3GPP TSG-RAN WG Meeting #90 Electronic [RP-20xxxx](http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Docs/RP-20xxxx.zip)

Online, 7 – 11 December 2020

**Agenda item: 9.6 Small Technical Enhancements and Improvements for REL-16 [TEI16]**

**Source: Huawei (rapporteur)**

**Title: Summary of [90E][21][DC\_location\_reporting] Intermediate period**

**WID/SID: TEI16 - Release 16**

**Document for: Discussion and Decision**

# 1 Introduction

This discussion handles the following document, according to the RAN Chairman request copied below.

As per the guidance, the goal of this discussion is to generate an agreeable way forward.

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| **Tdoc** | **Title** | **Source** |
| RP-202617 | Clarification on DC location reporting for intra-band UL CA | Huawei, HiSilicon |

***From:*** *3gpp\_tsg\_ran: tsg radio access network group [mailto:3GPP\_TSG\_RAN@LIST.ETSI.ORG]* ***On Behalf Of*** *Bertenyi, Balazs (Nokia - HU/Budapest)****Sent:*** *Sunday, December 6, 2020 10:36 PM****To:*** *3GPP\_TSG\_RAN@LIST.ETSI.ORG****Subject:*** *[90E][21][DC\_location\_reporting] Initial round*

*Dear all,*

*This is the formal kick off of the email thread on finding a way forward on handling DC location reporting for intra-band UL CA.*

*Goal: Generate an agreeable way forward.*

*Input contributions covered:  2617.*

*Moderator: Simone Provvedi.*

*Br,*

*Balazs.*

Please provide your initial comments on the 3 proposals copied in the Discussion section by 11:59 am tomorrow, so that I can elaborate a summary based on this initial round of discussion.

Please each company take the last file in the draft folder and add the company name at the end while also increasing the version number

Example:

Document\_Rapporteur\_v0

Document\_CompanyA\_v1

Document\_CompanyB\_v2

Etc.

# 2 Background

The background can be found in the Tdoc RP-202617.

Also about proposal 3 companies can have a look at RP‑202602.

# 3 Discussion Initial Round

The discussion in this section focuses on collecting companies input for the 3 proposals below.

**Proposal 1: Adopt RRC based signalling method for DC location reporting in Rel-16.**

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| Answers to Question 1 |
| Company | Yes/No | Comments |
| Apple |  | It was our understanding that RAN2 has agreed to use RRC-based solution in Rel-16 in last WG meeting. We are not sure the intention of Proposal 1 in this meeting. What if the proposal is not agreed, are we allowed to considered other method in RAN2 in Rel-16? In our view, if Proposal 3 can be done from Rel-16 for more than 2 UL CCs which is applicable for FR2 and future-proof for FR1, do we really need a Rel-16 RRC patch which is only applicable for 2 UL CCs? |
| Qualcomm |  | It is our understanding likewise Apple is saying, that RAN2 agreed this RRC already as per ran2 chairman notes. Overlapping agreement in RAN would be confusing.  |
| Intel (Youn He) | Yes | We don’t have a strong view about RAN2 latest status. We proposed RRC signalling based DC reporting in the last RAN2 meeting, but the discussion was postponed to the next meeting to get RAN4’s further input. In our understanding, it seems now clear that both RAN2 and RAN4 focus on RRC based signalling. So, we are ok to confirm it by this proposal 1.  |
| vivo |  Yes  | Agree with Apple |
| ZTE | Yes | In the past RAN2#112e, it has been concluded that RRC based signaling will be used. |
| Futurewei | Yes | RAN2’s agreement can be confirmed.  |
| Samsung | Yes | We share same views with others that RAN2 agreed to use RRC based signalling but we are fine to confirm it in RAN. |
| Huawei | Yes | In the last RAN2 meeting, RRC signalling agreement was made during email group discussion in the 1st week, but the discussion was suspended in the 2nd week to wait further input from RAN4. Until the completion of RAN2 #112-e, there is no more discussion and clear conclusion. Furthermore, from RAN2’s chairman note, “we use RRC, continues by email”, the wording ambiguous and could be misunderstood as a staged conclusion.So, We would like to confirm RAN2’s agreement as a clear instruction to the work of next meetings in RAN2 and RAN4. |
| MTK | Yes | Fine to have this confirmation. We also need a clear view on what has been done in Rel-16 in order to progress in Rel-17, if needed. |
| Ericsson | Unclear to us why this should be discussed in plenary again. The guidance from last plenary was enough in our view. Anyway, our input:Yes | Already agreed in RAN2#112. RAN4 are aware of this RAN2 agreement and hence removed the options that are not based on RRC. Unclear to us why we discuss this in plenary again. |
| OPPO | Yes | RAN2 agreed to use RRC based solution and the issue was postpone to next RAN2 working group meeting, there is no need to further discuss it in the plenary. We are ok to confirm the conclusion from RAN2 in RP if companies have different understanding. |
| Nokia. Nokia Shanghai Bell | Yes | This was already agreed in RAN2#112e. |
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**Summary 1: It seems clear from companies inputs that RAN2 already decided to adopt RRC based signalling method for DC location reporting in Rel-16, so nothing needed in addition in this RAN plenary.**

**Proposal 1: Not necessary to be re-discussed because already agreed in RAN2.**

**Proposal 2: Target to** **complete the Rel-16 RRC based DC location reporting signalling for 2 UL CCs in RAN#91e.**

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| Answers to Question 2 |
| Company | Yes/No | Comments |
| Apple |  | Proposal 2 would be pending on the agreement of Proposal 1. If agreed, how do we handle FR2 DC reporting for more than 2 UL CCs in Rel-16? |
| Qualcomm | No | We should concentrate on finding a solution and enabling technical discussion rather planning forced targets. With this proposal, RAN2 or RAN4 would not even try to accommodate > 2CC and as shown in RP-202617 it is possible within the agreement made in ran2. Maybe better to task ran4 to deliver what assumption can be made in the implementation what impacts DC location in the UE and task ran2 to find solution how to simplify the detailed message transport.  |
| Intel | Yes | We understand that FR1 related RAN4 discussion has been limited to up to 2CCs. Furthermore, according RAN4 LS, each TX DC location should be based on permutations of all possible simultaneously activated BWPs within configured BWPs as baseline in Rel16. Considering huge signalling overhead of this approach, it is practical to aim to design the Rel-16 RRC based DC location reporting signalling for 2 UL CCs.  |
| vivo | Yes  | 2 UL CCs is ok for R16. |
| ZTE | Yes | There has been discussion on the RRC signaling approaches in RAN2 but no consensus has been reached, thus discussion on the RRC based DC location reporting signaling in RAN2 has been postponed to next meeting.At least one more RAN2 meeting is needed to down select from the signaling approaches and conclude on the signaling details. |
| Futurewei | Yes | RAN2 should be tasked to complete Rel-16 by specifying RRC based DC location reporting signalling for 2 UL CCs in RAN#91e. |
| Samsung | See comments | We are OK to restrict up to 2CCs in FR1, but we understand it does not mean to design RRC based signalling without considering forward compatibility to other combinations e.g. more than 2 UL CCs and/or FR2. As Qualcomm pointed out, we are also under the impression that focusing on a future proof signalling solution with technical discussion outweighs this target plan.  |
| Huawei | Yes | According to the discussion status in RAN2 and RAN4, currently the reporting baseline was agreed as “report each TX DC location based on permutations of all possible simultaneously activated BWPs within configured BWPs”, the signalling overhead for more than 2 UL CCs case are super controversial and different optimized solutions were proposed by companies. We think it is hard to complete the discussion in Rel-16 for more than 2 UL CCs case before ASN.1 is frozen. So we prefer to complete the Rel-16 RRC based DC location reporting signalling for 2 UL CCs in RAN#91e and further discuss left issues in Rel-17.To Qualcomm, the key problem is timeline for Rel-16 signalling definition in RAN2. We need to face the reality that it seems impossible to complete the work for more than 2 UL CCs case in short meeting cycles. To Samsung, we agree that the Rel-16 RRC based solution should be future proof for more general cases, that’s the reason we provide an example in the annex to show this possibility. But in case, the views are RAN2 is divergent during the discussion, we should face the complex reality and move forward with a simple and acceptable solution for 2CC case.  |
| MTK | Yes | It is desired to have future-proof solution in RAN2 for Rel-16 as much as possible. In RAN4, given that Rel-16 WI is closed, we do not think it is desirable to extend the # of CCs in Rel-16. Extensions can be done in Rel-17.  |
| Ericsson | No | In past plenary RAN WGs were tasked to address this in an extensible way, i.e. not limited to 2 CCs. We think no further guidance from plenary is needed than was already provided in last plenary. |
| OPPO | Yes | We’re ok to consider this in a forward compatible way, restricting up to 2CCs in FR1 is ok to us due to time limitation/work load in R-16. |
| Nokia. Nokia Shanghai Bell | Yes | This should be the minimal target, but we would like to point out two things: 1. Signalling overhead is still a concern even with 3CC reporting

Depending on how the signalling is done, it might still work also for >2 UL CCs (this will be seen when RAN2 decides on the exact signalling) |
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**Summary 2**: There is a clear majority of companies that think we should aim to complete the Rel-16 RRC based DC location reporting signalling for 2 UL CCs in RAN#91e. To accommodate for the view of companies that would like think about a future-proof solution, perhaps we can modify the original Proposal 2 in this way below, and ask if companies are fine with it.

**Proposal 2bis**: **RAN to target RAN2 to complete the Rel-16 RRC based DC location reporting signalling for 2 UL CCs in RAN#91e, i.e. RAN2 should provide either agreed or, if agreement is not possible, technically endorsed CRs to RAN#91e, addressing the case of 2 UL CCs. A future-proof solution (e.g. that takes into account additional CC) is preferred.**

**Proposal 3: For more than 2 UL CCs, advanced methods for signalling overhead reduction will be further discussed in Rel-17. Add an objective(s) into Rel-17 FR1 UE RF requirement enhancement WI.**

Companies can have a look at RP‑202602 as an example on how to capture this, but in the initial round we do not want to discuss the details, rather trying to agree on the principle.

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| Answers to Question 3 |
| Company | Yes/No | Comments |
| Apple |  | Proposal 3 would be pending on the agreement of Proposal 1 and Proposal 2. If agreed, whether the objective should be included in Rel-17 FR1 UE RF requirement enhancement WI can be further discussed as intra-band UL CA with more than two CCs is not an objective in Rel-17 FR1 UE RF requirement enhancement WI. |
| Qualcomm |  | We should enable clear rel-17 discussion for this since reconfiguration based method may not be feasible in practice and e.g. activation based would provide more streamlined way. Since it is very late to work on R16 for activation based, R17 discussion should be enabled with e.g. enhancement WI objective, give TU budget allows. Objective in RP‑202602 should be rephrased to something more general such as advanced DC location methods and not specify the FR or number of CC’s or RCC vs DCI.  |
| Intel | See comment | Additional objectives to RAN4-led items shall be handled in email thread [09] along with all other proposals to extend the WI scope. |
| vivo |  | We are ok to discuss the enhancement, however how it is handled i.e., in which WID, can be discussed later.  |
| ZTE | No | Since the signaling details of RRC based DC location reporting have not been concluded and RAN2 is targeting to design a future-proof signaling, we think it is too early to add an objective into any Rel-17 WI to support DC location reporting for more than 2 UL CCs.  |
| Futurewei |  | Methods and signalling for more than 2 UL CCs can be further discussed in Rel-17. |
| Samsung | No | * We agree with ZTE that it is premature to make any decision to revise Rel-17 WI scope.
 |
| Huawei | Yes | * As commented in P1 and P2, signalling design for more than 2 UL CCs case are controversial and after several meetings, there is no consensus can be reached in RAN4. So more than 2 UL CCs is shifted to Rel-17 timeline is a practical choice.
* The issue is non-spectrum related, and it is discussed under FR1 RF requirement WI in Rel-16. Although it can be extended to FR2, the solution is general for both FR1 and FR2. Considering the continuity and extendibility, we prefer to further discuss it in Rel-17 FR1 RF enhancement WI.
* We would like to initiate a discussion on detailed objectives for Rel-17 among interested companies in this thread, as suggested by chairman.
 |
| MTK | Yes for RAN4 | * Support the proposal. In Rel-17, there will be sufficient time for discussion to come out concrete solution in RAN4. Therefore it is important to first conclude R16 discussion, then consider potential R17 scope.
* We understand the proposal is pending on the decision in thread #09.
* Although the Rel-17 FR1 UE RF requirement enhancement WI may only focus on FR1, we also need to ensure consistent solution between FR1 and FR2.
 |
| Ericsson | No | In past plenary RAN WGs were tasked to address this in an extensible way, i.e. not limited to 2 CCs. We think no further guidance from plenary is needed than was already provided in last plenary. |
| OPPO | No | It would be good discuss where and how to capture it until we have a baseline solution, so delaying this discussion to the future RP meeting is good to us. |
| Skyworks |  | We believe that more advanced solutions are needed in Release 17 for both FR1 and FR2. For FR1 at least, if agreed, using R17 FR1 enh WI is a good approach since interested companies are already active in this WI. |
| Nokia. Nokia Shanghai Bell | Yes (conditionally) | We are fine to add advanced methods to objectives in Rel-17 FR1 UE RF enhancement WI but would first like to see the Rel-16 signalling done, so this can be discussed in March after RAN2 has agreed to the Rel-16 signalling. Further, having a signalling overhead reduction objective in Rel-17 doesn't mean signalling overhead shouldn't be optimized already for Rel-16 (as that was heavily discussed in RAN2 already). |
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**Summary 3**: Companies have different opinions on this, but there is a clear majority of companies interested to consider this in Rel-17.

**Proposal 3**: There was no agreements on P3 in the initial round. Companies can still add additional comments on this proposal – if they wish – in the intermediate period, mainly to explain how they would like to phrase those objectives.

# 4 Proposals for the Intermediate period

Companies are invited to comment on the proposals below:

**Proposal 2bis**: **RAN to task RAN2 to complete the Rel-16 RRC based DC location reporting signalling for 2 UL CCs in RAN#91e, i.e. RAN2 should provide either agreed or, if agreement is not possible, technically endorsed CRs to RAN#91e, addressing the case of 2 UL CCs. A future-proof solution (e.g. that takes into account additional CC) is preferred.**

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| Comments to Proposal 2bis |
| Company | Yes/No | Comments |
| Intel | Yes with comments | We are ok with the proposal in general. We slightly prefer removing the last sentence “A future-proof solution (e.g. that takes into account additional CC) is preferred.” because it would cause unnecessary confusion toward signalling optimization discussion as we observed in the last meeting with the previous RAN plenary agreement.  |
| Huawei | Yes | RAN4 #97-e meeting already agreed that reporting baseline method is “report each TX DC location based on permutations of all possible simultaneously activated BWPs within configured BWPs”. Then the controversial problems for RAN2 to conclude are:* If no signalling compression solution, the signalling overhead will be increased with CC number increase, as shown in Annex page in RP-202617.
* For more than 2 UL CCs case, optimization solution seems necessary. But the optimization solutions are diversified in both RAN2 and RAN4, consequently RAN2 even suspended their discussion in their last meeting.

Facing this complex reality, we think a guidance on CC number limitation in Rel-16 from RAN will be helpful to next RAN2 and RAN4 meeting.Meanwhile, we understand companies’ concern on FR2 case. RAN4 didn't define uplink 256QAM requirements for FR2 in Rel-16, and FR2 adopts superheterodyne architecture as common understanding in RAN4, so we don’t see the urgency for FR2 DC location reporting. It means the LO leakage will not have impact on FR2 uplink performance actually.For future proof solution, definitely it is preferred from the beginning of DC location discussion. However, RAN2 Rel-16 signalling design will be completed in the next meeting, as observed in Intel’s comment, unnecessary confusion toward signalling optimization discussion may be caused. We prefer clear instruction from RAN plenary on CC number limitation in Rel-16. |
| Qualcomm | Yes | We are ok with the proposal however we would like to emphasize the FR2 aspect. Not only release 16 enabled up to 16 CC UL for FR2 and release 15 allready enabled 8 CC UL and there is no solution DC location reporting. We have a different understanding about the heterodyne impact to LO than Huawei, it only makes it more important since heterodyne transmitter has two LO’s to deal with. On the intel proposal to remove the “future-proof...” it is obvious that it should be accommodated if possible but we are fine removing the sentence since we do not know future solutions and it may complicate discussion unnecessary, but also ok to keep it.  |
| Apple | Yes | We are fine with the proposal if RAN2 needs to move on and complete the signalling design by RAN #91e. Though reporting each Tx DC location based on permutations of all possible simultaneously activated BWPs within configured BWPs was considered as baseline method, other more simplified reporting methods should not be excluded, even for just 2 UL CCs. For example, some UE may choose to fix the DC location to the center of configured CCs, and some UE may choose to fix the DC location to the center of the activated CCs.If in Rel-16 DC reporting is only designed for up to 2 UL CCs, for FR2 with more than 2 UL CCs, the expectation is that DC reporting would not be available.On the other hand, the signalling design should also allow UE to choose not to report DC location if their implementation does not have the need, such as Huawei mentioned above for FR2. For UE not reporting DC location should be equivalent to reporting “3300” or “3301” in Rel-15 DC signalling design.  |
| ZTE | Yes with comments | We share similar understanding with Intel and prefer to remove the last sentence “A future-proof solution (e.g. that takes into account additional CC) is preferred.” to avoid any unnecessary restriction on RAN2 discussion for the signaling optimization. |
| OPPO | Yes | We’re fine to remove the last sentence. |
| vivo | Yes  | Last sentence shall be removed.  |
| MTK | Yes | We support the proposal. Future-proof solution is preferred (if feasible), but if companies have concern, we can also leave it to RAN2 discussion. |
| Samsung | Yes  | We do not see any harm to keep the last sentence as it is aligned with last RANP's guideline to find a future-proof solution. As others commented, it is more preferable to strive to find some future-proof solution if possible. |
| Nokia. Nokia Shanghai Bell | Yes with comments | We think this is a reasonable way forward and enables RAN2 to complete the discussion. We think that either the last sentence is kept, or it's made clear that signalling efficiency is still considered in RAN2. We are worried we will have one solution in Rel-16, and then an "optimized" solution in Rel-17, and different UEs will implement different solutions. We think this will just make the system performance worse. Since the issue is about signalling overhead, it's better to make the explicit, e.g. as per below (highlighted parts new):*RAN to target task RAN2 to complete the Rel-16 RRC based DC location reporting signalling for at least 2 UL CCs in RAN#91e, i.e. RAN2 should provide either agreed or, if agreement is not possible, technically endorsed CRs to RAN#91e, addressing the case of at least 2 UL CCs. Solutions should also consider the signalling overhead.* |
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**Proposal 3: There was no agreements on Proposal 3 in the initial round. Companies can still add additional comments on this proposal – if they wish – in the intermediate period, mainly to explain how they would like to phrase those objectives**

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| Additional Comments to Proposal 3 |
| Company | Yes/No | Comments |
| Huawei |  | If Proposal 2bis is agreed, definitely we can confirm following issues need to be solved in Rel-17:* DC location reporting enhancement for intra-band UL CA
	+ - Affecting factors to DC location other than factors identified in Rel-16 if any for ≥2UL CCs case
* Study the DC reporting frequency of occurrence to each affecting factor
	+ - Enhanced reporting method based on Rel-16 mechanism:
* Specify reporting method for >2UL CCs case
* Study how to reflect affecting factors in DC location reporting
* Study optimization solution to reduce signaling overhead if any

Since the issue is non-spectrum related, and the solution is general for both FR1 and FR2, considering the continuity and extendibility, we prefer to further discuss it in Rel-17 FR1 RF enhancement WI. |
| Qualcomm | Yes | If limited Rel-16 solution is agreed then Rel-17 should be enabled. Since FR1 does not have requirements for >2CC the work should be done under Fr2 enhancement WI (NR\_RF\_FR2\_req\_enh2, last approved WID: RP-202107) Objective description from Huawei is mildly unclear, what are “affecting factors” and how they should be included in the WID objective? Since the release 16 solution is limited, we would like to define the objective so that it applies to any number of CC’s and is not necessary based on release 16 solution and applies not only >2CC. Modification as follows: Develop DC location reporting solution for UL CA with scalability* Specify reporting method up to 16 CCs [RAN2]
* Study if DC location reporting is more beneficial based on activation or configuration [RAN1, RAN4]
* Study optimization solution to reduce signaling overhead if any [RAN2]
* Study which UE implementation based factors have impact on DC location [RAN4]
 |
| Apple |  | We do not have strong view on which WI to include the objective for UL DC location reporting enhancement for intra-band UL CA in Rel-17. |
| ZTE |  | We understand it is too early to agree on adding such objective in any Rel-17 WI. Instead, we suggest to check the status in RAN#91e and discuss if there is need for further discussion in Rel-17 for more than 2 UL CCs.* If RAN2 conclude on a RRC signaling approach which is only applicable for the case of 2 UL CCs in Rel-16, the advanced methods for more than 2 UL CCs can be further discussed in Rel-17.
* If RAN2 conclude on a RRC signaling approach which is forward compatible also for the case of more than 2 UL CCs, there would be no need for further discussion on this in Rel-17.
 |
| OPPO |  | It would be good to discuss where and how to capture it until we have a baseline solution, so delaying this discussion to the future RP meeting is good to us. |
| vivo |  | Agree with ZTE and OPPO. |
| MTK | - | Time-permitting, we see the benefit to continue the discussion in Rel-17 as well as some potential enhancement in signalling for >2 CCs. Rel-17 FR1 UE RF enhancement WI is one good place to start the discussion as least for FR1. |
| Samsung |  | We also agree with ZTE and OPPO. |
| Skyworks | yes |  We support working on advanced DC location reporting in R17 that covers both FR1 and FR2 (but should be discussed in one place and FR1 enh WI is OK for us). We believe we already had fruitful discussions last meeting so we should agree this in this meeting. |
| Nokia. Nokia Shanghai Bell |  | We agree with others that (as we also indicated before) it's better to postpone the discussion on this to RAN#91e once the Rel-16 signalling solution is available (since no Rel-17 work will anyway happen during the next quarter). Then it's easier to assess the technical need for further improvements in Rel-17. |
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# Conclusion

TBA

# Annex – Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

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| Company | Name | Email Address |
| Discussion moderator | Simone Provvedi | simone.provvedi@huawei.com |
| ZTE | Yuan Gao | gao.yuan66@zte.com.cn |
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