices | Huawei Tech.(UK) Co.. Ltd |  |  |
| R4-2203693 | Remaining issues with the performance framework | Apple |  |  |
| R4-2203694 | Remaining issues with EN-DC configuration for TRP/TRS | Apple |  |  |
| R4-2203695 | On TRP for TxD UEs | Apple |  |  |
| R4-2204508 | TRP test method for UEs with Tx diversity | Qualcomm Incorporated |  |  |
| R4-2204573 | Discussion on ENDC combination and measurement parameters | Samsung |  |  |
| R4-2204574 | Discussion on FR1 TRP TRS performance requirement derivation | Samsung |  |  |
| R4-2204952 | 3GPP TS 38.161 v0.2.0 | vivo |  |  |
| R4-2204953 | Proposals for concluding the core part work of TRP TRS WI | vivo, Apple, CAICT |  |  |
| R4-2204954 | Rapporteur input to TR 38.834 | vivo |  |  |
| R4-2204955 | Updated Working procedure for TRP TRS requirement development | vivo |  |  |
| R4-2204956 | Workplan for altenative test methods | vivo |  |  |
| R4-2204957 | Test lab and device information for lab alignment activity | vivo |  |  |
| R4-2204958 | Further discussion on Single Point Offset test method for EN-DC testing time reduction | vivo |  |  |
| R4-2204959 | TP to TR 38.834 on Phantom Definition | vivo,CTIA Certification |  |  |
| R4-2204960 | TP to TR 38.834 on Environmental requirements | vivo |  |  |
| R4-2204981 | Downlink Rx signal impact on TAS test method | OPPO |  |  |
| R4-2204982 | On EN-DC combinations | OPPO |  |  |
| R4-2204983 | On Framework for lab alignment activity | OPPO |  |  |
| R4-2204984 | On test time reduction | OPPO |  |  |
| R4-2204988 | Discussion and TP on performance metrics | OPPO |  |  |
| R4-2204989 | TP to TR 38.834 on multi-antenna UE | OPPO |  |  |
| R4-2204990 | TP to TS 38.161 on Annex A: Test methodology | OPPO |  |  |
| R4-2205037 | On TRP TRS Lab Alignment Campaign | CAICT, SAICT |  |  |
| R4-2205132 | on On Performance test campaign | Xiaomi |  |  |
| R4-2205174 | TP to 38.161 on general aspects | Apple, vivo |  |  |
| R4-2205175 | TP to 38.161 on TRP aspects | Apple, Huawei, HiSilicon, OPPO, vivo |  |  |
| R4-2205234 | TP to TR 38.834: addition of RC in test methodology | SRTC, Bluetest |  |  |
| R4-2205237 | Discussion on the addition of RC in test methodology | SRTC, Bluetest |  |  |
| R4-2205491 | TR 38.834 v0.4.0 | OPPO |  |  |
| R4-2205645 | TP to TR 38.834 on Ripple test procedure | ETS-Lindgren Europe |  |  |
| R4-2205731 | TP to TR 38.834 on TRP-TRS test procedure | ROHDE & SCHWARZ, vivo |  |  |
| R4-2205814 | TP to TR 38.834 on Measurement distance | ROHDE & SCHWARZ, vivo |  |  |
| R4-2205826 | TP to TR 38.834 on contents for Annex B | ROHDE & SCHWARZ |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Notes:

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

## 2nd round

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

Notes:

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

# Annex

Contact information

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Name** | **Email address** | |
| Huawei, HiSilicon | Hai Zhou | hai.zhou1@huawei.com | |
| Element Materials Technology | Nik Bankov | Nik.bankov@element.com |
|  |  |  |

Note:

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