**3GPP TSG RAN WG1 Meeting #106bis-e R1-210xxxx**

**e-Meeting, October 11th-19th, 2021**

**Agenda Item: 5**

**Source: Moderator (Huawei)**

**Title: [Draft] Summary#1 of email discussion [106bis-e-AI5-LSs-02] on reply LS to R1-2108704**

**Document for: Discussion and Decision**

# Introduction

A RAN4 LS [1] asks RAN1 three questions on beam information of PUCCH SCell during PUCCH SCell activation procedure, as copied below.

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| ***Overall Description:***  *RAN4 is currently discussing the requirements for PUCCH SCell activation. For unknown PUCCH SCell activation (known cell conditions as defined in TS 38133 clause 8.3.2), from RAN4 perspective, we observe that UE may have problems supporting the following cases under the current NR specification:*   * *unknown FR1 PUCCH SCell activation with a valid TA* * *unknown FR2 PUCCH SCell activation with a valid TA* * *unknown FR1 PUCCH SCell activation without a valid TA* * *unknown FR2 PUCCH SCell activation without a valid TA*   *One issue among the above identified cases is the beam information cannot be reported to network via the PUCCH of target being-activated SCell during the PUCCH SCell activation procedure.* *From RAN4’s perspective, the beam information reporting may be needed for following purposes:*  *1. Determine the associated SSB in PDCCH order for CFRA for TA updating when TimeAlignmentTimer associated with the TAG containing the PUCCH SCell is not running.*  *2. Determine the TCI state for PDCCH and PDSCH(when applicable) on target being-activated SCell*  *3. Determine the UL spatial relation for PUCCH on target being-activated FR2 SCell*  *4. Determine the Rx beam for PUCCH of target being-activated SCell at network reception*  *RAN4 sees benefits in supporting PUCCH SCell activation for the above cases in terms of network operation flexibility and UE power consumption. RAN4 would like RAN1 and RAN2 to answer the following questions:*  ***Q1:*** *Whether UE can report CSI (e.g. L1-RSRP) of the target being-activated PUCCH SCell belonging to secondary PUCCH group by configuring CSI report setting (e.g. CSI-ReportConfig) on any active serving cells belonging to primary PUCCH group*  ***Q2:*** *Whether the above observation is correct, i.e. the identified four cases are not supported by the current RAN1 and RAN2 specification*  ***Q3:*** *Whether the above identified cases can be supported by RAN1 and RAN2 spec updates within Rel-17 timeframe.*  *RAN4 will further discuss whether/how to define requirements of PUCCH SCell activation for the above cases based on RAN1 and RAN2 reply to above questions.* |

As per chairman’s guidance, a reply LS is discussed and is expected to complete by October 18.

[106bis-e-AI5-LSs-02] Discuss incoming LS on beam information of PUCCH Scell in PUCCH SCell activation procedure for a possible reply LS by October 18 – Frank (Huawei)

# Discussions

## Q1: Whether UE can report CSI (e.g. L1-RSRP) of the target being-activated PUCCH SCell belonging to secondary PUCCH group by configuring CSI report setting (e.g. CSI-ReportConfig) on any active serving cells belonging to primary PUCCH group

Based on the contribution papers [2-8], companies have different views on the answer to the question.

In addition to provide your views on it, **it is appreciated if companies could provide detailed comments and reasoning, e.g. any specification text to quote, or any identified potential issue.**

### Question 1-1: In current RAN1 specification, whether has such cross-PUCCH-group CSI reporting been supported? Any specification text explicitly backs it up? If no, any identified potential issue?

Companies’ views are very welcome.

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| *Company* | *View* |
| Qualcomm | We do not see the issue of supporting such cross-PUCCH-group CSI reporting. However, we have a concern to say the current RAN1 spec already support it without any clarification. The RAN1 spec for UCI feedback is identical to NR-CA with two PUCCH-groups and NR-DC in general. If we say the current RAN1 spec already support it without any clarification, this implies that RAN1 consideres cross-cell-group CSI reporting is also supported.  So, our proposals are following:   * **Inform RAN4 that such cross-PUCCH-group CSI reporting is supported from RAN1 point of view** * **Apart from the above, clarify in RAN1 that cross-cell-group CSI reporting is not supported**   For the above, we can discuss whether spec update is necessary or just capturing it in the Chairman’s note suffices. Since the above difference between NR-CA with two PUCCH-groups and NR-DC are not visible in the spec, it would be better to consider spec updates, but we are open for further discussion. |
| Nokia, NSB | The clause 9 definition of PUCCH group in 38.213 can be understood so that all the UCI reporting takes place within a PUCCH group of cells, and if a cross-PUCCH group UCI reporting is to be supported, this clause may require a small clarification. A possible answer could go as follows, with the discussion sentence updated based on what RAN1 concludes on the matter in this meeting.  **Proposed answer to Q1:** There is nothing in the RAN1 specification that would not allow cross-PUCCH-group CSI reporting. RAN1 is discussing the necessity of clearly stating that this is possible |
| MTK | Our answer is “no” if the CSI report is based on PUCCH.  According to 38.331, the ***pucch-config*** can be configured on SpCell and PUCCH SCell:  ***pucch-Config* (38.331)**  PUCCH configuration for one BWP of the normal UL or SUL of a serving cell. If the UE is configured with SUL, the network configures PUCCH only on the BWPs of one of the uplinks (normal UL or SUL). The network configures PUCCH-Config at least on non-initial BWP(s) for SpCell and PUCCH SCell.  And if we look at the structure of ***pucch-Config*** and ***PUCCH-Resource*** in 38.331:          the PUCCH-resource ID counts from 0 for both SpCell and PUCCH SCell. Therefore, how does ***PUCCH-CSI-resource*** correspond to a ***pucch-Resource*** across PUCCH group? (Ex. If PUCCH-CSI-resource indicates pucch-Resource 0, then how can we indicate which pucch-Resource 0, i.e., on SpCell or on PUCCH SCell?) |
| vivo | Our understanding is that current CSI reporting configuration does not prohibit (i.e., allows) the possibility of reporting CSI from a cell in another PUCCH\_Scell group.  Clarifying in Chairman’s notes is fine.  One comment to QC, can you clarify a little bit why cross-CG CSI report is not supported? |
| Apple | We do not think specification supports cross-PUCCH-group CSI reporting.  The PUCCH group was introduced to handle the HARQ-ACK feedback, and in principle, to handle the UE processing constraint related to L1 processing. Therefore, without explicit specification allowing it and corresponding UE capability, it is not supported by default.  The 38.331 specification on the PUCCH-CSI-Resource quoted by MTK is another good evidence |
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### Question 1-2: If yes for the question 1-1, whether has UCI multiplexing on a PUSCH of primary PUCCH group been supported when the UCI contains CSI report from the secondary PUCCH group?

If the answer is yes for question 1-1, then the UCI containing the concerned CSI report may be multiplexed onto a PUSCH of primary PUCCH group, which involves a cross-PUCCH-group UCI multiplexing.

Companies’ views are very welcome.

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| *Company* | *View* |
| Qualcomm | We do not think “cross-PUCCH-group CSI reporting” is a “cross-PUCCH-group UCI multiplexing”. Although the UCI contents may include CSI report(s) for DL cell(s) of the other PUCCH-group, the UCI multiplexing procedure on a PUCCH or a PUSCH is still per-PUCCH-group basis and is never across two PUCCH-groups. |
| Nokia, NSB | Agree with Qualcomm, the UCI never multiplexes CSI reports from two PUCCH groups. One UCI always transmits CSI reports for one PUCCH group of cells only, but this does not prevent cross-PUCCH-group CSI reporting. |
| MTK | Our answer for question 1-1 is “no”. |
| vivo | We have the following understanding: CSI transmitted on PUSCH allows the possibility of transmitting CSI of cells from another PUCCH-SCell group. Thus its multiplexing follows the normal multiplexing rules. |
| Apple | We do not think specification supports cross PUCCH group UCI multiplexing |
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### Question 1-3: In addition to a reply LS, is it necessary to have any clarification in RAN1 specification or as a RAN1 conclusion to capture the outcome of the discussion on Q1?

Companies’ views are very welcome.

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| *Company* | *View* |
| Qualcomm | As we have answered to Q1-1, it is important to clarify that cross-PUCCH-group CSI reporting is supported but cross-cell-group CSI reporting is not supported. |
| Nokia, NSB | The section 9 of 38.213 can be understood so that cross-PUCCH-group CSI reporting is not applicable, and there maybe a need to clarify the case there. |
| MTK | Yes, since RAN4 is relying on RAN1’s action to support cross-PUCCH-group CSI report to proceed their work, while cross-PUCCH-group CSI report is not supported for now. |
| vivo | Fine to clarify this. |
| Apple | Based on the 38.331 quoted by MTK, we do not think RAN1 specification change is necessary. But we are fine to further clarify in RAN1 specification.  However, we think we need at least a conclusion |
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## Q2: Whether the above observation is correct, i.e. the identified four cases are not supported by the current RAN1 and RAN2 specification

In the received RAN4 LS, the identified four cases refer to

* *unknown FR1 PUCCH SCell activation with a valid TA*
* *unknown FR2 PUCCH SCell activation with a valid TA*
* *unknown FR1 PUCCH SCell activation without a valid TA*
* *unknown FR2 PUCCH SCell activation without a valid TA*

Since the reply LS will provide a view of RAN1 only, the discussion here **can focus more on RAN1 specification.**

Companies’ views are very welcome.

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| *Company* | *View* |
| Qualcomm | Not sure whether RAN1 has ideal expertise of saying “yes/no” to this question since RAN1 spec does not have (1) differences in known cell and unknown cell, (2) differences in FR1 and FR2, and (3) differences in valid TA and invalid TA.  Following reply would be more reasonable:   * RAN1’s answer to Q1 is YES. With this, RAN1 believes the following issue is resolved:   + “*One issue among the above identified cases is the beam information cannot be reported to network via the PUCCH of target being-activated SCell during the PUCCH SCell activation procedure*” |
| Nokia, NSB | In our understanding the observation in Q2 is correct. We’d be OK with the Qualcomm-proposed response. |
| MTK | To our understanding, NW would configure PUCCH-Config on PUCCH SCell, and any periodic CSI report should be reported by the PUCCH on PUCCH SCell. Therefore, UE can not report periodic CSI (e.g. L1-RSRP) of the target being-activated PUCCH SCell on any active serving cells belonging to primary PUCCH group. However, UE can report semi-persistent/aperiodic CSI (e.g. L1-RSRP) of the target being-activated PUCCH SCell on some serving cell belonging to primary PUCCH group using PUSCH.  Hence, If the CSI report to finish the PUCCH SCell activation is assumed periodic only, then the answer is yes. If the CSI report to finish the PUCCH SCell activation can be semi-persistent/aperiodic, then the answer is no. |
| vivo | Our answer is that the four cases are already supported with the understanding that cross-PUCCH-SCell group CSI reporting is allowed.  Do not understand QC’s answer “Yes” means the understanding stated in the LS is correct or not, if cross-PUCCH-SCell group CSI reporting is allowed |
| Apple | No, it is not correct. L3 RRM can be used to support this. |
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## Q3: Whether the above identified cases can be supported by RAN1 and RAN2 spec updates within Rel-17 timeframe.

### Question 3-1: Whether the above identified cases can be supported by RAN1 and RAN2 spec updates within Rel-17 timeframe?

Companies’ views are very welcome.

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| *Company* | *View* |
| Qualcomm | We think that the following two clarifications can apply Rel-16 and Rel-17.   * Cross-PUCCH-group CSI reporting is supported * Cross-cell-group CSI reporting is not supported |
| Nokia, NSB | Agree with Qualcomm |
| MTK | Yes. If the CSI report to finish the PUCCH SCell activation can be semi-persistent/aperiodic, then current RAN1/RAN2 spec already can support the identified cases. If the CSI report to finish the PUCCH SCell activation can only be periodic, then there are several possible ways requiring spec update to support the identified cases:   * UE transmits L1-RSRP report repetitively on different beams until the PUCCH SCell is activated successfully * Allow UE to transmit the CSI report (e.g. L1-RSRP) on SpCell for target PUCCH SCell before the PUCCH SCell is activated * Allow UE to perform CBRA RACH process on the PUCCH SCell   which should be able to be finished within Rel-17 timeframe. |
| vivo | They are already supported. |
| Apple | Yes, L3 RRM measurement can be used to support the four use cases which is carried in PUSCH. |
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### Question 3-2: If needed, any potential solution to support the identified cases? Any comments on the proposed solutions in [4] and [7] as copied below?

In [4], three alternatives are proposed,

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| * *UE transmits L1-RSRP report repetitively on different beams until the PUCCH SCell is activated successfully* * *Allow UE to transmit the CSI report (e.g. L1-RSRP) on SpCell for target PUCCH SCell before the PUCCH SCell is activated* * *Allow UE to perform CBRA RACH process on the PUCCH SCell* |

In [7], some analysis were provided for three alternatives below,

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| * *Option 2: CBRA on PUCCH SCell*   + *Based on the preferred SSB and associated PRACH, the common understanding on preferred beams can be established* * *Option 3: BFR for PUCCH SCell using the primary PUCCH group when it is being activated*   + *The UE can inform preferred beam via MAC-CE on a PUSCH in the primary PUCCH group* * *Option 4: L3 measurement based (no spec support)* |

Companies’ views are very welcome.

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| *Company* | *View* |
| Qualcomm | Except for “*Option 4: L3 measurement based (no spec support)*”, all the potential solutions require RAN1/RAN2 spec changes. We should focus on the solution mentioned in Q1. |
| Nokia, NSB | **L1 RSRP report beam sweeping:** This would be a new functionality that could lead to some negative interference impacts due to UL beam sweeping.  **Transmit the CSI report (e.g. L1-RSRP) on SpCell for target PUCCH SCell before the PUCCH SCell is activated**: This would appear to be the solution discussed in Q1 and we believe this is feasible with minimal spec clarification  **Allow UE to perform CBRA RACH process on the PUCCH SCell:** This could be a workable solution, but would require defining support for CBRA in SCell.  In addition it should be possible to perform PDCCH order beam sweeping for CFRA in the PUCCH SCell. In our understanding this is an implementation option currently available for the gNB, although latencywise not as attractive as basing the beam selection on RSRP reports. |
| MTK | Same view as Nokia. |
| Apple | We do not think we need any further action from RAN1 to support this. |
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## Issues that might be out of scope of this email thread

This email thread is about NR-CA. However, in [7], a proposal with respect to NR-DC is proposed, which is “***Clarify that “For NR-DC, CSI measured on a DL cell in a first cell-group is reported on a UL cell in a second cell-group” is not supported.***”

Since it is not relevant to the received RAN4 LS, the discussion on NR-DC is deprioritized. It may come back only if time permits. But if any companies have comment on it, it could be provided below.

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| *Company* | *View* |
| Qualcomm | It is not reasonable to deprioritize the clarification for NR-DC. Both should be clarified at the same time. Otherwise, Rel-16 NR-DC will have a problem. |
| Nokia, NSB | From RAN1 perspective it makes no difference if the PUCCH SCell is in NR-DC or in NR-CA, but we are not aware of any network setup where the MCG would deactivate and re-activate the SCG. If the MCG has such access to SCG, then it would also be able to apply the CA related measurement reporting and there’d be no need for RAN1 to differentiate between DC and CA. |
| MTK | We tend to agree with the proposal:“**Clarify that “For NR-DC, CSI measured on a DL cell in a first cell-group is reported on a UL cell in a second cell-group” is not supported.”**  The reason is explained in our answer to Question 1-1. |
| vivo | Can QC clarify why the following is not supported?  ***“For NR-DC, CSI measured on a DL cell in a first cell-group is reported on a UL cell in a second cell-group” is not supported.*** |
| Apple | Cross CG CSI reporting is not supported. In general, any cross CG scheduling is not allowed. |
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## Other Issues

Issues or comments that do not fit in any of the previous sections of this document can be provided in this section.

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| *Company* | *View* |
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# Conclusions

# References

1. R1-2108704 LS on beam information of PUCCH Scell in PUCCH SCell activation procedure RAN4, Huawei
2. R1-2108944 Draft Reply LS on beam information of PUCCH SCell in PUCCH SCell activation procedure vivo
3. R1-2109463 Draft Reply LS on beam information of PUCCH SCell in PUCCH SCell activation procedure Samsung
4. R1-2109550 Draft reply LS on beam information of PUCCH SCell in PUCCH SCell activation procedure MediaTek Inc.
5. R1-2109587 [Draft] Reply LS on beam information of PUCCH SCell in PUCCH SCell activation procedure ZTE
6. R1-2110009 Discussion on RAN4 LS R1-2108704 on beam information of PUCCH Scell in PUCCH SCell activation procedure Apple
7. R1-2110158 Discussion on LS on beam information of PUCCH SCell in PUCCH SCell activation procedure Qualcomm Incorporated
8. R1-2108775 Reply LS on beam information of PUCCH SCell in PUCCH SCell activation procedure Huawei, HiSilicon

# Appendix: