

v4  
Variant of [98e-27-R18-FR2\_multiRx\_DL] Version 0.0.4  
RAN

<https://nwm-trial.etsi.org/#/documents/8401>

3GPP TSG-RAN Meeting #98e RP-223467

Electronic Meeting, 12 – 16 December 2022

Agenda item: 9.3.4.4

Source: Moderator (RAN4 Vice-Chair - Intel)

Title: Email discussion summary for [98e-27-R18-FR2\_multiRx\_DL]

Document for: Information

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## 1 Introduction

This document is the summary of the RAN#98-e email discussion [98e-27-R18-FR2\_multiRx\_DL].

The following documents are covered in this email thread.

**Table 1:**

<b>Tdoc</b>	<b>Title</b>	<b>Source</b>
RP-223157	RRM Scope of multi-Rx chain DL reception	Qualcomm Incorporated

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## 2 Initial round

### 2.1 Open issues

**Issue #1: Rel-18 NR\_FR2\_multiRX\_DL WI RRM-related objectives**

The FR2\_multiRX\_DL WI RRM Core part objectives are provided in the WID RP-221753 as follows:

**Table 2: Original RRM objectives (RP-221753)**

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*Introduce necessary requirement(s) for enhanced FR2-1 UEs with simultaneous DL reception from different directions with different QCL TypeD RSs on a single component carrier*

- *Enhanced RRM requirements:*
  - *The following requirements should be studied and specified if necessary:*
    - *L1-RSRP measurement delay*
    - *L3 measurement delay (both cell detection delay and measurement period can be considered)*
      - *The starting point is the enhancements related to L1-RSRP measurement enhancements*
    - *RLM and BFD/CBD requirements*
    - *Scheduling/measurement restrictions*
    - *TCI state switching delay with dual TCI*
    - *Receive timing difference between different directions (different QCL Type D RSs)*

In RP-223157 it is proposed to further discuss and adjust the RRM objectives. In particular, the paper notes that “*The RRM discussions in the previous RAN4 meetings were very complicated and a lot of time was consumed discussing different proposals which are enhancements enabled by UE’s capability of simultaneous reception (e.g. UE receiving data from one direction while performing measurements in a different direction, etc). It should be noted that even though this item has a maximum of 1TU allocated for RRM core, about 60 papers were submitted to RAN4#105 and 3 email threads were assigned in both RAN4#104-bis-e and RAN4#105. Considering this, there is a risk that the work will not be completed on time if the discussion is not focused on the requirements that are needed to enable this feature.*” The following observations and proposals are made in RP-223157:

**Table 3: Proposals and observations in RP-223157**

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**Observation:** *There is a risk that the RAN4 RRM discussion will not be completed as planned if the discussion is not focused on the requirements needed to enable the feature.*

**Proposal:** *The WID [1] should be updated such that that RRM discussion is focused on requirements which are needed to enable simultaneous DL reception.*

*The RRM related WID objectives should be modified as follows:*

*Introduce necessary requirement(s) for enhanced FR2-1 UEs with simultaneous DL reception from different directions with different QCL TypeD RSs on a single component carrier*

- *Enhanced RRM requirements:*
  - *The following requirements should be studied and specified if necessary to enable simultaneous DL reception:*
    - *L1-RSRP measurement delay*
    - *L3 measurement delay (both cell detection delay and measurement period can be considered)*
      - *The starting point is the enhancements related to L1-RSRP measurement enhancements*
    - *RLM and BFD/CBD requirements*
    - *Scheduling/measurement restrictions*
    - *TCI state switching delay with dual TCI*
    - *Receive timing difference between different directions (different QCL Type D RSs)*

Moderator recommends further discussion on the WID modification proposed in RP-223157 and other possible modifications on the WID related to possible down-scoping or clarifications on the WI RRM objectives. Companies are encouraged to provide views on:

1. Proposal in RP-223157
2. Possible modifications of objectives on enhanced RRM requirements. To structure discussion companies are encouraged to share views on down-scoping or clarifications on general RRM objective as well as on candidate RRM enhancements listed in the WID:
  - a) *L1-RSRP measurement delay*
  - b) *L3 measurement delay (both cell detection delay and measurement period can be considered)*
  - c) *RLM and BFD/CBD requirements*
  - d) *Scheduling/measurement restrictions*
  - e) *TCI state switching delay with dual TCI*
  - f) *Receive timing difference between different directions (different QCL Type D RSs)*

**Feedback Form 1: Comments on RRM objectives for NR\_FR2\_multiRX\_DL WI**

**1 – Ericsson LM**

We understand the motivation to have necessary RRM requirements and reduce work load. But with current modification, there is risk that it can be interpreted as if no new L1 measurement requirements are needed for multi-RX chain. Whether any L1 measurement is needed or not should be decided by RAN4 since RAN4 can access the impact. So we prefer to keep the original wording of the objective. However, the bullet (b) on L3 measurements should be removed. It is unrealistic to define any new L3 measurement delay since L1 measurements are pre-requisite and which also need quite a lot of discussion in RAN4.

**2 – MediaTek Inc.**

We support the proposal in RP-223157. The only reason that UE wants to burn extra power by activating 2 panels simultaneously is to increase the data throughput, i.e., for simultaneous data reception with 2 panels, because it can be easily and directly improve end-user experience. Other enhancements such as reducing the measurement delay do not bring significant enough benefits to justify the additional power consumption.

We also agree with Ericsson’s suggestion to remove bullet (b). As we know, the multiRx UE does not move any faster than legacy UE. Therefore we fail to see the need to reduce the L3 measurement delays.

As this WI really consumes many discussion efforts in RAN4. It is important that Plenary can provide a guidance on prioritizing some specific requirements over the others. So that RAN4 can focus on what really needed and can finish the work in time.

**3 – Apple (UK) Limited**

We have a slightly different view than RP-223157. To support simultaneous DL reception, a UE is required to have two active panels. Compared to legacy UEs, this means a significant enhancement to UE hardware capability. Given the UE has such an enhanced capability, it is reasonable to consider all the potential RRM improvements to maximize the return on investment instead of limiting the consideration. Furthermore, as this RAN4 WI is based on multi-TRP/multi-panel scenarios/features specified in RAN1 in R16 and R17, it is natural that RAN4 would need a bit time to sort out the relevant aspects, have technical discussions, and then converge on what RRM enhancements should be specified. In particular, RAN4 just made an agreement in Nov. meeting regarding L3 measurements:

- o The following L3 related requirements enhancements should be studied and specified if necessary

- § L3 measurements in RRC Connected mode

- § Note: other enhancements are deprioritized

Therefore, we believe RAN plenary intervention at this moment is not needed. Instead, RAN4 should be given more time to consider all the technical aspects and decide what RRM enhancements can and should be specified.

**4 – Beijing Xiaomi Mobile Software**

With the current modification in RP-221753, it is still not clear what requirements are necessary to enable simultaneous DL reception and hence the modification cannot help to make the WID scope clearer. During the last RAN4 meeting, as stated also by Apple, the chairman has already down scoped the L3 measurement enhancement and clarify the enhancement is not limited to the simultaneous DL reception. We believe

further down scoping can be reached. For the requirements itself, we see as listed from a to f have already been discussed in RAN4 while we need more clarification on scenarios and UE capabilities, with that part clarified, the requirement enhancement will be easier to accomplish.

#### **5 – Huawei Technologies France**

We are fine with the proposal in RP-223157. The most important motivation of FR2 enhancements with activating two panels is to support simultaneous data receptions in multi-TRP scenarios. The discussion on RRM requirement enhancements can be based on this assumptions. RAN4 to discuss which RRM requirements need to be enhanced for supporting this purpose. We also agree that L3 measurement enhancements are more related to mobility enhancement rather than simultaneous reception enhancements, and the bullet on L3 measurements can be removed.

#### **6 – Samsung Electronics Co.**

We are fine with the modification in RP-223157. We understand the motivation is to narrow the discussion on what should be the requirements when enable the simultaneous DL reception.

For the down-scoping, we think b) is an item can be removed. When simultaneous DL reception, current L3 delay should be reused if multi-RX are independent. The other prioritized items should be considered firstly.

#### **7 – QUALCOMM JAPAN LLC.**

Our proposal was motivated by the fact that this WID has become a "basket" for new enhancements when the purpose of it is to introduce the requirements needed to enable this feature that is already defined.

To Ericsson's comment: in our view, L1 measurement requirements/enhancements might be needed to enable this feature, for example, in the last meeting it was agreed that group based reporting is one of the means to enable this feature. if requirements for group based reporting are needed, these would be considered essential.

To Apple: many enhancements(for example faster measurements by measuring simultaneously over multiple directions) can be done through implementation and the UE performance should improve anyway(if this enhancements brings an improvement). Many other enhancements being proposed are rather complicated and will need some level of network support that is not trivial.

Enhancements can be further discussed in a future WI that will be focused on them. After 3 RAN4 meetings, the progress on RRM is relatively small.

We believe b and d can clearly be removed. For c, we can discuss if anything related to support of dual TCI is needed.

#### **8 – ZTE Corporation.**

We understand the motivation in RP-223157 but we do not agree with such down-scoping on the WI objectives.

On one hand, in the recent RAN4#105 meeting, some discussion about the scope of the WI has been held and the following agreements has been achieved.

##### **<Agreement >:**

- o The following L3 related requirements enhancements should be studied and specified if necessary

§ L3 measurements in RRC Connected mode

§ Note: other enhancements are deprioritized

To our understanding, the above agreements means RAN4 has consume a lot of time to clarify the scope and some partial conclusion has been achieved. At this stage, ignore all previous discussion is a kind of retrogression.

On the other hand, for a powerful UE who supports simultaneous multi-panel Rx, only applying such powerful capability into the 4 layer DL reception, it is a kind of waste. We always believe all the objectives in the original WID are worth to be studied and enhanced. All these RRM aspects are helpful for 4 layer DL reception. More efficient L1 measurement, RLM, BFD, CBD would improve the reliability of DL data reception. And the measurement period of L1 measurement would be impacted by L3 measurement. Further more, the enhancements on such RRM aspects are also our motivation beside the multi-layer DL data reception.

#### **9 – LG Electronics Inc.**

We think it doesn't need to revise the WID since RAN4 has already discussed in the last RAN4 meeting. In RAN4#105, RAN4 agreed that L3 related requirements enhancements should be studied and specify if necessary, and in order to reduce workload, it was limited to CONNECTED mode only. We prefer to keep the RAN4 agreements.

#### **10 – NTT DOCOMO INC.**

We can understand the motivation in the contribution. As stated in Qualcomm's comment, the progress of RRM work is relatively small, so some kind of deprioritization, direction alignment, or narrow down should be considered at this stage. We can compromise to deprioritize at least b). Other items need more discussions.

#### **11 – vivo Mobile Communication (S)**

Firstly, the change Proposal in RP-223157 does not actually clarify the scope. There are different understandings on "enable simultaneous DL reception". It can be simultaneous DL reception of data and RS, or simultaneous DL reception of RSs.

We understand the proposal in RP-223157 is to make the WI discussions more focused considering the RRM workload and diverse of discussions. However, there are still different views even if only RRM requirements related to simultaneous PDSCH/PDCCH reception is considered. For example, the group-based beam reporting is a function for network to figure out the beam pairs that UE can be used for simultaneous reception. But UE is not required to monitor CSI-RS resources simultaneously based on report setting. The function can work without further RRM requirements enhancement. In our view, maybe only RRM requirements for TCI state switching with dual TCI are necessary for simultaneous data reception.

In addition, we also think it is beneficial to take advantage of UE capability of multi-panel reception and related RRM requirements can be considered. RAN4 agreed in the last meeting to further study the feasibility of enhancing scheduling restriction/measurement restriction requirements. We can wait for one meeting cycle to see the progress of such feasibility study.

Therefore, we think the change as in RP-223157 may be considered in the next RAN plenary meeting depending on progress in RAN4 in Feb. meeting 2023.

## 12 – China Mobile Com. Corporation

We are fine with the proposal in RP-223157 to focus on requirements to enable simultaneous DL reception. For the detailed subbullet on the requirements, we can leave the technical discussion and downscoping to RAN4.

## 13 – Intel Corporation (UK) Ltd

For proposal in RP-223157 – We understand the motivation. However, we don't think it's necessary and it may cause additional ambiguity as there will be debate on exactly which enhancements to current requirements are necessary to 'enable simultaneous DL reception'.

For the topic down-scoping, we are open to further discuss and prioritize the sub-objectives if needed.

For L3 measurement delay – RAN4 already made some down-scoping and focused on RRC CONNECTED mode. If RAN would like to further down-scope some subjects, we are fine to de-prioritize this sub-objective as well. From our understanding, L3 related measurement enhancement (not related to delay) is not precluded from the other objectives, e.g. Scheduling/measurement restrictions.

## 14 – Nokia France

We agree with Ericsson that the original wording of the objective should be retained. The purpose of the objective is not only about enabling simultaneous DL reception, but, as stated in the justification section of the WID, “Enhanced NR FR2 UEs with multi-beam simultaneous reception and multiple RX chains can provide a meaningful performance improvement in FR2 improving ... RRM performance .... This work item aims to introduce the requirements for UEs capable of multi-beam/chain simultaneous DL reception on a single component carrier to achieve improved RF, **RRM** and UE demodulation performance.” (emphasis ours).

In order to find a way forward that constrains the solutions to a reasonable extent without precluding useful RRM performance gains, we propose the following:

- *Introduce necessary requirement(s) for enhanced FR2 UEs with simultaneous DL reception from different directions with different QCL TypeD RSs on a single component carrier*
  - o *Enhanced RRM requirements when simultaneous DL reception from different directions is in use:*
    - *The following requirements should be studied and specified if necessary:*
      - *L1-RSRP measurement delay*
      - *L3 measurement delay (both cell detection delay and measurement period can be considered)*
        - ◆ *The starting point is the enhancements related to L1-RSRP measurement enhancements*
      - *RLM and BFD/CBD requirements*
      - *Scheduling/measurement restrictions*

- *TCI state switching delay with dual TCI*
- *Receive timing difference between different directions (different QCL Type D RSs)*

Note: The WID update can be discussed in the intermediate/final rounds in case there is a consensus to modify the WI objectives.

## 2.2 Summary from Initial Round

### Summary of comments

14 companies provided comments in the initial round. Companies' views can be summarized as follows:

- General views on RRM objectives
  - Several companies acknowledged that the RRM scope is relatively large and that further reasonable RRM objectives prioritization can be performed
  - At least 5 companies do not see the need for any down-scoping at current stage
  - Several companies commented that RAN4 already agreed to limit the scope to RRC Connected mode for L3 measurements enhancements
  - Several companies commented that that the key motivation of multi-Rx chain UEs is to improve throughput performance rather than improve RRM performance.
  - Several companies commented that multi-Rx chain UEs would result in substantially increased complexity of UE hardware implementations and that potential RRM improvements are required to justify the changes along with throughput improvements
- Views on Proposal in RP-223157
  - 5 companies supported Proposal in RP-223157
  - 8 companies did not support the Proposal in RP-223157 and preferred to keep the original wording of the WID objectives. Several companies shared a view that the proposed wording does not make the text clearer. Several companies admitted that proposed text would result in additional discussions in RAN4 on the identification of RRM requirements related to “enabling simultaneous DL reception”.
  - Several companies shared a view that the proposed wording does not make the text clearer. Several admitted that proposed text would result in additional discussions in RAN4 on the identification of RRM requirements related to “enabling simultaneous DL reception” unless there is a clear guidance from the plenary.
  - 1 company proposed alternative wording: “Enhanced RRM requirements when simultaneous DL reception from different directions is in use: ...”
- Views on candidate modifications of objectives on enhanced RRM requirements.

- 5 companies commented that no down-scoping is needed at current stage at all
- 6 companies proposed to de-prioritize sub-objective b ('L3 measurement delay')
- 1 company proposed to de-prioritize sub-objective d ('Scheduling/measurement restrictions')
- 1 company proposed to further discuss details of sub-objective c ('RLM and BFD/CBD requirements')
- 1 company proposed to leave decision up to RAN4 under assumption that Proposal in RP-223157 is approved

### **Moderator summary**

- **Proposal in RP-223157:** There is no consensus to update WID objectives based on Proposal in RP-223157 and moderator does not see a good chance to converge on a general statement, which would reduce the scope and be acceptable for the group. The existing WID does not restrict the RRM enhancements to be necessarily coupled with simultaneous DL reception. Therefore, moderator recommends no further discussion on Proposal in RP-223157 and the tdoc can be noted.
- **Enhanced RRM requirements sub-objectives prioritization:** There are diverse views on whether a prioritization of specific sub-objectives is required. There is a good level of support among the companies to de-prioritize the work on 'L3 measurement delay' reduction. From the moderator perspective such proposal can be considered in the intermediate round as a reasonable compromise to reduce the workload. An alternative approach is to continue work in RAN4 based on the existing objectives, and make further check during March or June plenary to assess the progress.
- For the intermediate round moderator propose to discuss between the following alternative proposals
  - Alternative 1: De-prioritize and remove RRM objective on 'L3 measurement delay' from the WID
  - Alternative 2: Keep the existing WI RRM sub-objectives unchanged and, if needed, perform down-scoping in RAN#100 subject to RAN4 work progress

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## **3 Intermediate round**

### **3.1 Open issues**

For the intermediate round moderator proposes to discuss between the following alternative proposals

- **Alternative 1:** De-prioritize and remove objective on 'L3 measurement delay' from the WID
- **Alternative 2:** Keep the existing WI RRM sub-objectives unchanged and, if needed, perform down-scoping in RAN#100 subject to RAN4 work progress

**Feedback Form 2: Intermediate round comments**

**1 – Ericsson LM**

We support Alternative # 1.

The primary objective of the WID is multi-RX reception and therefore L1 measurement enhancement (e.g. BM) is justified to enhance performance.

But L3 measurement enhancements are not directly linked to the multi-RX reception. Given very high RAN4 work load, we suggest to remove L3 measurement delay. In our view such enhancement can be considered in future release e.g. in R19 for UE supporting multiple chains/panels.

**2 – Nokia France**

We cannot agree to alternative 1. We support Alternative 2, since useful improvements in cell detection delay and scheduling delays around L3 measurement periods can be achieved by leveraging a UE's multiple Rx chains, which will also benefit user throughput.

**3 – Apple (UK) Limited**

We prefer Alt. 2 at this moment. While we agree that from UE mobility's perspective, there is no need to enhance the L3 measurement requirements, there are other potential benefits of enhancing L3 measurements such as easing of measurement restriction or scheduling restriction, which will benefit UE performance. Furthermore, as stated in Alt. 2, if needed, we can come back to it in RAN#100.

**4 – QUALCOMM JAPAN LLC.**

We support Alternative#1.

So far nobody has shown any data to justify any need of improvements for L3 procedures. Faster measurements do not lead automatically to better overall performance.

**5 – NTT DOCOMO INC.**

We support Alternative #1. The current work plan considers to finish feasibility/necessity assessment by RAN4#106-bis meeting and to conclude all the RRM requirements in RAN4#108. According to this timeline, we need deprioritization at this stage.

**6 – MediaTek Inc.**

We support Alternative #1. Reasons were provided in the 1st round already.

**7 – Samsung Electronics Co.**

We support alternative 1. Feature 16-2c "Simultaneous reception with different Type-D" major related to L1 operation. Continuation of the discussion in WG may face the same situation in future RAN-P, it's better to make decision in this RAN-P to save RAN4 effort.

**8 – Guangdong OPPO Mobile Telecom.**

Fine with Alternative#1 to de-prioritize and remove 'L3 measurement delay' part . We agree with Intel's comments in last round that L3 related measurement enhancement (not related to delay) is not precluded from the other objectives, e.g. scheduling/measurement restrictions.

**9 – LG Electronics Inc.**

We support Alt. 2. We prefer to keep the discussion based on the agreement of the last RAN4 meeting, and fine to check the progress in RAN#100.

**10 – Intel Corporation (UK) Ltd**

We are fine with Alternative 1 if down-scoping is needed.

**11 – Huawei Technologies France**

We support Alternative 1.

The purpose of introducing multi-Rx receptions is to enable that UE can perform simultaneous data receptions from different TRPs with different beam directions. The enhancements on L3 measurement delay (e.g., enhance cell identification) has nothing to do with this purpose.

In addition, L3 measurements are limited by searcher capability at UE side. RAN4 has agreed to reuse the existing UE searcher capability (i.e. one searcher for one SPCC, one searcher is shared for other CCs). Supporting simultaneous L3 measurements on one CC (which would need 2 searchers) would exceed the existing searcher capability.

**12 – vivo Mobile Communication (S)**

We are fine with Alt 1 to down-select "L3 measurement delay" from the objectives.

Meanwhile, if down-selection is made in the RAN plenary meeting, some clarification is needed that if enhancements to other L3 related procedures can be considered, such as FR2 Handover delay, FR2 PSCell addition/change delay and FR2 SCG activation delay for FR2 unknown target cell/PSCell. We do see the benefit to enhance these procedures for UE capable of multi-Rx chain/panel. Enhancement on these procedures were deprioritized in the last RAN4 meeting over L3 measurements in RRC connected mode. If L3 measure delay is removed, the enhancement on these procedures can be considered as the normative work should be small.

**13 – China Mobile Com. Corporation**

OK with alternative 1.

**14 – Beijing Xiaomi Mobile Software**

We are fine with alternative 1. However, as pointed out by VIVO, there are also ongoing other RAN4 Rel-18 WID waiting for the L3 enhancement result from the multi-RX WID and if we decide not to further enhance the L3 measurement delay then how to treat these related topics need to be clarified for RAN4 whole group progress.

**15 – Beijing Xiaomi Mobile Software**

We are fine with alternative 1. However, as pointed out by VIVO, there are also ongoing other RAN4 Rel-18 WID waiting for the L3 enhancement result from the multi-RX WID and if we decide not to further enhance the L3 measurement delay then how to treat these related topics need to be clarified for RAN4 whole group progress.

## 3.2 Summary from Intermediate Round

In the intermediate round moderator asked companies to share views on the next steps on WID update and share views on the following alternatives:

- **Alternative 1:** De-prioritize and remove objective on ‘L3 measurement delay’ from the WID
- **Alternative 2:** Keep the existing WI RRM sub-objectives unchanged and, if needed, perform down-scoping in RAN#100 subject to RAN4 work progress

14 companies provided comments in the intermediate round and views can be summarized as follows:

- The majority of companies support Alt 1 and prefer to de-prioritize and remove RRM objective on ‘L3 measurement delay’ from the WI scope (11 companies).
- Several companies support Alt 2 and would like to keep the objectives unchanged and defer the decision to future meetings (3 companies).
- Several companies commented on potential relation L3 measurement delay reduction to other WID sub-objectives
  - Apple mentioned that “... *there are other potential benefits of enhancing L3 measurements such as easing of measurement restriction or scheduling restriction, which will benefit UE performance...*”.
  - vivo mentioned that “*some clarification is needed that if enhancements to other L3 related procedures can be considered ...*”.
  - Moderator understanding of current status of WID and agreements in RAN4 is that the removal of “L3 measurement delay” sub-objective does not imply that discussion on other L3 procedures are precluded. For instance, discussion on L3 procedures can proceed if they are related to one of the remaining sub-objectives (e.g., L3 measurements impact on Scheduling/measurement restrictions can be a part of discussion). Furthermore, such discussion should be limited to RRC Connected state as agreed in the previous RAN4 meeting.
- One company (Xiaomi) mentioned that other ongoing RAN4 Rel-18 WID are waiting for the L3 enhancement result from the multi-RX WID and the process needs to be clarified. Moderator recommends to further check if there are any other items which are waiting for conclusions on L3 measurement delay enhancements and make decision after this is clarified.

### **Moderator summary:**

Taking into account companies positions moderator thinks that it is preferable to make the decision in this RAN plenary to have stable RRM objectives scope and let RAN4 focus on the remaining aspects without further WID revisions or uncertainty. The following is proposed after the intermediate round

- Remove the ‘L3 measurement delay’ sub-objective from the WID
- Add a note to the WID to clarify that the work on L3 measurements is not precluded if this work is relevant to the remaining sub-objectives

### **Moderator Proposal #1: Revise WID RRM objectives as follows**

- *Introduce necessary requirement(s) for enhanced FR2-1 UEs with simultaneous DL reception from different directions with different QCL TypeD RSs on a single component carrier*

- *Enhanced RRM requirements:*

- *The following requirements should be studied and specified if necessary:*

- *L1-RSRP measurement delay*
- *L3 measurement delay (both cell detection delay and measurement period can be considered)*
  - *The starting point is the enhancements related to L1-RSRP measurement enhancements*
- *RLM and BFD/CBD requirements*
- *Scheduling/measurement restrictions*
- *TCI state switching delay with dual TCI*
- *Receive timing difference between different directions (different QCL Type D RSs)*

undefined *NOTE: Studies and work on enhancing L3 measurements in RRC Connected mode as a part of work on candidate enhancements is not precluded*

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## **4 Final round**

### **4.1 Open issues**

For the Final Round moderator recommends to discuss Proposal #1

### **Moderator Proposal #1: Revise WID RRM objectives as follows**

- *Introduce necessary requirement(s) for enhanced FR2-1 UEs with simultaneous DL reception from different directions with different QCL TypeD RSs on a single component carrier*

- *Enhanced RRM requirements:*

- *The following requirements should be studied and specified if necessary:*

- *L1-RSRP measurement delay*
- *L3 measurement delay (both cell detection delay and measurement period can be considered)*

- *The starting point is the enhancements related to L1-RSRP measurement enhancements*
- *RLM and BFD/CBD requirements*
- *Scheduling/measurement restrictions*
- *TCI state switching delay with dual TCI*
- *Receive timing difference between different directions (different QCL Type D RSs)*

undefined *NOTE: Studies and work on enhancing L3 measurements in RRC Connected mode as a part of work on candidate enhancements is not precluded*

Companies are encouraged to share views on the Moderator Proposal #1 after the intermediate round and address the following sub-questions

- 1) Any strong objections to remove 'L3 measurement delay'
- 2) Views on proposed Note on L3 measurements relation to other sub-objectives
- 3) Other comments

### Feedback Form 3: Final Round Comments

#### 1 – Ericsson LM

- 1) No objection to remove 'L3 measurement delay'. This will reduce RAN4 work load without impacting primary objective of this WI.
- 2) Our understanding of the note is allow possible L3 measurement enhancement in RRC connected state. But realistically speaking this will be difficult to achieve in R18 since first priority should be L1 measurement requirements. We have slight preference to also remove the NOTE.

#### 2 – QUALCOMM JAPAN LLC.

- 1) We support the removal
- 2) This note can create more confusion, companies could now still come with many proposals and argue they are improving one of the other items. We would rather not have it.

#### 3 – Apple (UK) Limited

While the objective of *L3 measurement delay* is removed, the NOTE *NOTE: Studies and work on enhancing L3 measurements in RRC Connected mode as a part of work on candidate enhancements is not precluded* means L3 aspects related to scheduling/measurement restriction can still be discussed and specified. If this understanding is correct, we are OK with Moderator's proposed revision.

#### 4 – MediaTek Inc.

We support removing L3 measurement delay.

Regarding the note, we understand the concern raised by vivo. As a compromise, we are fine to add a note to keep the potential enhancement on HO/CA/DC procedures open. A wording suggestion: "NOTE: Studies on benefit of enhancing L3 aspects in HO/CA/DC procedures are not precluded, but with low priority. Corresponding works, if needed, are pending on the study outcome."

#### **5 – NTT DOCOMO INC.**

- 1) No strong objection.
- 2) The note is little bit confusing. We prefer to remove the note. Although we reached the agreement in previous meeting that L3 measurement enhancement in CONNECTED mode should be studied, it needs clear and strong necessity considering remaining time. About vivo's concern, since we reached another agreement in RAN4#104-bis that,
  - RRM requirement discussion shall be focused on the case with different QCL TypeD RSs **on a single component carrier**
  - FFS whether UE can be configured with multiple component carriers, including intra-band CCs and/or inter-band CCs, **but multi-Rx chain is enabled on only one of the component carriers.**

it is not the scope of this work.

#### **6 – Huawei Technologies France**

- 1) Support to remove 'L3 measurement delay'
- 2) As the bullet 'L3 measurement delay' is removed, it means RAN4 discussion is focused on L1 operations. The note somewhat conflicts with the removing of 'L3 measurement delay'. We prefer not to add this note here.

#### **7 – LG Electronics Inc.**

We are fine with the moderator proposal with the NOTE.

#### **8 – vivo Mobile Communication (S)**

We support to remove "L3 measurement delay".

The Note in proposal#1 is not so clear to us that what L3 measurements related work can be further discussed.

The Note suggested by MediaTek is quite good for us and we support it. We still think enhancement on HO/CA/DC procedures is beneficial for multi-Rx chain/panel UE which can bring significant delay reduction with throughput improvement in return at the cost of acceptable UE power consumption and complexity.

Regarding the question raised by NTT DOCOMO, it would be too early to conclude CA/DC is not in the scope since it is FFS whether multi-Rx chain can be enabled on only one of the component carriers. We are fine not to consider CA/DC enhancement if RAN4 concludes the issue that UE cannot be configured with multiple carriers for multi-Rx chain enabled UE. Moreover, enhancement on handover is not relevant to CA/DC.

Regarding enhancement on measurement restriction/scheduling restriction related to L3 measurements, we think this can be further revisited after RAN4 conclude the feasibility study on measurement restriction/scheduling restriction enhancement for L1 measurements. There are critical issues to be resolved.

**9 – Samsung Electronics Co.**

We support to remove 'L3 measurement delay'. For the note, we share similar view as QC and some other companies. It's better we can be clear enough in Rel-18 we only focus on L1 operation enhancement without any consideration on L3 enhancement.

**10 – Samsung Electronics Co.**

Another alternative way was to add a check point in future RAN-P to see the progress on this WI RRM part, can check whether we can have consider some part for L3 in later phase.

**11 – China Mobile Com. Corporation**

We support removing L3 measurement delay. And we prefer to remove the NOTE to avoid the confusion.

**12 – ZTE Corporation.**

To move forward, we are general fine with moderator's suggestion. However in our opinion, remove the sub-bullet of "L3 measurement delay" but add the note, maybe it would still lead to some confusion. So as to be more clear, can we go with the following statement: Only the enhancement of L3 measurement period is precluded, but other possible enhancements regarding to L3 measurement in RRC mode are not precluded.

**13 – Intel Corporation (UK) Ltd**

Fine to remove 'L3 measurement delay'.

We are also fine with the note. It tries to classify that the removed bullet is only related to enhancement of L3 measurement delay, while for other L3 measurement enhancement in connected mode, further discussion is not precluded for other sub-objectives.

We understand the concern from companies that even L1 related requirement is not clear now and prefer to prioritize L1 part. If it's the majority view, we are fine to deprioritize L3 related measurement enhancement and add a note that we can come back in future RAN to check whether L3 enhancement can be considered depending on the progress.

**14 – Intel Corporation (UK) Ltd**

**Moderator:**

Based on the received feedbacks companies have different interpretation and views on the proposed note on L3 measurements.

Let me clarify moderator understanding: The original sub-objective on "L3 measurement delay" is related to possible improvements on **delay** requirements only. For other sub-objectives (e.g. scheduling/measurement restriction) the discussion on L3 measurement related aspects is not precluded by the current WID. The intention of the originally proposed note is to clarify this specific aspect.

Let me also address some comments from the companies:

- To MediaTek and vivo: on L3 aspects in HO/CA/DC procedures - it would be good to clarify to which existing WI sub-objectives it is related. The original WID does not include such objectives and in my view further clarifications in WID are needed on whether such enhancements are in the scope. So far, I see diverse views on this in the group.
- To Huawei: On “*As the bullet 'L3 measurement delay' is removed, it means RAN4 discussion is focused on L1 operations.*” - The intention is to remove L3 measurement **delay**, but not all other L3 aspects if they are related to other sub-objectives as I clarified above.
- To Ericsson: On “first priority should be L1 measurement requirements” – I acknowledge that many companies are fine with such prioritization, but still several companies would like to have work on L3 related aspects and current WID does not preclude this.

Overall, I see that the current proposed wording of the note does not work well and let me suggest an alternative one based on suggestions from Samsung and considering that some companies do see the interest to consider L3 aspects at least for scheduling/measurement restrictions.

#### **Updated proposal**

- *Note 2a: The work on L3 measurement related aspects for scheduling/measurement restriction requirements is not precluded.*
- *Note 2b: Further check in RAN #100 whether to include other L3 measurement related aspects and objectives subject to RAN4 progress.*

May I ask companies to check if Notes 2a/2b can be an acceptable compromise and suggest further revisions based on alternative proposal.

#### **15 – Ericsson LM**

Thanks to moderator for clarifying the intention of the NOTE. Agree there can be impact on the scheduling restriction defined for L3 measurements since the UE is scheduled with two TRPs from different directions. With this understanding we are OK with Note 2a. On Note 2b: we prefer to remove 2b because realistically speaking RAN4 will be even more loaded with work during 2H/2023. So it is highly unlikely that RAN4 will have time to do any up scoping (include L3 measurement enhancements) in June plenary.

#### **16 – Beijing Xiaomi Mobile Software**

Thanks for moderator’s proposal, we are fine with the note 2a and 2b provided as the latest comment. We also share similar understanding that CA/DC should not be included since the WID is limited to single carrier only.

#### **17 – Intel Corporation (UK) Ltd**

Thanks for moderator’s latest proposal. We are fine with the note 2a and 2b.

**18 – ZTE Corporation.**

Thanks for moderator's further proposal. We are fine with Note 2a and 2b.

**19 – Nokia France**

We are fine with the Notes. We would also be OK to delete 2b and just keep 2a.

**20 – Samsung Electronics Co.**

We are fine with Notes, also fine to keep only note 2a to save RAN4 effort and make down-selection right now if possible.

## 4.2 Summary from Final Round

In the final round companies did not raise major concerns on moderator proposal to remove "L3 measurement delay" sub-objective from the WI scope and this can be considered stable.

Companies have different interpretation and views on proposed NOTE on L3 measurements. Moderator provided additional clarifications in the final round and proposed an alternative Note, which was supported by several companies. 6 companies commented on this. Companies are generally fine with Note 2a and for Note 2b several companies commented that it may not be required. From moderator perspective, Note 2b is a fair compromise and we can leave this question to future RAN meetings.

Taking into comments and discussions the moderator proposal after the is revised as follows:

### **Proposal 1: Revise FR2\_multiRx\_DL WID RRM objectives as follows**

- *Introduce necessary requirement(s) for enhanced FR2-1 UEs with simultaneous DL reception from different directions with different QCL TypeD RSs on a single component carrier*
  - *Enhanced RRM requirements:*
    - *The following requirements should be studied and specified if necessary:*
      - *L1-RSRP measurement delay*
      - *L3 measurement delay (both cell detection delay and measurement period can be considered)*
        - *The starting point is the enhancements related to L1-RSRP measurement enhancements*
      - *RLM and BFD/CBD requirements*
      - *Scheduling/measurement restrictions*
      - *TCI state switching delay with dual TCI*
      - *Receive timing difference between different directions (different QCL Type D RSs)*
  - *NOTES:*

- *Studies and work on enhancing L3 measurements in RRC Connected mode as a part of work on candidate enhancements is not precluded*
- *The work on L3 measurement related aspects for scheduling/measurement restriction requirements is not precluded.*
- *Further check in RAN #100 whether to include other L3 measurement related aspects and objectives subject to RAN4 progress.*

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## 5 Conclusions

The following conclusions were reached during the discussion:

### Recommended proposals

#### **Proposal 1: Revise FR2\_multiRx\_DL WID RRM objectives as follows**

- *Introduce necessary requirement(s) for enhanced FR2-1 UEs with simultaneous DL reception from different directions with different QCL TypeD RSs on a single component carrier*
  - *Enhanced RRM requirements:*
    - *The following requirements should be studied and specified if necessary:*
      - *L1-RSRP measurement delay*
      - *L3 measurement delay (both cell detection delay and measurement period can be considered)*
        - *The starting point is the enhancements related to L1-RSRP measurement enhancements*
      - *RLM and BFD/CBD requirements*
      - *Scheduling/measurement restrictions*
      - *TCI state switching delay with dual TCI*
      - *Receive timing difference between different directions (different QCL Type D RSs)*
  - *NOTES:*
    - *The work on L3 measurement related aspects for scheduling/measurement restriction requirements is not precluded.*
    - *Further check in RAN #100 whether to include other L3 measurement related aspects and objectives subject to RAN4 progress.*

### Recommended conclusions:

<https://nwm-trial.etsi.org/#/documents/8401>

- Note RP-223157
- Approve the revised WID RP-223527