**3GPP TSG-RAN WG2 Meeting #116 electronic R2-21xxxxxx**

**Online, Nov 1-12, 2021**

**Agenda item:** 8.24.1

**Source:** Huawei, HiSilicon

**Title:** Summary of [AT116-e][018][NR17] Beam information of PUCCH SCell in PUCCH SCell activation (Huawei)

**Document for:** Discussion and Decision

# 1. Introduction

This document attempts to summarize the following offline discussion.

* [AT116-e][018][NR17] Beam information of PUCCH SCell in PUCCH SCell activation (Huawei)

Scope: Treat R2-2109360, R2-2110486, R2-2110088, R2-2110089, R2-2110487, R2-2110964, R2-211035, R2-2109566, R2-2109569, R2-2109659. Determine agreeable parts, including agreeable Reply LS, Draft CR if applicable.

Intended outcome: Ph1 Report, Ph 2 Approved LS, agreed in principle CR if applicable.

Deadline: Ph 1 Friday W1 (CB Online – if needed).

Rapporteur suggests companies to provide comments before Thursday W1 UTC 10:00, so that the agreeable part/possible way forwards can be summarized before on-line CB Friday W1.

# 2. Contact info

|  |  |  |
| --- | --- | --- |
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# 3. RAN4 LS

A RAN4 LS [1] asks RAN2/RAN1 three questions on beam information of PUCCH SCell during PUCCH SCell activation procedure, as copied below.

|  |
| --- |
| ***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.* |

# 4. Phase 1 discussion

To answer RAN4 Q1-3, RAN2 needs to analyze whether RAN2 specifications support or exclude the cross PUCCH group CSI reporting mentioned in Q2, and give views on Q2-Q3 from RAN2’s perspective.

## 4.1 Discussion on RAN4 Q1

For Q1, it was observed that RAN1 did not achieve conclusion on the issue in RAN1 Oct meeting, but it should not affect the RAN2 answer on Q1: i.e. in RAN2 specification, whether UE can report CSI (e.g. L1-RSRP) of the target being-activated PUCCH SCell on PCell’s PUCCH or other Cell’s PUSCH.

In contribution R2-2110486, R2-2110964, R2-2111035, companies express the view that there is no limitation in RAN2 specification to exclude the cross PUCCH group CSI reporting, in that sense it could be supported by RAN2 spec. While in R2-2109566, company thinks this case cannot be supported, as the PUCCH resource to be used in PCell is not clear.

Then it is critical to have a RAN2 common understanding on the following question first. In addition, it is appreciated if companies could provide detailed comments and reasoning, e.g. any specification text related, or any identified potential issue.

**Q1: In current RAN2 specifications, whether UE can report CSI (e.g. L1-RSRP) of PUCCH SCell on PCell or other serving cells belonging to primary PUCCH group?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | See comment | In principle we think that current RAN2 signaling supports the CSI report of PUCCH SCell over the PCell but we need to check with RAN1 is this was the intention from the beginning.  Nevertheless, since RAN1 is currently discussion which solution to adopt regarding the questions asked by RAN4, we prefer to wait for the RAN1 outcome before making a decision in RAN2. |
| Apple | See comment. Support is different from whether signalling allows it | We do not think RAN2 can decide if it is supported, just because signaling allows it. We think we need to leave this to RAN1 to decide if it is allowed or not. |
| OPPO | No | We think the intention of the field “carrier” within CSI-ReportConfig is to link report configuration and CSI resource of serving cells within same PUCCH group. But we also agree it is not crystal clear in current spec and it is possible that CSI report configuration within primary PUCCH group could be linked to PUCCH SCell in theory. We agree with E/// that we need wait for RAN1’s discussion to check whether such cross PUCCH group report is RAN1’s original intention.  From RAN2 point of view, even we assume it is feasible, such configuration will be strange if PUCCH SCell is already activated since obviously CSI report of PUCCH SCell can be transmitted via itself. So in order to enable this, after PUCCH SCell is activated a sensible implementation of network will reconfigure to normal configuration i.e. CSI resource of PUCCH SCell is linked back to PUCCH SCell itself. Assuming such reconfiguration is done not via *reconfigurationWithSync*, there is a period of uncertain time for UE to decide how to transmit CSI report of PUCCH SCell. And such uncertain period could be comparable to the period RAN1 try to save for a quick CSI Report during PUCCH SCell activation procedure. Note once PUCCH SCell is deactivated again, network need reconfigure so that CSI report of PUCCH SCell will be linked to serving cell of primary PUCCH group. So the RRC signaling overhead is doubled.  If the reconfiguration is done via *reconfigurationWithSync,* the cost is even higher. |
| Qualcomm | See comment | From purely signaling point of view, we think there is no issue to support cross PUCCH group reporting of CSI, as long as network configures CSI-reportConfig in any serving cell with PUCCH in the primary PUCCH group. But whether such a reporting is feasible should be decided by RAN1. |
| MediaTek | Yes, but | There is no limit from RAN2 spec, but we should wait for RAN1 conclusion. |
| ZTE | See comment | We also think the current RAN2 signalling can support it, but whether to support the function should wait for RAN1 decision. |
| vivo | Yes but | There is no issue to support cross PUCCH group CSI reporting, from RAN2 spec point of view. |
| Huawei, HiSilicon | Yes | We agree with many others that from RAN2 perspective, the existing signalling can support cross PUCCH group CSI reporting. Then whether this functionality could be supported is more rely on RAN1’s evaluation. Since now RAN4 is asking both RAN2 and RAN1, we can just reply with RAN2 view. We do not say anything about RAN1 status, RAN4 can be aware the situation taking both RAN1 and RAN2 answers into account.  Furthermore, we do not see RAN1’s conclusion does matter to RAN2 much. Because either RAN1 can support or not, we cannot do more other than saying RAN2 signalling already support.  In response to OPPO’s comment, we think a reconfiguration of reportConfig is always allowed, and whether/when to do it is NW implementation, we do not see the issue. |
| Nokia | See comment | For periodic/SP CSI reporting cell is preconfigured and for each serving cell it can only be configured on either PCell or PUCCH SCell. Configure it to both PCell and PUCCH SCell would be a waste of resource. If to configure PUCCH of PUCCH SCell on PCell, it stays like that not only during activation stage which is a bit odd configuration and defeat the purpose of PUCCH SCell. Even if no restriction from specification point of view, whether it is a reasonable configuration is another aspect.  For aperiodic CSI, whether it is supported might mainly depend on RAN1. |
| Intel | See comment | From RAN2 spec pov, we don’t see any showstopper to configure CSI reporting of PUCCH SCell on PCell. We should wait for RAN1 conclusion. In addition, although there is no issue to support in the spec, we are not sure it can be supported in Rel-15/16 because it has been assumed that PUCCH SCell is supposed to be used to provide CSI information which include own PUCCH SCell. Nevertheless, we are open for Rel-17 on the support of this operation. |
| CATT | Yes | RAN2 can show the concern that, RAN2 needs the input from RAN1 about initial or actual intention of “carrier” in CSI report configuration. |
| Samsung | Yes, but | Our understanding is that there is no limit from RAN2 perspective in theory. However, we should wait for RAN1 conclusion. |

**Summary:**

According to the companies’ comments, it seems the common understanding is that the existing RAN2 signalling allows CSI reporting of PUCCH SCell over the PCell. And some companies highlight that RAN2 signalling supports does not mean this feature can be supported, which should be tightly up to RAN1 conclusion on the support.

**Proposal 1: RAN2 understand the existing RAN2 signalling allows CSI reporting of PUCCH SCell over the PCell, and whether UE can report CSI of PUCCH SCell on PCell mainly depends on RAN1.**

## 4.2 Discussion on RAN4 Q2

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*

RAN4 assume that to support the 4 cases, UE needs to report PUCCH SCell’s beam information via CSI reporting on PCell or other serving cell in primary PUCCH group. So whether the 4 cases can be supported in current specification is tightly related to the answer to Q1. Companies’ views on the following question are very welcome, which could be more focusing on RAN2 perspective.

**Q2:** **Whether the above observation is correct, i.e. the identified four cases are not supported by the current RAN2 specification.**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | See comment | If we confirm that the CSI report of PUCCH SCell over the PCell is allowed by RAN1 and RAN2 specification, we think that these case are currently supported.  However, before taking a decision in RAN2 we would like to wait for the outcome of RAN1 discussions. |
| Apple | Same views as Q1… | Known/Unknown definition is not within the scope of RAN2 anyway. Also we agree with Ericsson’s response to get input from RAN1 before we commit to anything in RAN2. |
| OPPO | Yes | From RAN2 point of view they are not supported. |
| Qualcomm | See comment | We share the same view as Ericsson. |
| MediaTek | See comment | From RAN2 point of view, there is no limitation, but we still need to wait for RAN1’s conclusion. |
| ZTE | See comment | We share the same view as Ericsson. |
| vivo | See comment | Same view with Ericsson. |
| Huawei, HiSilicon | No | In our understanding, these cases are agnostic to RAN2. But we agree with the RAN4 observation that if cross PUCCH group CSI reporting can be supported then those cases can be supported. We can answer RAN4 with this if it is RAN2 common understanding. |
| Nokia | See comment | No issue with valid TA case since no RA procedure needed for PUCCH SCell. UL transmission on PUCCH SCell can happen whenever the cell is ready. Doing RACH on PUCCH might be the main issue for no TA case.  [Huawei] We also agree that “no TA case” is more critical, because the issue on how to perform RACH needs to be addressed first. Without beam information, the UE may not be able to receive PDCCH order.  And for the “with valid TA case”, we understand from RAN4 LS the beam information is needed for PDCCH monitoring of data scheduling. |
| Intel | See comment | The question seems a bit unclear. We wonder what is the issue with “valid TA” case. We understand that in case of “without valid TA”, there is no way for gNB to trigger PDCCH order for CFRA which is required to activate PUCCH SCell without a valid TA.  [Huawei] We understand from RAN4 LS is even for with valid TA case, the beam information is needed for PDCCH monitoring. |
| CATT | See comment | Share the same view with Ericsson. |
| Samsung | See comment | Same view as Ericsson. |

**Summary:**

According to the companies’ comments, 8/12 companies think if the CSI report of PUCCH SCell over the PCell is allowed by RAN1 and RAN2 specification, these case are supported. 2/12 companies think only without valid TA cases have the issue. 1/12 companies think those cases cannot be supported. 2/12 companies mention that there is no unknown/known definition in RAN2. Moderator understand according to the text in RAN4 LS, in the cases of with valid TA UE also needs to monitor PDCCH, then beam information is needed. According to the majority view, the below proposal tries to capture this RAN2 understanding.

**Proposal 2: RAN2 specifications do not differentiate known/unknow SCell, but RAN2 understand that if the CSI reporting of PUCCH SCell over the PCell is concluded as supported in RAN1, the cases asked by RAN4 are supported.**

## 4.3 Discussion on RAN4 Q3

RAN4 think to support the 4 cases are valuable and prefer to complete them in Rel-17. Then they are asking whether it can be supported by RAN2 and RAN1 in Rel-17, especially in case that cross PUCCH group CSI reporting cannot be supported in current specifications. From RAN2 point of view, if companies can achieve the common understanding that cross PUCCH group CSI reporting is supported in RAN2 specification, then there is no RAN2 effort is needed in Rel-17. But if not, some further evaluation and discussion are required. Thus Q3 and Q4 are given below.

**Q3: Whether the above identified cases can be supported by RAN1 and RAN2 spec updates within Rel-17 timeframe?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | Wait for RAN1 | RAN1 is currently discussing this LS and there 3 options on the table. We think that RAN2 should wait for RAN1 to make a decision first. |
| Apple | Same view as Ericsson |  |
| OPPO | Comment | From RAN2 point of view, yes. But we agree we need wait for the progress in RAN1 also. |
| Qualcomm | Same view as Ericsson |  |
| MediaTek | Comment | From RAN2 point of view, yes, but we need to wait for RAN1’s input. |
| ZTE | Same view as Ericsson |  |
| vivo | Same view as Ericsson |  |
| Huawei, HiSilicon | Depends … | Our understanding is if those cases are supported by cross PUCCH group CSI reporting (confirmed by RAN1), no RAN2 effort is needed, then RAN2 can support in Rel-17 of course. But for other situations, we are not sure, so maybe need to consider how RAN1 decides to handle it. |
| Nokia | Yes | Either clarify cross PUCCH group CSI reporting is possible or specify solutions with only RAN2 impact. |
| Intel | TBD | The answer would be dependent on Q1 and what modification is needed if the current spec doesn’t support. |
| CATT | Yes |  |
| Samsung | Same view as Ericsson |  |

**Summary:**

According to the companies’ comments, it is hard to give a conclusive answer by RAN2 without RAN1 conclusion on the support of CSI reporting of PUCCH SCell via PCell. However, moderator understand companies are open to discuss the RAN2 solutions if RAN1 concludes CSI reporting of PUCCH SCell via PCell can not be supported. And it seems obvious that if RAN1 can conclude CSI reporting of PUCCH SCell via PCell can be supported, no issue for RAN2 to support such cases as the discussion on Q2.

**Proposal 3: RAN2 understand if CSI reporting of PUCCH SCell cannot be supported by RAN1, RAN2 may need to discuss RAN2 solutions in Rel-17.**

Some companies show concerns that if cross PUCCH group CSI reporting cannot be supported either by RAN1 specification or RAN2 specification, there should be other solutions specified in RAN2 Rel-17. For instance, in R2-2111035 the following options are given, among which option 1 is preferred in R2-2109566.

* Option 1: trigger BFR for the PUCCH SCell when it is activated and no valid TA
* Option 2: CBRA on SCell with RA resource separately configured for such purpose that would result in different RN-RNTI(s) as PCell ROs and different from the common RA resource broadcasted in the SCell
* Option 3: wait for RAN1 conclusion on the possibility of cross-PUCCH group CSI reporting and if any configuration update needed

**Q4: Among the above 3 options, which option do companies agree to further discuss in RAN2?**

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| --- | --- | --- |
| Company | Option # | Comments |
| Ericsson | Option 3  (Wait for RAN1) | RAN1 is currently discussing this LS and the 3 listed options. We think that RAN2 should wait for RAN1 to make a decision first. |
| Apple | Same view as Ericsson |  |
| OPPO | Option1 | From RAN2 point of view we can conclude on option1. |
| Qualcomm | Option 3 | Same view as Ericsson |
| MediaTek | Option 3 |  |
| ZTE | Option 3 |  |
| vivo | Option 3 |  |
| Huawei, HiSilicon | open | We are open to discuss RAN2 solution as option1 or option2. But we are okay to do that only after RAN1 conclude cross-PUCCH group CSI reporting cannot be supported since Rel-15. |
| Nokia | Option 1 is preferred  Option 2 is also acceptable  Option 3 only if RAN1 can conclude | Option 1 with triggering BFR seems to be simplest approach without impact to other WGs.  Option 2 could be acceptable as well, but it has larger impact and restrict RO NW configuration for PCell and SCell.  If option 1 or 2 can be adopted, it can avoid the lengthy discussion on cross-PUCCH group UCI reporting which was not intended from the beginning anyway. Besides, it also depends on RAN1 discussion and it seemed to be difficult to conclude in RAN1. Otherwise, we wait for RAN1 (option 3). |
| Intel | Option 3 |  |
| CATT | Option 3 |  |
| Samsung | Option 3 |  |

**Summary:**

Most companies still prefer to wait for RAN1 conclusion before RAN2 discussion on other solutions other than CSI reporting of PUCCH SCell over PCell, then no proposal is given.

Considering RAN2 have a majority views/common understanding as in P1/P2/P3, moderator suggests RAN2 to reply RAN4 with the RAN2 understandings in P1/P2/P3.

**Proposal 4: RAN2 to reply RAN4 LS with the RAN2 understandings within the above proposal 1/2/3.**

## 4.4 Any others issues?

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| --- | --- |
| Company | Comments |
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# 3. Phase 2 discussion

Based on Ph1 discussion, could discuss if agreeable reply LS can be sent to RAN4 and if any CR is needed in RAN2.

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# 4. Conclusion

[To be updated]

4. References

[R2-2109360](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2109360.zip) LS on beam information of PUCCH SCell in PUCCH SCell activation procedure (R4-2115339; contact: Huawei) RAN4 LS in Rel-17 NR\_RRM\_enh2-Core To:RAN1, RAN2

[R2-2110486](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110486.zip) Discussion on beam information of PUCCH SCell in PUCCH SCell activation (RAN4 LS) Huawei, HiSilicon discussion Rel-17 NR\_RRM\_enh2-Core

[R2-2110088](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110088.zip) Discussion on LS reply for PUCCH Scell Apple discussion Rel-17 NR\_RRM\_enh2-Core

[R2-2110089](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110089.zip) [Draft] LS reply for PUCCH Scell RAN4 LS Apple LS out Rel-17 NR\_RRM\_enh2-Core To:RAN4 Cc:RAN1

[R2-2110487](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110487.zip) Draft LS Reply on beam information of PUCCH SCell in PUCCH SCell activation procedure Huawei, HiSilicon LS out Rel-17 NR\_RRM\_enh2-Core To:RAN4 Cc:RAN1

[R2-2110964](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110964.zip) [DRAFT] LS Reply on beam information of PUCCH SCell in PUCCH SCell activation procedure Samsung LS out Rel-17 To:RAN4 Cc:RAN1

[R2-2111035](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2111035.zip) PUCCH SCell activation Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_RRM\_enh2-Core

[R2-2109566](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2109566.zip) Discussion on CSI report for being activated PUCCH SCell OPPO discussion Rel-17 NR\_RRM\_enh2-Core

[R2-2109569](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2109569.zip) Draft LS on CSI report of PUCCH SCell OPPO LS out Rel-17 NR\_RRM\_enh2-Core To:RAN4 Cc:RAN1

[R2-2109659](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2109659.zip) Draft CR on CSI report of PUCCH SCell OPPO draftCR Rel-17 38.321 16.6.0 F TEI17