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

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

**Agenda item:** 10.2.1

**Source:** vivo

**Title:** WF on FR1 TRP TRS

**Document for:** Approval

# Introduction

This is the general Way Forward for TRP TRS WI, which captures the agreements discussed in email thread [335].

# Topic #1: General and Work plan

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

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

*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.

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

*Agreement:*

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.

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

*Agreement:*

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.

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

*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.

**Issue 1-1-5: Project management 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.

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

*Agreement:*

The TRP TRS definition improvement is agreed in TP R4-2207321

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

*Agreement:*

The UE mechanical modes description is agreed in TP R4-2205174

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

*Agreement:*

The UE minimum requirement description is agreed in TP R4-2207323

# Topic #2: TRP TRS test methodology

### Sub-topic 2-1 General aspects for SA and EN-DC test methodology

**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. It is preferable if the UE is fully charged in the beginning of the Test.

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

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

*Agreements:*

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

| 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). | | |

**Issue 2-2-2: Decision tree for UE not support example band in the table**

*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.*

*Agreements:*

UE declaration based on the principle in Option 2-b

**Apple:** We still don't see how Options 2-a or 2-b are practical from the test lab's perspective. How will the test lab know the full set of suported EN-DC band combinations by the UE? The RAN2 signaling design of band combination capabilities is highly optimized, such that it is not possible for the UE to transfer all supported EN-DC band combinations in a single RRC message. Do RAN5 procedures support such an exhaustive download of band combination capabilities? So it is still not clear to us how the lab can perform the proposed decision tree. To us it seems that only a UE declaration of EN-DC band combinations to be tested, such that they are aligned with the EN-DC band combination selection principle, is the practical way forward.

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

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

*Agreements:*

Option 1

# Topic #3: TRP TRS Performance requirement

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

The framework for TRP TRS performance requirement is approved in R4-2207317.

**Issue 3-1-1: Framework update for TRP TRS Performance requirement**

*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 in R4-2207327 to submit the measurement results
   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

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

*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

**Apple:** we propose no less than 25 DUTs if the manufacturing tolerance framework is adopted and no loess than 50 otherwise

### 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**

*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.

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

*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.

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

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

*Agreement:*

* The confirmed test lab and LAD information is agreed in R4-2207319

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

*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.

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

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

*Agreements:*

* TBA

**Apple:** we still believe that considering manufacturing tolerances will ensure the applicability of the pass/fail limits to regulatory requirements, such as ETSI, NAL, etc. If RAN4 does not define such a framework, then the applicability of the 3GPP requirements to these regulatory processes is not clear. RAN4's decision related to this will also impact the number of DUTs needed to test, since the alternative approach would require a larger DUT pool size in the performance framework (please see our related comment earlier).

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

*Agreements:*

* Multi-band impacts of antenna performance can be considered when specify TRP TRS requirements

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

*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.

The general verification procedure is as following:

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 degree 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 degree. 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 degrees 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.

The applicability of this verification procedure is FFS. The criteria of confirming TAS-OFF based on above verification procedure is FFS.

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

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

*Agreement:*

Workplan in RAN4 for TRP TRS Alternative test methods:

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 core part completion

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

# Reference

*[1] R4-2207425, Email discussion summary for [102-e][335] FR1\_TRP\_TRS\_Part1, Moderator (vivo), RAN4#102e, Mar 2022.*