[97e-28-R17-UE-TRP-TRS] - Version 0.0.5
RAN

3GPP TSG RAN Meeting #97-e RP-222588

Electronic Meeting, September 12 - 16, 2022

Agenda item: 9.5.4.2

Source: RAN4 Vice-Chair (Samsung)

Title: Moderator's summary for discussion [97e-28-R17-UE-TRP-TRS]

Document for: Discussion & Decision

1 Introduction

This document provides as summary of the following email discussion during RAN#97e:

- Goal: Seek for the conclusion on Rel-17 TRP TRS WI handling and proposal for continued Rel-18 TRP TRS WI

Email Thread Title	Related Documents
[97e-28-R17-UE-TRP-TRS]	Topic#1: Rel-17 TRP/TRS WI handling: RP-222152(SR), 2160, 2269(revised WID), 2321

2 Topic #1: Rel-17 FR1 TRP TRS handling

2.1 Initial round

2.1.1 Proposals and comments collection

Issue 1-1: Framework of developing FR1 TRP TRS requirements (Test device information disclosure)

- Option 1: The labs involved in the measurement campaign to disclose the list of tested devices
- Option 2: The labs involved in the measurement campaign to disclose the following information:
  a) Number of models tested by the labs
  b) Number of vendors that produced the models

c) percentage of tested devices per vendor

d) Percentage of models per production year

e) Power Class of the devices

– Option 3: Maintain existing RAN4 agreed framework i.e. *anonymous approach* no test device information disclosure

Feedback Form 1: Issue 1-1: Framework of developing FR1 TRP TRS requirements (Test device information disclosure)

1 – Guangdong OPPO Mobile Telecom.

For clarification, is this for Rel-17 WI or Rel-18 WI?

In Rel-17, the anonymous approach was agreed and followed by the data providing labs. In our view there is no issue from procedure point of view. And changing the requirements seems not possible at this moment. Therefore, it might be better to focus on Rel-18 discussion and see how to accommodate the concerns raised here.

But we understand some companies may lack of confidence in the requirement due to somehow like a black box data pool to them if no information are disclosed. Also we believe the group is well recognized the sensitivity of disclosing device information in the 3GPP contributions. Considering these two aspects, some of limited information in Option 2 probably can be further considered in the Rel-18 requirement definition.

2 – Orange

As described in the contribution RP-222160 which we co-sourced, we see a need to disclose the list of tested mobiles to build confidence on the measurements. Performance of each individual UE will remain anonymous since no reference would be made between the tested UE and actual measurement results.

Option 2 would be ideal, but as a minimum we would like to see option 1 approved.

3 – Apple Italia S.R.L.

As already commented in GTW, OEMs entered the RAN4 measurement activities with the prior RAN4 agreement on the anonymous approach for handling the performance campaign. Our key concern is associated with the potential to misuse the device model list outside of 3GPP.

For 3GPP to reverse this agreement after the test campaign has concluded and after requirements have been agreed in RAN4 would be an unprecedented step backward. Thus, our strong preference is for Option 3.

4 – TELECOM ITALIA S.p.A.

To Oppo: this specific contribution addresses Rel 17. As it is we have strong concerns with approving the requirements unless some information on the tested devices is provided.

For example, let's assume Lab A tested 10 devices. If the majority of devices are from the same vendor (even if different models) the measurement campaign is very likely to be biased, since likely the vendor reused the same antenna configuration for all devices.

More in general, we have a strong concern with 3GPP adopting procedures which are NOT CORRECT from a statistical point of view. How you can ensure the data are not biased if you do not know what was measured.

Note that we are not asking to change the results or the procedures. I think this is an artificial argument brought by companies which do not want to disclose the data (and making us more worried about bias in the results). What we require is to have the basic information on what was measured to ensure the data are not biased. And we agree with Orange that this is not impacting the fact that measurements are anonymous.

To Apple: we really do not understand your concern. This is not a reversal of the decision, but it simply asks to assure that the data are not biased. **By the way with Alt. 2, the list of devices is not made public**

5 – Qualcomm Incorporated

We undertand the concerns from operators. We clarification questions on the propsoal 1&2: Would disclosure information have impact on the agreements on the requirements from RAN4#104e meeting? If yes, how to proceed?

Option 1 was disucssed in RAN4 meetings but it did not get the consensus. Option 2 could be a starting pointto further disucss what infomation can be discloused by UE vendors.

6 – Telia Company AB

Option 2 and 1 would give openness and also the statistical confidence for the test campaigns and results. Where and how the campaign results would be visible and reported is to be discussed or is there already a solution for this?

7 – Samsung Electronics Co.

We support option 3 as commented in GTW. The framework of anonymous approach was an agreement we took. Option 1 and 2 need a lot of discussions in the future to make a consensus in RAN4.

8 – Huawei Technologies France

We prefer Option 3. The anonymous approach was agreed at the start of RAN4 work on this WI. We think RAN4 should stick to what has been agreed before.

9 – vivo Communication Technology

We share similar views as Qualcomm, given the requirements are defined based on the agreed framework and contributed measurement results after long-term lab alignment activity, it would be difficult to define New criteria on how to filter the measurement data (by removing some results from specific lab). To move forward, we also think the suggestion from Qualcomm is a good way to go, maybe disclose partial information in option 2 can be further discussed.

10 – VODAFONE Group Plc

Agree with the comments from Orange and Telecom Italia. Our preference is option 1 or 2 to help build statistical confidence in the tests and results.

11 – AT&T GNS Belgium SPRL

We think that Option 2 is a reasonable way forward to gain more statistical confidence without sacrificing the anonymous approach. We do not see spending more time on Option 1 as a fruitful discussion at this point.

12 – CAICT

We undertand the concerns from operators and share similar views as QC.

According to R17's experience, not every aligned labs can provide enough measurement results to mask the mapping between measurement results and UE models. In the case of few test results are submitted from one lab, others can easily obtain a complete list of UE models vs measurement results through some of the information disclosed.

If we decide to disclose part of the UE information, we need to be very careful and further discuss the specific details

Issue 1-2: Comments on SR (RP-222152), revised WID (RP-22269), updated TS 38.161 (RP-222321)

Feedback Form 2: Issue 1-2: Comments on SR (RP-222152), revised WID (RP-22269), updated TS 38.161 (RP-222321)

1 – Orange

We have strong concerns on the TRP and TRS values captured for in TS 38.161. These values are lower than anything we have measured, and would not serve as useful references for UE testing in the industry. As such the TS cannot be approved from our perspective at this stage, and TRP and TRS should be revisited in RAN4, together with a disclosure of the list of tested UEs as explained in the previous question.

2 – TELECOM ITALIA S.p.A.

We share the concern raised by Orange and cannot approve the TS.

And we cannot accept that the requirements are obtained on the basis of a NOT CORRECT procedure, since the characteristics of the measured UEs are not known and data can be easily biased. This is a very bad precedent for 3GPP.

To be clear: **much better to have no requirements than bad requirements** (bad in terms of how they were derived)

2.1.2 First round summary

Issue 1-1: Framework of developing FR1 TRP TRS requirements (Test device information disclosure)

Observation:

- Option 1 objected by UE vendors as it's contradicted with previous RAN4 agreements which has dropped during RAN4 discussion.
- Several companies think option 2 can be considered starting point to further discuss which information can be disclosed as the compromise solution. (7 companies fine with option 2). Meanwhile companies also share the concern does such activity will impact RAN4 agreed requirements specified in Rel-17. And some companies share the concern option 2 will take much time to further discuss in RAN4.
- 3 companies (Apple, Samsung, Huawei) support option 3.

Moderator suggest below compromised solution:

Proposal 1: Taking option 2 as starting point to further discuss which information needed including

a) Number of models tested by the labs

b) Number of vendors that produced the models

c) percentage of tested devices per vendor

d) Percentage of models per production year

e) Power Class of the devices

Proposal 2: The information collection activity can be handled in Rel-17 maintenance phase with Rel-17 TRP TRS concluded in RAN#97-e

- **Unless critical issues identified, such activity shall not impact RAN4 agreed Rel-17 TRP/TRS requirements.**

Issue #1-2 are pending on the conclusion on issue #1-1.

2.2 Intermediate round

2.2.1 Proposals and comments collection

Proposal 1: Taking option 2 as starting point to further discuss which information needed including

1. Number of models tested by the labs
2. Number of vendors that produced the models
3. percentage of tested devices per vendor
4. Percentage of models per production year
5. Power Class of the devices

Proposal 2: The information collection activity can be handled in Rel-17 maintenance phase with Rel-17 TRP TRS WI concluded in RAN#97-e

- Such activity shall not impact RAN4 agreed Rel-17 TRP/TRS requirements unless critical issues identified

Feedback Form 3: Comments on proposal 1 and proposal 2

1 – Guangdong OPPO Mobile Telecom.

We support Proposal 1 and 2.

2 – Orange

We support proposal 1. For proposal 2, we would suggest to delay the completion of the WI to the next RAN plenary in order to let RAN4 gather the information listed in proposal 1 before a final decision is made on the TRS / TRP performance requirements.

3 – Huawei Technologies France

we support proposal 2.

4 – vivo Communication Technology

The TRP TRS requirements was defined based on agreed framework and all the involved interested companies' discussion outcome, we prefer to respect the agreements and do not see the reasons to delay the completion of the WI.

For the "additional information" collection activity in proposal 1, we are willing to organize this work to collect more information from test labs, with the condition of proposal 2 is agreed.

5 – Samsung Electronics Co.

For the sake of progress, we can compromise to support proposal 1 and 2. With that, we think this WI can be concluded in this plenary meeting.

6 – TELECOM ITALIA S.p.A.

We would like to thank the moderator for the good proposals. In principle we are ok with proposal 1 and 2, even if we prefer the revision provided by Orange (to complete the Work Item after the details are made known).

And as indicated by the moderator for the Rel 18 discussion, it must be agreed that the information for proposal 1 should be the baseline for the Rel 18 activity (also for the MIMO OTA perf requirements)

7 – AT&T GNS Belgium SPRL

We support Proposal 1. We are OK with Proposal 2 (Rel-17 maintenance phase) or with the Orange proposal.

8 – Telia Company AB

We support moderator's proposals 1 and 2.

9 – VODAFONE Group Plc

We support proposals 1 and 2.

10 – Apple Italia S.R.L.

We do not support either proposal in the context of Rel-17 outcomes on TRP/TRS. This issue was discussed in RAN4 already, with the RAN4 decision on the requirements (and the RAN4 agreed CR). Proposal 2 even allows to reopen the Rel-17 requirements at a later date! With RAN5 work to specify the conformance requirements, and forums outside of 3GPP also anticipating the availability of these requirements, 3GPP cannot afford to engage in this kind of requirement revisionism. Thus, for Rel-17, we are firmly opposed to any future revisions of the agreed requirement. At this RAN we should reach a decision of whether to approve the agreed requirement CR from RAN4 with no other strings attached. If RAN does not approve the RAN4 agreed requirement CR, then we will unfortunately repeat the LTE TRP/TRS outcome, when 3GPP failed to converge on requirements.

For Rel-18 TRP/TRS, where the work scope on the performance requirement framework is under discussion, we can consider Proposal 1 with some modifications as a starting point. As stated above, this can only be agreeable if Rel-17 outcomes are not impacted in any way. Our detailed comments on Proposal 1 in the context of Rel-18 work are as follows:

Disclosing the number of models tested by the labs is not feasible to implement, since it would require the disclosure of exact device model lists. The RAN4 WID rapporteur already provided good explanation in RAN4 GTW of how the CDF curve depicted a good statistical spread and even by artificially plugging in duplicate data (as a hypothetical extreme) the %-tiles did not shift significantly. Secondly even if two labs tested the same device (which is quite possible as it is logistically impossible for 8 labs to be coordinating device lists) it provides a distinct set of data from separate test systems which is still useful. Unless the assumption is the same device was tested >4 or 5 times (which seems highly unlikely from a simple review of the raw measurement data from each lab and the CDF curve explained by the rapporteur), this approach does not provide any useful insights.

Number of vendors that produced the models: this is acceptable if vendor name/device models are not disclosed. This could work if each lab provides to neutral party a spread of vendors whose devices were used (as “Vendor A, Vendor B, Vendor C”. Neutral party summarizes as lab 1 - 4 vendors, lab 2 - 6 vendors, lab 3 - 5 vendors etc…).

Percentage of tested devices per vendor: acceptable if no device models or vendor names disclosed.This can be derived from the process in 2. Only complete list to be shared publicly (no per lab list is needed for this query).

Percentage of models per production year: Acceptable if no device models or vendor names disclosed. Labs to share separate list with only production year to neutral party for devices they tested. Full list/spread of production years (only) can be compied and shared by neutral party (no per-lab list).

Power Class of the devices: this is unnecessary, as the performance requirement framework already clearly specifies which power class is measured, and for which power class the TRP requirements are applicable.

2.2.2 Second round summary

Except one company, all others (9 companies) seem ok for proposal 1 and proposal 2. And some companies prefer to do the effort with extending Rel-17 TRSP TRS WI with one quarter meanwhile they also accept to

carry such effort under Rel-17 maintenance phase. It's moderator's understanding proposal 1 and proposal 2 combined to be a package as a compromised solutions since some other companies see the urgency to conclude Rel-17 WI in this RAN-P.

Apple share strong concern on proposal 1 and proposal 2 and suggests to consider such activity for test device information disclosure in Rel-18 and Apple share strong concern on the possibility of reopening the discussion of Rel-17 TRP/TRS requirements agreed in RAN4. It's moderators understanding any update shall be consensus basis and discussion driven. To move forward, moderator make slightly update on proposal 2 to remove the sub-bullet to avoid any misleading. Apple also provides some detailed feedback on proposal 1 the information which can be included. Moderator thinks such detailed information can be further discussed in RAN4 under maintenance phase. To move forward, moderator make slightly update on proposal 1 and 2.

Updated proposal 1: Taking option 2 as starting point to further discuss which information needed including

1. [Number of models tested by the labs]
2. Number of vendors that produced the models
3. percentage of tested devices per vendor
4. Percentage of models per production year
5. [Power Class of the devices]

Updated proposal 2: The information collection activity can be handled in Rel-17 maintenance phase with Rel-17 TRP TRS WI concluded in RAN#97-e

Moderator suggests to endorse the updated proposal 1 and update proposal 2. And the recommendation on the t-docs as following:

Tdoc	Title
RP-222152	Status report for WI perf.part: Introduction of UE TRP (Total Radiated Power) and TRS (Total Radiated Se
RP-222160	Considerations on TRP and TRS measurement campaign
RP-222269	Revised WID: Introduction of UE TRP (Total Radiated Power) and TRS (Total Radiated Sensitivity) requir
RP-222321	TS 38.161 v1.0.0 on NR User Equipment (UE) TRP (Total Radiated Power) and TRS (Total Radiated Sensi

With above conclusion, no further discuss needed on final round.

3 Topic #2: Rel-18 TRP TRS WI proposal

3.1 Initial round

Based on input from companies, the harmonized tentative objectives for Rel-18 list below:

- Core part
  - Tenative core_objective #1: Enhancement of the anechoic-chamber based test methodology with below potential areas
    - Sub-objective #1-1: UE with NR 2TX configuration
    - Sub-objective#1-2: Redcap device
    - Sub-objective#1-3: CA
    - Sub-objective#1-4: Verification of UE with Tx antenna switching ON
  - Tenative core_objective #2: Reverb-chamber based test methodology
  - Candidate core_objective #3: Enhancement on the testing time reduction
  - Candidate core_objective #4: MU assessment [RAN5]
- Performance part:
  - Tenative perf_objective #1: TRP TRS requirements for UE with NR of 2Tx (associated with core objective #1-1)
  - Tenative perf_objective #2: TRP TRS requirements for Redcap device (associated with core objective #1-2)
  - Tenative perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC) (based on defined methodology in Rel-17)

3.1.1 Proposals and comments collection

Issue 2-1: Tentative core_objective #1: Enhancement of the anechoic-chamber based test methodology

Detailed objective proposals as following:

- Specify necessary enhancement of the anechoic-chamber based test methodology to support (test methodology defined in TR 38.834 is the baseline):
  - UE with NR 2Tx configuration
    - Case 1: TxD (i.e., TxD capability supported)
    - Case 2: single layer UL-MIMO (i.e., codebook-based capability supported)
    - Test case applicability for case 1 and case 2
  - RedCap devices (e.g. industry sensor, video surveillance, and wearable devices)

- Considering UEs with antenna configurations of 1 Tx, 1 Rx, 2 Rx
- For wearable devices, forearm phantom should also be specified
- Other phantoms are not precluded

- UE with DL/UL carrier aggregation configuration
  - Independent measurements of each CC can be the baseline approach
  - Limited to inter-band CA cases
- Verification of UE with Tx antenna switching ON

Feedback Form 4: Tentative core_objective #1: Enhancement of the anechoic-chamber based test methodology

1 – E-surfing Digital

China Telecom:

If down-selection is needed, the first and third objectives can be prioritized, since they are based on the features in earlier releases compared to RedCap.

2 – Guangdong OPPO Mobile Telecom.

1. For 2Tx :
   - Case 1 is ok since it is the lefts in Rel-17;
   - For Case 2, it is not clear the necessity of it, since it means 1layer 2port, and UE will use only one antenna to transmit, then there is no difference from current TRP test 1layer 1port configuration. The only difference we can see is the codebook configuration, but this is base band and no impact to antenna performance. Therefore, suggest to remove this case.
2. Redcap:
   - Redcap is a wide concept and can be supported by many UE types, currently as far as we know there is no UE/chipset support this. We suggest to be focus on the test method only, and focus on wearable device type which is more mature than others.
   - UE antenna configurations depends on the bands, suggest to be clear of the targeting band.
3. CA:
   - For inter-band UL CA, the RF Tx power is determined independently in each band with total power limitation. There might be no much difference from OTA requirements besides of 3dB power back off due to RF Tx power. From this perspective, the inter-band CA can be deprioritized comparing to other candidate objectives.

3 – Apple Italia S.R.L.

We note that the number of enhancement topics could be too large for a single release. Would it be possible for the moderator to collect a list of ranked choices from each company? Our list is as follows:

#1 preference: 2 TX (can further prioritize UL MIMO over TxD if needed)

#2: RedCap

#3: CA (in general, we prefer to continue work on single-carrier TRP/TRS requirements in Rel-18 and could consider the CA objective additionally if the TAS ON objective is removed)

Regarding the verification of device TRP with TAS ON, we observed that this topic was treated the entirety of Rel-17, with no final conclusion. At least our understanding here is that TAS ON is not a feature defined by 3GPP but is rather a reference to various UE implementation techniques designed to overcome a number of user-imposed and field-imposed impairments. We are not surprised that 3GPP was unable to conclude on a measurement methodology for this and recommend dropping the objective from further consideration.

4 – Samsung Electronics Co.

We'd like some clarification for single layer UL-MIMO case for NR 2TX. Does it mean uplink full power mode 1?

For inter-band CA cases, it would be better to exclude the case when there is overlapping frequency. And should we start with 2DL and 2UL?

5 – Qualcomm Incorporated

1) UE with 2Tx: Both Case 1 and Case 2 are implemeted by UE. We support to keep both opions in the WID and we can further disucss the difference of test methdology for these two options.

2) RedCap: There are many devices types for RedCap. We suggest to prioritizing some UE types such as wearale device (watch).

3) CA: if the band combinaiton is selected based on non-MSD rule, not sure if there is much difference between single CC and CA on TRP/TRS. In addtion, the request for the band combinaitons might increse the workload. CA part can be deprioritizd if needed.

4) UE Tx switching ON: Is it for the TRP testing? In Rel-17, we focused on the TRS with antenna switching ON.

6 – Huawei Technologies France

1) UE with 2 Tx: both case 1 and 2 should be included.

2) RedCap: this can be placed at low priority or removed from scope because TRP from a RedCap device would be similar to that from a normal device and TRS could be estimated from 4Rx or 2Rx. Alternatively, the RedCap scope can focus on wearable devices as its form factor is different.

3) we prefer to continue the path on single carrier because issues such as MSD in CA complicates the picture.

7 – China Mobile Com. Corporation

Our first priority is 2Tx including both case1 and case2. Second priority is RedCap.

8 – vivo Communication Technology

Feedback to Samsung, uplink full power mode 1 could be the typical mode for single-layer UL-MIMO. But for details of other cases, may need RAN4 level further discussion.

Clarification feedback to Huawei, the redcap scope for this part is just for test methods development. Even we talk about performance, given the RedCap (e.g. wearable) would use different phantom, we may not simply say the TRP is the same and TRS can be estimated by normal UE (smartphone in Rel-17) with offset, due to potential different configuration parameters (e.g. RBs, bandwidth…)

For CA, the priority is to develop test methods. CA requirement work can be deprioritized.

Regarding the UE Tx switching ON for TRP, we are OK to deprioritize this objective.

9 – CAICT

our preference

1) UE with 2Tx

2) Redcap: It would be helpful to down-select the device types to ensure a smooth progress of the WI, focusing on the wearable devices at this stage.

Issue 2-2: Tentative core_objective #2: Reverb-chamber based test methodology

Detailed objective proposals as following:

- Specify reverb-chamber based test methodology to support SA and EN-DC TRP TRS testing:
  - Specify test methodology for UE type with 1Tx and 2Tx configuration
    - Test scenarios support: at least browsing mode, talk mode, and wrist-worn mode
  - Perform harmonization activity with reference test method is needed
    - Define harmonization framework and pass/fail criteria
  - If reverb-chamber based test methodology is found harmonized with the reference test method, then further discuss applicability of reverb-chamber based test methodology for requirements conformance testing

Feedback Form 5: Tentative core_objective #2: Reverb-chamber based test methodology

1 – Guangdong OPPO Mobile Telecom.

Reverb-chamber has been specified as the standard test method in 3G/LTE and is a fast test method which is good to reduce test costs. We support to specify it also in NR.

1. For the test scenarios support, though we agree all of scenarios can be supported, we need to be careful about the workloads and should get some prioritization in the beginning like browsing mode, after that can further consider talk mode, etc.

2. Harmonization activity can be carried out as 3G/LTE has done, low, mid, high bands can be chosen here as example bands to facilitate the discussion.

2 – Apple Italia S.R.L.

In principle, we are OK to include the RC related objective, but this should be based on operator demand. Could we identify an operator to sponsor this objective?

Regarding the objective itself, we suggest formulating it in the WID as a two-step process: in the first step we suggest focusing on harmonization with the reference methodology, and in the second step, if harmonization is confirmed, to define the related measurement methodology. Our understanding is that the harmonization part of the work would feature a test campaign to verify RC alignment with the reference methodology. The WID should also include a definition of the reference methodology to avoid any misunderstandings.

3 – Samsung Electronics Co.

We support to introduce RC chamber.

However, we are not sure if it is mature to include 2TX configuration at current stage.

4 – Qualcomm Incorporated

OK to conisder RC chamber

5 – vivo Communication Technology

Support to consider RC. For the 2Tx case, it can be studied with core_objective #1 in parallel, given this is test methods development but not for 2Tx requirements. The 2Tx requirements work will be specified based on reference methods in core_objective #1.

6 – CAICT

we are OK to include the RC related objective

Issue 2-3: Tentative core_objective #3: Enhancement on the testing time reduction

Detailed objective proposals as following:

- Develop the testing time reduction methodology for TRP and TRS testing.

Feedback Form 6: Tentative core_objective #3: Enhancement on the testing time reduction

1 – Guangdong OPPO Mobile Telecom.

Though we agree that test time reduction is important for OTA tests, we see no much progress can be made for this in Rel-17, or in other words the Rel-17 test method has taken this into account especially for EN-DC tests.

Instead of list test time reduction as a separate objective without clear view on how to reduce test time, probably it is better to be considered as a general principle in test method development, e.g.

- Test time reduction will be considered in the development of TRP and TRS testing.

2 – Samsung Electronics Co.

We support this objective.

3 – Huawei Technologies France

We agree with the comment from OPPO.

4 – vivo Communication Technology

For EN-DC we have considered the testing time reduction from reducing band combination perspective. But for the new methodologies, it is valuable to further discuss if any methods or solutions can be figured out to reduce the OTA testing time.

Still, we can not confirm whether new methods will be adopted, e.g. single point or multi-points offset approach, we prefer to update the wording as:

- Study and specify the testing time reduction methodology for TRP and TRS testing.

Issue 2-4: Tentative core_objective #4: MU [RAN5]

Detailed objective proposals as following:

- Develop the Measurement Uncertainty (MU) assessment of the above newly defined test methodologies and test configurations [RAN5]:
  - Measurement Uncertainty (MU) aspects will be handled by RAN5 and the conclusions can be captured in a separate section of the TR
  - Browsing mode, talk mode, and wrist-worn mode should be considered

Feedback Form 7: Tentative core_objective #4: MU [RAN5]

1 – Guangdong OPPO Mobile Telecom.

Generally ok with the objective. Whether the browsing mode, talk mode, and wrist-worn mode will be considered depends on the previous test method objectives.

Issue 2-5: Tentative perf_objective #1: TRP TRS requirements for handheld UE with NR of 2Tx

Detailed objective proposals as following:

- Specify TRP TRS requirements for UE with NR 2Tx based on enhanced reference test method
  - Specify the performance part framework:

- Lab alignment outcome and performance campaign framework in Rel-17 should be baseline with the following considerations:
  - Handheld UE type is the first priority
  - Consider both browsing mode and talk mode;
  - Power class 3, 2, 1.5
  - Requirement applicability of TxD and single-layer UL MIMO of the same UE should be specified

- Specify the requirements and test tolerance for UE with SA mode:
  - Band n41, n77, n78, and as the first priority
  - FDD bands are not precluded
  - Consider UE size 1 and size 2
  - SA with 1 CC is the first priority
    - CA requirements as 2nd priority. Consider developing a framework on how to develop CA requirements

Feedback Form 8: Tentative perf_objective #1: TRP TRS requirements for handheld UE with NR of 2Tx

1 – E-surfing Digital

China Telecom:

We support the objective.

2 – Apple Italia S.R.L.

The Rel-17 WID actually defined measurement methods for two test scenarios: browsing mode with hand phantom and talk mode with head+hand phantoms. In the Rel-18 WID we would like to suggest to aim the performance objectives toward defining all applicable test cases per band, such that for each band selected for OTA requirement definition we define 1 Tx, 2 Tx, browsing mode, and talk mode requirements.

3 – Guangdong OPPO Mobile Telecom.

1. As commented above, there seems no difference in OTA for single layer UL MIMO comparing to current single port tests, thus suggest to remove it.
2. It is not clear the meaning of ”UE size 1 and size 2”, suggest to clarify them.
3. For the TxD, suggest to focus on PC2 and PC1.5 and not consider PC3. And the requirement definition should only be started after test method is clear.

4 – Samsung Electronics Co. For 2TX case, we think it is better to focus on some down-selected scenarios, e.g. handheld UE with browsing mode for PC2. And we are not convinced why the CA requirements are mentioned for 2TX case if 2TX means TxD or UL full power.
5 – Qualcomm Incorporated For 2Tx, PC3 is not the case. Clarifications on UE size 1 and size 2 are needed. FDD band can be considered per the request from operators.
6 – TELECOM ITALIA S.p.A. The framework for the measurement campaign need to be discussed. We cannot accept a black box approach which does not ensure the results are unbiased. We propose to follow one of the two approaches described in RP-222160.
7 – Huawei Technologies France The scope is quite wide. We prefer to focus on wide hand phantom, PC2 and browsing mode because the performance would be comparable with the work carried out in R17.
8 – vivo Communication Technology We share similar view with Apple, also prefer to keep both browsing mode and talk mode. Further down-selection can be discussed in RAN4, if needed. We are also OK to drop CA requirements.

Issue 2-6: Tentative perf_objective #2: TRP TRS requirements for Redcap device

Detailed objective proposals as following:

- Specify TRP TRS requirements and test tolerance for RedCap UE based on enhanced reference test method
    - Band n28, n41, n78, n77, and n79 as the first priority
    - Focus on SA with single CC
    - 2RX as baseline
        - Discuss whether separate requirements for UE supports 1Rx and 2Rx
    - Maximum channel bandwidth after initial access shall be 20 MHz

Feedback Form 9: Tentative perf_objective #2: TRP TRS requirements for Redcap device

1 – Guangdong OPPO Mobile Telecom. Suggest to remove this part because of no Redcap UE/chipset on the market, or at least put on 2nd priority.
2 – Qualcomm Incorporated UE types is not clear. Suggest to prioritizing the UE type when specifying the RedCap UE requirements.
3 – TELECOM ITALIA S.p.A. The framework for the measurement campaign need to be discussed. We cannot accept a black box approach which does not ensure the results are unbiased. We propose to follow one of the two approaches described in RP-222160.

Issue 2-7: Tentative perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC)

- Specify TRP TRS requirements for UE with NR 1Tx (SA and EN-DC) based on reference test method
  - Using the lab alignment and OTA performance requirement frameworks in Rel-17 as baseline,
    - Decide whether lab alignment is needed for new test bands, new test case (talk mode) and EN-DC configuration
  - Specify the requirements and recommended tolerance for UE under browsing mode:
    - SA: n28 with PC3, n77 and n79 with PC2 and PC3
      - Consider size 1 and size 2
    - EN-DC: Band n28, n41, n77, n78, and n79 related EN-DC band combinations are the first priority, only NR carrier requirement will be specified
      - Rel-17 band combination conclusions in TS 38.161 should be the basis
      - For each newly added NR band to the scope, at least one example band combination shall be defined
  - Specify the requirements and test tolerance for UE under talk mode:
    - Bands n28, n41, n77, n78, n79 for SA and related EN-DC combinations as the first priority
      - Consider size 1 and size 2
      - For EN-DC only NR carrier requirement will be specified

Feedback Form 10: Tentative perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC)

1 – E-surfing Digital

We propose to consider n1 (PC2, PC3), n5 (PC3), n8 (PC3) as well.

2 – Apple Italia S.R.L.

The Rel-17 WID actually defined measurement methods for two test scenarios: browsing mode with hand phantom and talk mode with head+hand phantoms. In the Rel-18 WID we would like to suggest to aim the performance objectives toward defining all applicable test cases per band, such that for each band selected for OTA requirement definition we define 1 Tx, 2 Tx, browsing mode, and talk mode requirements.

3 – Guangdong OPPO Mobile Telecom.

1. We are ok to consider talk mode with head/hand phantom in Rel-18.
2. For the bands to be considered in Rel-18 performance requirement definition, the work load need to be taken into account.
3. From procedure perspective, the performance part of browsing mode can be started early since the test methods are already defined in Rel-17.
4. The meaning of ”Size 1” and ”size 2” need to be clarified.

4 – Samsung Electronics Co.

If the requirements are based on test campaign which is time consuming, we may still need to prioritize the UE power class and UE width etc.

5 – Qualcomm Incorporated

Clarification on ”Decide whether lab alignment is needed for new test bands, new test case (talk mode) and EN-DC configuration”, would it expect to use other appraoch rather than lab alignment?

It seems we will have a lot of work on the measurmenet considering the number of band combos for EN-DC.

6 – TELECOM ITALIA S.p.A.

The framework for the measurement campaign need to be discussed. We cannot accept a black box approach which does not ensure the results are unbiased. We propose to follow one of the two approaches described in RP-222160.

7 – Huawei Technologies France

We prefer to narrow the scope to n28 and n79 with wide hand phantom because n77 TRP TRS performance should be similar to that of n78 due to band overlap.

8 – vivo Communication Technology We also support to list a common bands list for performance part work for different scenarios, e.g. 1 Tx, 2 Tx, browsing mode, and talk mode. Keeping different power class and UE size in the scope is helpful, further down-selection can be done based on more information collected on number of available devices in RAN4.
9 – vivo Communication Technology Regarding the performance framework in Rel-18, we should also consider the outcome in Topic#1.

Issue 2-8: Others

Please provide your comments on others not list above e.g. timeline for Rel-18 TRP TRS WI.

Feedback Form 11: Others

1 – TELECOM ITALIA S.p.A. We would like to ensure that FDD bands are included in the Work Item proposal. Band n28 is indicated for one Tx devices, but we suggest to include also band n3 and band n7. Due to the discussion in Release 17 on the disclosure of the devices to be tested in laboratories, guidelines must be clearly identified. It is not acceptable to derive requirements without any knowledge of the set of devices tested by the labs - see RP-222160 for possible proposals
2 – SoftBank Corp. Just for a question for clarification: does the group have a plan on when (or which release) an operator can propose bands of interest, typically FDD bands with conventional configuration (PC3, 1 or 2Tx)?
3 – vivo Communication Technology Feedback to Softbank, given the OTA measurement is quite time consuming, if operators have interests on some bands, it would be better that the proposed bands can be added in the WID from the beginning, to ensure a smooth process of the project management. So, operators can share suggested bands either in this feedback form, or under each perf_objectives, i.e., perf_objective#1, perf_objective#2 and perf_objective#3.
4 – Apple Italia S.R.L. Agree with including at least one more FDD band based on operator request.
5 – Guangdong OPPO Mobile Telecom. Regarding the bands, it is ok to propose the interested bands, but from work load management point of view some prioritization still be needed.

3.1.2 First round summary

Issue 2-1: Tentative core_objective #1: Enhancement of the anechoic-chamber based test methodology

- Tentative core_objective #1: Enhancement of the anechoic-chamber based test methodology with below potential areas
    - Sub-objective #1-1: UE with NR 2TX configuration
    - Sub-objective#1-2: Redcap device
    - Sub-objective#1-3: CA
    - Sub-objective#1-4: Verification of UE with Tx antenna switching ON

Observation:

- Regarding Sub-objective #1-1: 2Tx configuration which get widest supporting from companies, this sub-objective seems stable enough to be included in Rel-18 scope.
- Regarding sub-objective #1-2 Redcap:
    - Apple, China Mobile, CAICT, OPPO, Huawei support to consider in additional to 2Tx.
        - CAICT, QC, OPPO proposed to focus on wearable device
    - Companies also mentioned we can decouple core part on test method and performance part on performance requirements i.e. only focused on introducing test method in Rel-18.
- Regarding sub-objective #1-3 CA:
    - China Telecom prefer to take this as 2nd priority in additional to 2Tx. Apple fine to take this as third priority.
    - Oppo, QC and Huawei would like to deprioritize this case.
- Regarding Sub-objective#1-4: Verification of UE with Tx antenna switching ON
    - No clear support received in 1st round comments, Apple suggests to remove this objective and vivo fine to deprioritize this one.

Proposal 3: Include below sub-objectives for Enhancement of the anechoic-chamber based test methodology

- **Sub-objective #1-1: UE with NR 2TX configuration**
- **Sub-objective#1-2: Redcap device (focused on wearable device only)**

Proposal 4: FFS whether sub-objective #1-3 inter-band CA need to be included or not

- **Option 1: not included**
- **Option 2: included as 2nd priority**

Tentative core_objective #2: Reverb-chamber based test methodology

Observation:

- All the companies to include core_objective #2 into Rel-18 WI scope.
- Apple suggest to get operators' feedback on the demand.

Proposal 5: Include core_objective #2: Reverb-chamber based test methodology into Rel-18 WI with detailed objectives as following:

- Study and, if feasible, specify reverb-chamber based test methodology to support SA and EN-DC TRP TRS testing:
    - Specify test methodology for UE type with 1Tx and 2Tx configuration
        - Test scenarios support: at least browsing mode, talk mode, and wrist-worn mode
    - Perform harmonization activity with reference test method is needed
        - Define harmonization framework and pass/fail criteria
    - If reverb-chamber based test methodology is found harmonized with the reference test method, then further discuss applicability of reverb-chamber based test methodology for requirements conformance testing

Tentative core_objective #3: Enhancement on the testing time reduction

Observation:

- Companies ok to include this objective with some suggestions on the refinement of this objective.

Proposal 6: Include core_objective #3: Enhancement on the testing time reduction into Rel-18 WI with detailed objective as following:

- Study and specify the testing time reduction methodology for TRP and TRS testing.

Issue 2-4: Tentative core_objective #4: MU [RAN5]

No much comments received for this objective. It's straightforward to include such objectives.

Proposal 7: include core_objective #4: MU[RAN5] into Rel-18 WI. (Agreed)

Issue 2-5: Tentative perf_objective #1: TRP TRS requirements for handheld UE with NR of 2Tx

Observation:

- All the companies support the tentative objectives with some suggestion on the detailed scope
- PC: Oppo and QC proposed to remove PC3 for 2Tx
- CA: Samsung and vivo suggest to remove CA case.
- Browsing mode and talk mode:
    - Apple, vivo suggests to cover both
    - Samsung and Huawei proposed to focus on browsing mode only
- Huawei also suggest to focus on wide hand phantom only.
- Oppo: Suggest to remove UL MIMO part
- Companies also suggests to clarify size 1 and size 2 (such information will be clarified in final WID)
- One company also mentioned "The framework for the measurement campaign need to be discussed" for Rel-18 performance requirements. Moderator suggests this can be discussed in Topic #1 (issue 1-1) and then we can update that part pending on the conclusion on issue 1-1.

Proposal 8: Include perf_objective #1: TRP TRS requirements for handheld UE with NR of 2Tx in to Rel-18 WI

- **Remove PC3 from the proposed scope**
- **Remove CA from the proposed scope**
- **FFS browsing mode only or both browsing mode and talk mode**
- **FFS whether consider size 1 only or both size 1 and size 2**
- **FFS wehther UL MIMO part need to be included or not**

Issue 2-6: Tentative perf_objective #2: TRP TRS requirements for Redcap device

Observation:

- One company suggests to drop this performance part or taking as 2nd priority due to no Redcap UE/chipset on the market.
- One company suggests to clarify UE type.

Based on current proposed work scope, and overall RAN4 workload. Moderator sugguests to drop this part if no strong market demand.

Proposal 9: Drop Tentative perf_objective #2: TRP TRS requirements for Redcap device

Tentative perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC)

Observation:

- China Telecom propose to consider n1 (PC2, PC3), n5 (PC3), n8 (PC3) as well.
- Huawei: prefer to narrow the scope to n28 and n79 with wide hand phantom
- Apple/vivo: Proposed to generate a common band list to cover different cases including 1Tx, 2Tx and browsing mode, and talk mode requirements.
- Some companies share the concern on the work load.

Proposal 10: Include perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC) into scope; the detailed band list including power class need to be further discussed with below as starting point:

- Specify TRP TRS requirements for UE with NR 1Tx (SA and EN-DC) based on reference test method
    - Using the lab alignment and OTA performance requirement frameworks in Rel-17 as baseline,
        - Decide whether lab alignment is needed for new test bands, new test case (talk mode) and EN-DC configuration
    - Specify the requirements and recommended tolerance for UE under browsing mode:
        - SA: n28, n5 and n8 with PC3, n1, n77 and n79 with PC2 and PC3
            - Consider size 1 and size 2
        - EN-DC: Band n28, n41, n77, n78, and n79 related EN-DC band combinations are the first priority, only NR carrier requirement will be specified
            - Rel-17 band combination conclusions in TS 38.161 should be the basis
            - For each newly added NR band to the scope, at least one example band combination shall be defined
    - Specify the requirements and test tolerance for UE under talk mode:
        - Bands n28, n41, n77, n78, n79 for SA and related EN-DC combinations as the first priority
            - Consider size 1 and size 2
            - For EN-DC only NR carrier requirement will be specified

Others

Companies are discussing how to decide FDD bands, operators feedback seems required.

3.2 Intermediate round

3.2.1 Proposals and comments collection

Issue 2-1: Tentative core_objective #1: Enhancement of the anechoic-chamber based test methodology

Proposal 3: Include below sub-objectives for Enhancement of the anechoic-chamber based test methodology

- **Sub-objective #1-1: UE with NR 2TX configuration**
- **Sub-objective#1-2: Redcap device (focused on wearable device only)**

Proposal 4: FFS whether sub-objective #1-3 inter-band CA need to be included or not

- **Option 1: not included**
- **Option 2: included as 2nd priority**

Feedback Form 12: Comments issue 2-1

1 – Guangdong OPPO Mobile Telecom. For proposal 3: - #1-1: For Case 2, it is not clear the necessity of it, since it means 1layer 2port, and UE will use only one antenna port to transmit, does it mean Mode 1 here? If it is, should be clear in the WID. For other ULFPTx modes, we don't see the necessity for TRP/TRS definition since there is only one antenna transmit which is same as current TRP/TRS tests. - #1-2: Ok For proposal 4: We perfer Option 1 to make the whole scope in a reasonable level and focus on the high demands.
2 – vivo Communication Technology For proposal 4, we believe CA test methods is quite important, this is also missing part from LTE phase. Currently, most of UEs are supporting CA features, providing guidance in 3GPP on how to verify those UEs are valuable for the OTA industry.
3 – vivo Communication Technology Especially considering EN-DC test methods have been defined in Rel-17, it is quite easy to enhance the test procedure to support CA test cases. At least, test methods for 2DL and 2UL CA, should be specified.

4 – TELECOM ITALIA S.p.A.

We would like to ask for clarification on what is expected by #1-2, since wearable devices could differ quite a lot (watches, glasses, ...) and their test environment could vary as a consequence. Is the intention of this activity to define a phantom wrist, a new head model, other?

If this is the case, the workload in RAN4 could be quite significant

5 – China Telecommunications

We are ok to include Sub-objective #1-1, and include one of Sub-objective#1-2 and Sub-objective#1-3 to balance the overall workload.

Among Sub-objective#1-2 and Sub-objective#1-3, our preference is Sub-objective#1-3 considering that it is a Rel-15 feature, but we are ok to follow majorities' view.

Regarding OPPO comment on Case 2 of #1-1 (1-layer 2-port), in our understanding, since we will only test the power, 1-layer transmission with sum of the power on 2 ports could also serve the testing purpose.

6 – China Mobile Com. Corporation

We are OK with proposal 3. For proposal 4, we support option 2, to consider CA as second priority.

7 – CAICT

Support sub-objective #1-1. For #1-2 and #1-3, at least one of them should be removed or deprioritized to balance the work load. If #1-3 is included, need to clarify up to xDL/xUL CA would be discussed.

8 – vivo Communication Technology

For #1-1, we are OK to add a statement that for single-layer UL MIMO case, mode-1 is the 1st priority.

Feedback to TIM, for #1-2, the main target is to develop test methods for wearable device, watch can be the first priority for wearable to be discussed. The corresponding forearm phantom has been defined in CTIA, RAN4 can work with CTIA for this topic, similar with what we did for wide hand phantom in Rel-17.

9 – Huawei Technologies France

we support #1-1.

For #1-2, the scenario for "wearable" should be further clarified, e.g. to limit to wearable devices on forearm only because inclusion of other types of wearable devices such as glasses would make the scope too large.

For #1-3, we prefer option 1, but are fine to include CA test methodology in an informative annex.

10 – Qualcomm Incorporated

For #1-1: We are ok witht the propsoal. Two simultaneous antenna are the target.

For #1-2: OK to restrict the device type for Redacap. Watch can be with first prioroty.

For P4, OK with option 2.

11 – China Unicom

We are fine with proposal 3.

For proposal 4, we are open to include inter-band CA scenario as 2nd priority.

12 – Samsung Electronics Co.

We just would highlight our understanding of UE with NR 2TX configuration. In our understanding the NR 2TX case should means UE relying on 2TX simultaneous transmission to achieve maximum output power. from that sense, TxD case and ULFPTx mode 1 case are enough.

Between wearable device objective and inter-band CA objective, we have no strong preference. We agree with Telecom Italia's comment that wearable device covers many UE types corresponding to different test methods.

13 – Apple Italia S.R.L.

For Proposal 3, we should clarify what 2 Tx means. To us, 2 Tx implies UL MIMO or TxD. As Samsung pointed out, UL MIMO could also have sub-cases depending on the ULFPTx mode. Since not all UEs which support UL MIMO will also support ULFPTx mode 1, we should keep the applicability more generic. If we must prioritize TxD vs UL MIMO, then we prefer to treat UL MIMO as the first priority. Regarding RedCap wearable we would prefer to prioritize the wrist-worn device type.

For Proposal 4, we can accept the CA objective as the 2nd priority.

Issue 2-2: Tentative core_objective #2: Reverb-chamber based test methodology

Proposal 5: Include core_objective #2: Reverb-chamber based test methodology into Rel-18 WI with detailed objectives as following:

- Study and, if feasible, specify reverb-chamber based test methodology to support SA and EN-DC TRP TRS testing:
  - Specify test methodology for UE type with 1Tx and 2Tx configuration
    - Test scenarios support: at least browsing mode, talk mode, and wrist-worn mode
  - Perform harmonization activity with reference test method is needed
    - Define harmonization framework and pass/fail criteria
  - If reverb-chamber based test methodology is found harmonized with the reference test method, then further discuss applicability of reverb-chamber based test methodology for requirements conformance testing

Feedback Form 13: Commments on issue 2-2

1 – Guangdong OPPO Mobile Telecom.

We support the Proposal 5, however, for the relation between test scenarios (1T/2T, browsing/talk/wrist) and the harmonization, we would like to make it clear that the harmonization can be carried out for each scenario independently, and when one of them is harmonized the RC can be applied to that scenario. It doesn't need all the scenario to be harmonized at the same time. So suggest to add below clarification:

- Note: the harmonization between anechoic chamber and Reverb-chamber based method can be applied independently for the conditions between 1T and 2T, among browsing mode, talk mode, and wrist-worn mode.

2 – Beijing Xiaomi Mobile Software

Agree with Proposal 5 and also OPPO's modification.

3 – Beijing Xiaomi Mobile Software

Agree with Proposal 5 and also OPPO's modification.

4 – Beijing Xiaomi Mobile Software

Agree with Proposal 5 and also OPPO's modification.

5 – Beijing Xiaomi Mobile Software

Agree with Proposal 5 and also OPPO's modification.

6 – Beijing Xiaomi Mobile Software

Agree with Proposal 5 and also OPPO's modification.

7 – Beijing Xiaomi Mobile Software

Sorry for the internet issue that the same comment has been submitted many times.

8 – vivo Communication Technology

Detailed test cases for harmonization can be discussed in RAN4 when we define framework. In general, we think 1Tx case with wide hand should be the 1st priority.

9 – CAICT

Proposal 5 is fine to us.

10 – Qualcomm Incorporated

We are fine with P5.

11 – Huawei Technologies France

We support proposal 5. The modification from OPPO is also fine for us. The final scope for proposal 5 should be aligned with that of anechoic chambers.

12 – Huawei Technologies France We support proposal 5. The modification from OPPO is also fine for us. The final scope for proposal 5 should be aligned with that of anechoic chambers.
13 – Samsung Electronics Co. In our understanding, 2Tx, talk mode, wrist-worn mode have not been done for AC method yet. So the harmonization between RC and AC for all scenarios may not be performed at the same time. With OPPO's note, the proposal 5 is acceptable for us.
14 – Apple Italia S.R.L. We are fine with proposal 5 and agree with OPPO's note.

Issue 2-3: Tentative core_objective #3: Enhancement on the testing time reduction

Proposal 6: Include core_objective #3: Enhancement on the testing time reduction into Rel-18 WI with detailed objective as following:

- Study and specify the testing time reduction methodology for TRP and TRS testing.

Feedback Form 14: Issue 2-3

1 – Guangdong OPPO Mobile Telecom. Ok with proposal 6.
2 – CAICT Support proposal 6.
3 – Qualcomm Incorporated OK with P6.
4 – Huawei Technologies France We support proposal 6.
5 – Apple Italia S.R.L. OK with proposal 6

Issue 2-5: Tentative perf_objective #1: TRP TRS requirements for handheld UE with NR of 2Tx

Proposal 8: Include perf_objective #1: TRP TRS requirements for handheld UE with NR of 2Tx in to Rel-18 WI

- **Remove PC3 from the proposed scope**

- **Remove CA from the proposed scope**
- **FFS browsing mode only or both browsing mode and talk mode**
- **FFS whether consider size 1 only or both size 1 and size 2**

Feedback Form 15: Comments on issue 2-5

1 – Guangdong OPPO Mobile Telecom. Ok with remove PC3, and CA. For the testing modes, we prefer to take browsing mode only as high priority to cover more bands, and de-prioritize talk mode. For the size, we prefer to only consider size 1 if it means large size.
2 – vivo Communication Technology For usage scenarios, we think it is quite important to keep both browsing mode and talk mode in the scope, given talk mode performance is valued for many regions. Further down selection and work management can be further discussed in RAN4, similar way as what we did in Rel-17. For size 1 and size 2, we prefer to keep both in the scope, but clearly state size 1 is the first priority.
3 – Qualcomm Incorporated OK to remove PC3 and CA. For talk mode, it is an important scenarios for smartphne. To balance the workload, we suggest to focuing on few bands in Rel-18.
4 – Huawei Technologies France We are fine with removing PC3 and CA. Browsing mode and wide hand should be the first priority.
5 – Samsung Electronics Co. In our view, the burden seems high if we consider different phantom scenarios and different UE width. at least we'd better down-select either phantom scenarios or UE width.
6 – Apple Italia S.R.L. We are fine to remove PC3 and CA. The beside the head + hand test case is a very important minimum requirement on smartphone performance in talk mode and should be defined in Rel-18, and we would like to elevate this to the first priority. Agree with Qualcomm that work load balance can be achieved by prioritizing the band list.

Issue 2-6: Tentative perf_objective #2: TRP TRS requirements for Redcap device

Proposal 9: Drop Tentative perf_objective #2: TRP TRS requirements for Redcap device.

Feedback Form 16: Comments on issue 2-6

1 – Guangdong OPPO Mobile Telecom. Ok with proposal 9.
2 – Beijing Xiaomi Mobile Software Agree with Prop 9 since no such UEs available at this stage.
3 – Huawei Technologies France We support proposal 9.
4 – TELECOM ITALIA S.p.A. agree
5 – Apple Italia S.R.L. OK with proposal 9

Issue 2-7: Tentative perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC)

Proposal 10: Include perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC) into scope; the detailed band list including power class need to be further discussed with below as starting point:

- Specify TRP TRS requirements for UE with NR 1Tx (SA and EN-DC) based on reference test method
  - Using the lab alignment and OTA performance requirement frameworks in Rel-17 as baseline,
    - Decide whether lab alignment is needed for new test bands, new test case (talk mode) and EN-DC configuration
  - Specify the requirements and recommended tolerance for UE under browsing mode:
    - SA: n5, n8 and n28 with PC3, n1, n77 and n79 with PC2 and PC3
      - Consider size 1 and size 2
    - EN-DC: Band n28, n41, n77, n78, and n79 related EN-DC band combinations are the first priority, only NR carrier requirement will be specified
      - Rel-17 band combination conclusions in TS 38.161 should be the basis
      - For each newly added NR band to the scope, at least one example band combination shall be defined

- Specify the requirements and test tolerance for UE under talk mode:
  - Bands n28, n41, n77, n78, n79 for SA and related EN-DC combinations as the first priority
    - Consider size 1 and size 2
    - For EN-DC only NR carrier requirement will be specified

Feedback Form 17: Comments on issue 2-7

1 – Guangdong OPPO Mobile Telecom. For the UE size, the meaning of size 1 and 2 need to be clarified. If it means the large size (large hand phantom) or small size (PDA phantom), we prefer to focus on large hand phantom due to no much small size smartphone today on the market and difficulty in collecting data. For the bands, it is better to align between browsing mode and talk mode. Besides it seems the work load will be high if we combine these bands and working modes, and sizes. The overall work load should be carefully considered.
2 – China Telecommunications For talk mode, we are fine with starting with a smaller set of bands compared to the browsing mode. But we propose to add n1 for talk mode, since there are already many commercial UEs for n1.
3 – Beijing Xiaomi Mobile Software We suggest to down select the bands for NR and EN-DC since we have only 2 bands and only SA Perf requirement defined in Rel-17. For Rel-18 we see the difficulty as currently listed 5 to 6 bands with both SA and EN-DC which results in 10 to 12 Perf requirements to be defined. Also considering we are defining more new test method in the same timeline.
4 – Beijing Xiaomi Mobile Software We suggest to down select the bands for NR and EN-DC since we have only 2 bands and only SA Perf requirement defined in Rel-17. For Rel-18 we see the difficulty as currently listed 5 to 6 bands with both SA and EN-DC which results in 10 to 12 Perf requirements to be defined. Also considering we are defining more new test method in the same timeline.
5 – vivo Communication Technology We prefer to list interested bands requested by operators in the scope, but with the understanding that further down-selection can be made in RAN4, based on more information collected from commercial devices. For the devices size, we prefer to keep size 1 (wide DUT) as first priority.
6 – Qualcomm Incorporated Need to consider the workload. There are many bands listed in the WI. We suggest to targeting 2 or 3 bands.

7 – Huawei Technologies France

In view of the work load, we prefer to focus on wide hand (or size 1) and limited numbers of bands, e.g. 2 FDD and 2 TDD bands proposed by operators.

8 – Samsung Electronics Co.

We agree with Xiaomi observation. Many bands multiply different phantom scenarios multiply different UE width multiply at least 50 devices, that will be enormous of test. We have no strong view which bands to be selected, but the band number and phantome scenarios and UE width cases should be considered together in a balance.

9 – CAICT

The definitions of Size1 and Size2 should be clearly stated in WID to avoid misunderstanding. We support wide DUT as first priority.

For the requirement development work, seems that the workload of testing and specify is high. Further down-selection per band/scenario/mode/ should be considered. It is OK to clarify the priority in WID or during WI discussion. We slightly prefer the former one but do not have strong view.

Current workload:

- browsing mode:
  - 6 bands for SA
  - 5 bands for EN-DC are first priority, at least 1 example band combination for each band
- talk mode:
  - 5 bands for SA
  - 5 band for EN-DC

10 – TELECOM ITALIA S.p.A.

Since the work was focused on TDD bands in Rel 17, we think we should focus on FDD bands in Rel 18. MNOs should indicate the bands to be prioritized (the list of prioritized bands could be compiled by RAN#98)

11 – Apple Italia S.R.L.

Overall, the proposed objectives are very good, and we agree with the comments that the list of bands should be further prioritized. Don't agree with Telecom Italia to leave this discussion until the next meeting. We have all operators engaged in this discussion, and it should be possible to find 2 or 3 bands which can be listed as the 1st priority during this week.

Regarding DUT size, we are fine to focus on the w > 72mm phantom in Rel-18, although not ever defining the w < 72 mm would not be good, since it had been shown in CTIA that for a device with w ~= 72mm there is a significant performance difference depending on which hand phantom is used. If 3GPP leaves requirements for this size undefined, it could lead to misunderstanding of the requirement by outside forums in the future.

3.2.2 Second round summary

Issue 2-1: Tentative core_objective #1: Enhancement of the anechoic-chamber based test methodology

For Proposal 3 (2Tx case), companies would like to clarify with case 1 TxD and case 2 UL MIMO case. For UL MIMO case, ULTXP mode 1 shall be considered as 1st priority.

For proposal 3(Redcap case), companies would like to clarify watch shall be 1st priority.

The updated proposal 3 as following:

Updated proposal 3: Include below sub-objectives for Enhancement of the anechoic-chamber based test methodology(Agreeable)

- **Sub-objective #1-1: UE with NR 2TX configuration**
  - Case 1: TxD (i.e., TxD capability supported)
  - Case 2: single layer UL-MIMO (i.e., codebook-based capability supported)
    - ULFPTx mode1 as **1st**priority
  - Test case applicability for case 1 and case 2
- **Sub-objective#1-2: Redcap device (focused on wearable device only)**
  - Wrist-worn device as 1st priority

For proposal 4 (inter-band CA), companies ok to take this as 2nd priori**ty**

Updated proposal 4: Include sub-objective 1-3 inter-band CA as 2nd priority (Agreeable)

- Limited up to 2DL/2UL cases

Issue 2-2: Tentative core_objective #2: Reverb-chamber based test methodology

All companies fine with proposal 5 with modifications from OPPO.

Updated proposal 5: Include core_objective #2: Reverb-chamber based test methodology into Rel-18 WI with detailed objectives as following: (Agreed)

- Study and, if feasible, specify reverb-chamber based test methodology to support SA and EN-DC TRP TRS testing:
    - Specify test methodology for UE type with 1Tx and 2Tx configuration

        - Test scenarios support: at least browsing mode, talk mode, and wrist-worn mode

    - Perform harmonization activity with reference test method is needed

        - Define harmonization framework and pass/fail criteria
        - Note: the harmonization between anechoic chamber and Reverb-chamber based method can be applied independently for the conditions between 1T and 2T, among browsing mode, talk mode, and wrist-worn mode.

    - If reverb-chamber based test methodology is found harmonized with the reference test method, then further discuss applicability of reverb-chamber based test methodology for requirements conformance testing

Issue 2-3: Tentative core_objective #3: Enhancement on the testing time reduction

All companies ok with proposal 6. Proposal 6 agreed

Issue 2-5: Tentative perf_objective #1: TRP TRS requirements for handheld UE with NR of 2Tx

All the companies ok to remove CA and PC3 from the scope. For browsing mode and talk mode, 2 companies prefer to prioritize browsing mode and 3 companies mentioned talk mode is important mode for smart phones. It's hard to down scope or make prioritization in this RAN. Moderator suggest to keep both browsing mode and talk mode and add a note" Further prioritization not precluded" For size 1 and size 2, companies seem ok to take size 1 as 1st priority.

Updated Proposal 8: Include perf_objective #1: TRP TRS requirements for handheld UE with NR of 2Tx in to Rel-18 WI (Agreeable)

- Remove PC3 from the proposed scope
- Remove CA from the proposed scope
- Include both browsing mode and talk mode
    - **Further prioritization not precluded**
- Include both size 1 and size 2
    - Size 1 as 1st priority
- Note 1: Size 1 (wide, width >72mm and ≤92mm), Size 2 (narrow, width ≥56mm and ≤72mm);
- Note 2: Browsing mode (hand phantom only), Talk mode (head and hand phantom);

Issue 2-6: Tentative perf_objective #2: TRP TRS requirements for Redcap device

All the companies ok with proposal 9, proposal 9 agreed.

Issue 2-7 Tentative perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC)

All the companies ok with proposal 10 of proposed objectives, meanwhile companies share concern on the workload and suggest to make further priority list. China Telecom proposed to include band n1 for talk mode.

Moderator suggests to endorse proposal 10 and further discuss the priority list during final round; if no further agreement reached on priority list during this RAN-P then we can continue the effort during WI phase similar as we did in the Rel-17 WI.

Proposal 10: Include perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC) into scope with the detailed band list below as starting point (Agreeable)

- Specify TRP TRS requirements for UE with NR 1Tx (SA and EN-DC) based on reference test method
    - Using the lab alignment and OTA performance requirement frameworks in Rel-17 as baseline,
        - Decide whether lab alignment is needed for new test bands, new test case (talk mode) and EN-DC configuration
    - Specify the requirements and recommended tolerance for UE under browsing mode:
        - SA: n28, n5 and n8 with PC3, n1, n77 and n79 with PC2 and PC3
            - Consider size 1 and size 2
        - EN-DC: Band n28, n41, n77, n78, and n79 related EN-DC band combinations are the first priority, only NR carrier requirement will be specified
            - Rel-17 band combination conclusions in TS 38.161 should be the basis
            - For each newly added NR band to the scope, at least one example band combination shall be defined
    - Specify the requirements and test tolerance for UE under talk mode:
        - Bands n1, n28, n41, n77, n78, n79 for SA and related EN-DC combinations as the first priority
            - Consider size 1 and size 2
            - For EN-DC only NR carrier requirement will be specified
    - Further prioritization on band list not precluded

3.3 Final round

With 2 round discussions, the proposed scope and detailed objectives for continued Rel-18 MIMO OTA WI seem stable enough.

All the proposals agreeable which list below: (companies can continue discuss the prioritization of band list from proposal 10.)

Issue 2-1: Tentative core_objective #1: Enhancement of the anechoic-chamber based test methodology

Updated proposal 3: Include below sub-objectives for Enhancement of the anechoic-chamber based test methodology(Agreeable)

- **Sub-objective #1-1: UE with NR 2TX configuration**
    - Case 1: TxD (i.e., TxD capability supported)
    - Case 2: single layer UL-MIMO (i.e., codebook-based capability supported)
        - ULFPTx mode1 as **1st**priority
    - Test case applicability for case 1 and case 2
- **Sub-objective#1-2: Redcap device (focused on wearable device only)**
    - Wrist-worn device as 1st priority

Updated proposal 4: Include sub-objective 1-3 inter-band CA as 2nd priority (Agreeable)

- Limited up to 2DL/2UL cases

Issue 2-2: Tentative core_objective #2: Reverb-chamber based test methodology

Updated proposal 5: Include core_objective #2: Reverb-chamber based test methodology into Rel-18 WI with detailed objectives as following: (Agreed)

- Study and, if feasible, specify reverb-chamber based test methodology to support SA and EN-DC TRP TRS testing:
    - Specify test methodology for UE type with 1Tx and 2Tx configuration
        - Test scenarios support: at least browsing mode, talk mode, and wrist-worn mode
    - Perform harmonization activity with reference test method is needed
        - Define harmonization framework and pass/fail criteria
        - Note: the harmonization between anechoic chamber and Reverb-chamber based method can be applied independently for the conditions between 1T and 2T, among browsing mode, talk mode, and wrist-worn mode.
    - If reverb-chamber based test methodology is found harmonized with the reference test method, then further discuss applicability of reverb-chamber based test methodology for requirements conformance testing

Issue 2-3: Tentative core_objective #3: Enhancement on the testing time reduction

Proposal 6: Include core_objective #3: Enhancement on the testing time reduction into Rel-18 WI with detailed objective as following: (Agreed)

- Study and specify the testing time reduction methodology for TRP and TRS testing.

Issue 2-4: Tentative core_objective #4: MU [RAN5]

Proposal 7: include core_objective #4: MU[RAN5] into Rel-18 WI. (Agreed in 1st round)

Issue 2-5: Tentative perf_objective #1: TRP TRS requirements for handheld UE with NR of 2Tx

Updated Proposal 8: Include perf_objective #1: TRP TRS requirements for handheld UE with NR of 2Tx in to Rel-18 WI (Agreeable)

- Remove PC3 from the proposed scope
- Remove CA from the proposed scope
- Include both browsing mode and talk mode
    - Further prioritization not precluded
- Include both size 1 and size 2
    - Size 1 as 1st priority
- Note 1: Size 1 (wide, width >72mm and ≤92mm), Size 2 (narrow, width ≥56mm and ≤72mm);
- Note 2: Browsing mode (hand phantom only), Talk mode (head and hand phantom);

Issue 2-6: Tentative perf_objective #2: TRP TRS requirements for Redcap device

Proposal 9: Drop Tentative perf_objective #2: TRP TRS requirements for Redcap device (Agreed)

Issue 2-7 Tentative perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC)

Proposal 10: Include perf_objective #3: TRP TRS requirements for handheld UE with NR of 1Tx (SA and EN-DC) into scope with the detailed band list below as starting point (Agreeable)

- Specify TRP TRS requirements for UE with NR 1Tx (SA and EN-DC) based on reference test method
    - Using the lab alignment and OTA performance requirement frameworks in Rel-17 as baseline,
        - Decide whether lab alignment is needed for new test bands, new test case (talk mode) and EN-DC configuration
    - Specify the requirements and recommended tolerance for UE under browsing mode:
        - SA: n28, n5 and n8 with PC3, n1, n77 and n79 with PC2 and PC3
            - Consider size 1 and size 2

- EN-DC: Band n28, n41, n77, n78, and n79 related EN-DC band combinations are the first priority, only NR carrier requirement will be specified
    - Rel-17 band combination conclusions in TS 38.161 should be the basis
    - For each newly added NR band to the scope, at least one example band combination shall be defined
- Specify the requirements and test tolerance for UE under talk mode:
    - Bands n1, n28, n41, n77, n78, n79 for SA and related EN-DC combinations as the first priority
        - Consider size 1 and size 2
        - For EN-DC only NR carrier requirement will be specified
- Further prioritization on band list not precluded

3.3.1 Proposals and comments collection

For final round discussion, moderator suggests volunteer vivo to provide the revised WID based on the conclusion from intermediate round into inbox folder:

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_97e/Inbox/Drafts/%5B97e-28-R17-UE-TRP-TRS%5D

Companies, please provide your comments on the revised WID and TU request file.

Feedback Form 18: Comments on revised WID

1 – Qualcomm Incorporated We support the propsoals from moderator. The revised WID looks good to us.
2 – TELECOM ITALIA S.p.A. In my understanding the conclusion on (partial) disclosure of the DUTs should be reflected in the WI description – as concluded in proposal 1 in topic #1 (Rel 17 handling).
3 – Guangdong OPPO Mobile Telecom. Generally the revised WID is good, and we support. 1. Regarding 2T case 2 (single layer UL MIMO), suggest to make it clear that this is only for Mode 1 since only Mode 1 can transmit with 2T TxD, the mode 0 and 2 will transmit only with 1T. Therefore, changes as below: - Case 2: single layer UL-MIMO (i.e., codebook-based capability supported) **with ULFPTx mode1**   - ~~ULFPTx mode1 as **1st** priority~~

2. Regarding the performance part, currently there are too many factors to be considered, like **UE size, browse/talk mode, PC3/2/1.5, TxD/ULFPTx, 1T/2T, SA/ENDC, and 10 proposed bands**... This means if we combine them together then the whole testing work will have:

- **For 2T case:** 3bands * 2UE size * 2phantom* 2PowerClass* 2Tx(TxD/Mode1) = **48 requirements**
- **For 1T case:** (8PC3 bands + 5PC2 bands) * 2UE size * 2phantom = **52 requirements**
- **For EN-DC case,** the bands in SA will be considered.

Then in total the requirements will be at least 100 requirements !!! without considering EN-DC.

We have to make some down selection on the whole task. And some of the conditions need to be put on 2nd priority. Now the large size is prioritized, but still 50 requirements needs to be defined if the small size is not even considered. In this situation, we suggest to either reduce the bands, or we have to de-prioritize the talk mode (head and hand phantom). And our preference is to enhance the browsing mode with more bands covered, but de-prioritize the talk mode in the performance work and consider it as best effort approach.

4 – Beijing Xiaomi Mobile Software

Thanks for all the discussion and generally we would like to further develop the TRP/TRS industry within 3GPP in the Rel-18 timeline. However, as stated in our intermidiate round comments and also similar as commented above by OPPO, we only specify 2 requirements in Rel-17 timeline while we are going to specify too many requirements in Rel-18. We would like to further down scope the number of Rel-18 Performance requirements.

5 – Huawei Technologies France

We support the WID and the associated TU allocation.

6 – vivo Communication Technology

Thanks for the comments, we fully understand it is a challenge to finalize all the requirements, so the understanding is that this is the overall target (from current operators request) but RAN4 will further down select based on collection of more commercial devices information in the market, this is also the same way as we did in Rel-17. RAN4 decided further focus on 1Tx with PC2 for wide hand for two bands.

Based on the interests collected from 1st and 2nd round, and offline, different companies have different preference, it would be good to further discuss prioritization in RAN4 with more information we have. (e.g. primary power class, widely supported popular bands, number of available devices, in different regions …)

For 1-layer UL-MIMO, after further checking RAN1 spec TS 38.211, we believe several index can support 1-layer UL-MIMO for different type UE (coherent or noncoherent), so list ULFPTx mode1 may not be accurate. We prefer keep this bullet general, and further discuss the detailed configurations in RAN4, not only from UE configuration perspective, but also from Test system feasibility perspective.

§ Case 2: single layer UL-MIMO (i.e., codebook-based capability supported)

- ~~ULFPTx mode1 as **1st** priority~~
- *Study proper configuration from UE implementation and test system feasibility perspective*

Regarding the Rel-17 “additional information” disclose conclusion, we can capture the similar aspects in the WID for further discussion in RAN4.

FFS whether and which information could be shared during Rel-18 measurement campaign:

- *[Number of models tested by the labs]*
- *[Number of vendors that produced the models]*
- *[percentage of tested devices per vendor]*
- *[Percentage of models per production year]*
- *[Power Class of the devices]*

7 – TELECOM ITALIA S.p.A.

To Vivo: to avoid again the discussion we had at this plenary, we require to remove the FFS on the information to be shared during Rel-18 measurement campaign.

A possible text proposal is:

RAN4 to define the information to be shared during Rel-18 measurement campaign:

- [Number of models tested by the labs]

- **[Number of vendors that produced the models]**
- **[percentage of tested devices per vendor]**
- **[Percentage of models per production year]**
- **[Power Class of the devices]**
- **[other]**

8 – vivo Communication Technology

Thanks for the suggested wording, fully understand we should avoid repeated discussion for this topic. Then, I think it would be good that we reuse exactly the same wording of the agreed conclusions:

Taking option 2 as starting point to further discuss which information needed including

1. [Number of models tested by the labs]
2. Number of vendors that produced the models
3. percentage of tested devices per vendor
4. Percentage of models per production year
5. [Power Class of the devices]

9 – Orange

we support the view from TIM to remove the FFS and agree with TIM’s wording proposal

3.3.2 Final round summary

Based on final round comments and feedback, seems the latest version of draft WID already address all the comments and agreeable.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_97e/Inbox/Drafts/%5B97e-28-R17-UE-TRP-TRS%5D/rev%20RP-222142%20New%20WID%20for%20Rel-18%20TRP%20TRS%20_after%20final%20round.doc

Moderator recommends to approved latest version of Rel-18 TRP TRS WI.

4 Conclusion

Topic #1 Rel-17 FR1 TRP TRS handling (Concluded in intermediate round)

Updated proposal 1 &2 as following endorsed:

Updated proposal 1: Taking option 2 as starting point to further discuss which information needed including

1. [Number of models tested by the labs]
2. Number of vendors that produced the models
3. percentage of tested devices per vendor
4. Percentage of models per production year
5. [Power Class of the devices]

Updated proposal 2: The information collection activity can be handled in Rel-17 maintenance phase with Rel-17 TRP TRS WI concluded in RAN#97-e

Recommendation of t-docs as following:

Tdoc	Title
RP-222152	Status report for WI perf.part: Introduction of UE TRP (Total Radiated Power) and TRS (Total Radiated Se
RP-222160	Considerations on TRP and TRS measurement campaign
RP-222269	Revised WID: Introduction of UE TRP (Total Radiated Power) and TRS (Total Radiated Sensitivity) requir
RP-222321	TS 38.161 v1.0.0 on NR User Equipment (UE) TRP (Total Radiated Power) and TRS (Total Radiated Sensi

Topic #2 Rel-18 TRP TRS WI proposal

Recommendation of t-docs

Table

Tdoc	Title
RP-222071	Motivation of R18 FR1 TRP TRS
RP-222072	R18 New WID on FR1 TRP TRS
RP-222141	Motivation for new WID: Rel-18 TRP/TRS
RP-222142	New WID: Rel-18 TRP/TRS
RP-222178	Motivation paper for NR FR1 TRP TRS work in Rel-18
RP-222179	New WID: Continuation of UE TRP (Total Radiated Power) and TRS (Total Radiated Sensitivity) requirem