3GPP TSG-RAN WG2 Meeting #116bis Electronic R2-220xxxx

Online, 17 – 25 Jan 2022

**Agenda item: 8.24.1**

**Source: Huawei, HiSilicon**

**Title: Summary of [AT116bis-e][033][NR17] (Huawei)**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the summary report of the following offline discussion:

* [AT116bis-e][033][NR17] (Huawei)

 Scope: Treat R2-2200086, R2-2201341, R2-2201502, R2-2201503, R2-2201504. Determine agreeable parts, identify parts for online CB.

 Intended outcome: 1 Report, 2 Reply LS, Draft CRs if applicable.

 Deadline: 1 On-Line CB Thu W1, 2 EOM

# 2 Contact Points

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| --- | --- | --- |
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| vivo | Wenjuan Pu | wenjuan.pu@vivo.com |
| LGE | SunYoung LEE | Ssunyoung.lee@lge.com |
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# 3 Phase I Discussion

As requested by RAN4, RAN2 discussed the beam information reporting for unknown PUCCH SCell activation in RAN2 #116 meeting, and made the following agreements.

* RAN2 understand the existing RAN2 signalling can allow configuration of CSI reporting of PUCCH SCell over the PCell, and whether UE can report CSI of PUCCH SCell on PCell mainly depends on RAN1.
* RAN2 specifications do not differentiate known/unknown 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 can be supported.
* Chair: RAN2 hasn’t looked at other solutions yet. Wait for RAN1 to determine if this is needed. We don’t send Reply LS (now). We wait for RAN1.

In this meeting, several contributions discuss the potential RAN2 spec impact based on RAN1 LS in R2-2200086 from the following aspects:

* Cross-PUCCH group CSI reporting
* Other RAN2 solutions to support unknown PUCCH SCell activation

## 3.1 Cross-PUCCH group CSI reporting

As indicated in RAN1 LS R2-2200086, there is no restriction in the current RAN1 specification that would not allow UE to report CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group. But there is no RAN1 consensus on whether all UEs supporting NR-CA with dual PUCCH-groups for the BC support such CSI report in Rel-15 and Rel-16. Support of such CSI report is indicated in Rel-17 with a new UE capability.

Regarding the detailed UE capability reporting, R2-2201341 propose to introduce this capability from Rel-16 and the UE supporting PUCCH SCell should be mandated to report such capability; R2-2201502 propose this capability should be a per-UE level capability. Companies are welcome to give comments on the above proposals.

**Question 1: Do companies agree to introduce the capability of cross PUCCH group CSI reporting from Rel-16 as proposed in R2-2201341?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | No strong view | We agree to introduce a capability as indicated by the reply LS sent by RAN1. However, whether to have it directly from Rel-16 or from Rel-17 we do not have actually a strong view. Nevertheless, if we decide to reuse the current RRC signalling for this feature, probably having it from Rel-16 makes sense. |
| ZTE | Yes | We think it’s also fine to introduce the capability from Rel-16 if we decide to reuse the current RRC signalling for cross PUCCH group CSI reporting. |
| Huawei, HiSilicon | See comments | In general, we are ok to introduce this capability from Rel-16, although it is not the same release indicated in RAN1 LS. However, considering Rel-16 has been frozen for a long time, it seems not a good idea to mandate a Rel-16 UE capability. In this sense, if RAN2 is about to introduce this capability from Rel-16, at least in Rel-16 this capability is optional, not conditional mandatory. |
| Nokia | Yes |  |
| OPPO | No | Even there is no restriction from RAN1 point of view, we still think such configuration in RRC will cause more confusion in RAN2 spec. In 38.300 section 10.6, it says “…SCells of secondary PUCCH group (a group of SCells whose PUCCHsignalling is associated with the PUCCH on the PUCCH SCell)…”so if the CSI of one SCell belonging to primary PUCCH group can be reported via PUCCH on 2nd PUCCH SCell, it means this serving cell is associated with PUCCH SCell i.e. it belongs to 2nd PUCCH group too. If CSI of PUCCH SCell can be reported via PUCCH of SPCell, it also mean PUCCH SCell belongs to primary PUCCH group which is very weird since it belongs to 2nd PUCCH group for sure. So we prefer not to introduce such capability. Instead we think a solution based on MAC CE BFR is sufficient. [Huawei, HiSilicon] We share the sympathy on the concern that allowing CSI reporting of PUCCH SCell via PCell seems confuse the concept of PUCCH group. But we understand such supporting is only needed during the SCell activation, and only after the SCell is successfully activated (means PUCCH channel is ready), the network can add other SCell into the secondary PUCCH group by associating the new SCell with the PUCCH SCell. In this case, the network should ensure the PUCCH SCell send CSI via its own PUCCH. This can up to network implementation, and we can have some clarification in RAN2 spec or chainman notes if needed. |
| Apple | No | We do not think this needs to be introduced from Rel-16 itself. Rel-17 can carry this. |
| MediaTek | No | We prefer to introduce this capability from Rel-17.  |
| Docomo | Yes | See Q2 |
| CATT | No | We prefer to introduce this capability from Rel-17, if such capability is introduced. |
| vivo | No | We prefer to introduce this capability from Rel-17. |
| LGE | No strong view | However, there seems to be no urgency to have it from Rel-16. |
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11 companies provide views. 3/11 companies agree to introduce this capability since Rel-16. 5/11 companies disagree, while 1 company disagree to introduce this capability at all. 2 companies have no strong view considering existing RRC signalling already support the configuration but seems no urgency meanwhile.

The moderator understands this capability is already agreed by RAN1 to address the issue that unknown PUCCH SCell cannot be activated due to lack of beam information in network side. As other 10/11 companies do not against this capability, the moderator suggest we follow majority view and not challenge the RAN1 agreement of introducing this capability.

About the release, since it was indicated as a Rel-17 capability in RAN1 LS, and there is no majority support to implement it earlier in Rel-16, the moderator would also suggest to follow RAN1 agreement of having this capability since Rel-17.

**Proposal 1: RAN2 agree to introduce the UE capability (i.e. UE reports CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group) since Rel-17 as indicated by the RAN1 LS.**

**Question 2: Do companies agree that the capability of cross PUCCH group CSI reporting should be conditional mandatory for** **the UEs supporting PUCCH SCell as proposed in R2-2201341?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | Yes |  |
| ZTE | Yes | We think supporting cross PUCCH group CSI reporting for PUCCH SCell activation is enough. So having a conditional mandatory UE capability can avoid introducing another solutions, which have significant spec impact. |
| Huawei, HiSilicon | See comments | For Rel-17 and later releases, conditional mandatory/optional are both fine to us. For earlier release, it should be optional if introduced. |
| Nokia | Yes |  |
| OPPO | No | Please refer to answer to Q1 |
| Apple | No | PUCCH SCell feature has been with us without this, so we do not understand why this has to be conditionally mandatory for Rel-17. As we commented to Q1, NWs would have to deal with Rel-16 UEs which have not implemented this and so NWs should be able to deal with such UEs without depending on the UEs to implement this. |
| MediaTek | No strong view | We don’t really think this is necessary as commented by Apple. But it also fine to make it conditional mandatory if majority prefers. |
| Docomo | Yes | With this we could avoid introducing multiple solutions. |
| CATT | Yes | We are fine to set it as conditional mandatory for Rel-17, in order to avoid additional complexity, e.g., to define some new solution for UEs that do not support such capability but supporting PUCCH SCell. |
| vivo | No strong view |  For Rel-17, the capability of cross PUCCH group CSI reporting can be conditional mandatory for the UEs supporting PUCCH SCell. |
| LGE | Yes |  |
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11 companies provide views. 6/11 companies support to make the UE capability as conditional mandatory for UEs supporting PUCCH SCell. 3/11 companies can accept to have this capability as conditional mandatory in Rel-17.

In moderator’s understanding, there is a majority support of conditional mandatory as it could better support the PUCCH SCell activation in CA. And according to RAN1 and RAN2 analysis, there is no restriction to support such reporting from specification perspective, which implies the UEs may already support it or can easily support it. If there is no big technical concern, the moderator would suggest to follow majority view.

**Proposal 2: RAN2 agree the UE capability indicated in RAN1 LS is conditional mandatory supported by the UEs supporting PUCCH SCell since Rel-17.**

**Question 3: Do companies agree that the capability of cross PUCCH group CSI reporting should be per-UE level as proposed in R2-2201502?**

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| Company | Yes/No | Comments |
| Ericsson | Yes |  |
| ZTE | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
| OPPO | No | Please refer to answer to Q1 |
| Apple | No | RAN2 cannot simply decide this, need input from RAN1/4 |
| MediaTek | Yes, but | We prefer to check with R4 |
| CATT | Yes |  |
| vivo | Yes |  |
| LGE | Yes |  |
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10 companies provide views. 8/10 companies agree this UE capability is per-UE level. 2 companies disagree, and 1 company think input from RAN1/RAN4 is needed, which is also echoed by 1 company answering yes. In order to avoid redundant consult-feedback round, the moderator would suggest to first have a RAN2 agreement on this, and inform RAN1/RAN4 for issue-checking.

**Proposal 3: RAN2 agree the UE capability indicated in RAN1 LS is per-UE level, and inform RAN1/RAN4 for issue checking.**

As discussed in RAN2 #116 meeting, it has been already confirmed that the existing RAN2 signalling can allow configuration of CSI reporting of PUCCH SCell over the PCell. In this sense, no extra RAN2 work required to configure the cross-PUCCH group CSI reporting.

**Question 3.1: Do companies agree that the existing RRC signalling is enough to configure UE to report CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group?**

If the answer is no, please indicate what the explicit RAN2 signalling would be.

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| --- | --- | --- |
| Company | Yes/No | Comments |
| ZTE | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes | UE capability needs to be added though. |
| Ericsson | Yes |  |
| OPPO |  | Technically yes, but we think it is not the right way to go |
| Apple | Yes | Technically yes. We assume NW acts after it knows the UE capability. |
| MediaTek | Yes |  |
| Docomo | Yes |  |
| CATT | Yes |  |
| vivo | Yes |  |
| LGE | Yes |  |
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11 companies provide views, and all companies confirm technically the existing RRC signalling is enough to configure UE to report CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group, after knowing the UE supports such reporting from UE capability.

**Proposal 4: RAN2 confirm that the existing RRC signalling is enough to configure UE to report CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group, after knowing the UE supports such reporting from UE capability.**

## 3.2 Other RAN2 solutions

The following options were briefly discussed in the previous RAN2 meeting in case the cross PUCCH group CSI reporting cannot be supported:

* Option 1: to report beam information via BFR-like MAC CE which would indicate the candidate beam information
* Option 2: CBRA on SCell discussed in RAN4 without requiring beam information for the PUCCH SCell

In R2-2201341/R2-2201502, the potential RAN2 impact to support the above two solutions are given. For option1, the main spec impact would be defining the beam reporting in MAC which is very similar with BFR; while for option2, the spec impact would be significant since the RAR for RA on SCell is sent on PCell and the UE is currently not required to monitor CSS of the SCell. Then in case cross-PUCCH group CSI reporting is not conditional mandatory for the UEs supporting PUCCH SCell, the simpler RAN2 solution between option 1 and option 2 can be considered if spec impact is clear and manageable.

**Question 4: Do companies agree to support option1, i.e. beam information reporting via MAC CE, if cross-PUCCH group CSI reporting is not conditional mandatory for the UEs supporting PUCCH SCell?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | No | As already clarified by RAN1, there is no restriction in the current RAN1 specification that would not allow UE to report CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group. We think that current signalling is enough and we do not need any additional solution for it.This is also in line with the agreements taken by RAN2 in the last meeting:* RAN2 understand the existing RAN2 signalling can allow configuration of CSI reporting of PUCCH SCell over the PCell, and whether UE can report CSI of PUCCH SCell on PCell mainly depends on RAN1.
* RAN2 specifications do not differentiate known/unknown 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 can be supported.
 |
| ZTE | No | We think supporting cross PUCCH group CSI reporting for PUCCH SCell activation is enough. No additional solution is needed. |
| Huawei, HiSilicon | (Proponent)Yes | The intention is to provide a simpler RAN2 solution in case cross-PUCCH group CSI reporting cannot be supported by some UEs.As shown in the MAC CR and RRC CR, the changes are quite straightforward and no RAN1 impact. Thus we think it could be specified in Rel-17 as a candidate solution to report beam information in case the cross PUCCH group CSI reporting is not mandatory supported. |
| Nokia | - | Depends on the outcome of Q2 whether all the UEs supporting PUCCH SCell supports cross cell group CSI reporting. |
| OPPO | Yes | We also support solution based on MAC CE, but we disagree with the detail solution from Huawei. We think it is sufficient to reuse current MAC CE BFR. The only necessary change is to add the way to trigger and cancel BFR due to activation of PUCCH SCell. Please find detail CR in R2-2109659. |
| Apple | No | We can just go with capability/configuration methods as discussed above. |
| MediaTek | No |  |
| Docomo | No | Agree with ZTE |
| CATT | - | We are fine for the MAC CE based solution, and it seems more discussions are needed regarding whether the current signalling can be reused for that. |
| vivo | No | Cross PUCCH group CSI reporting solution is sufficient.  |
| LGE | No | It depends on Q1/Q2. It would be clean and clear not to create a case where some UEs are not supporting cross-PUCCH group CSI reporting. |
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11 companies provide views. 7/11 companies disagree to support the MAC CE-based beam reporting. 2 companies support the solution, but with different views on detailed MAC CE design. 1 company think more discussion is needed. 1 company think it depends on the conclusion of conditional mandatory.

As there is not much support on the solution, the moderator would suggest RAN2 not consider this solution in Rel-17 and inform RAN4.

**Proposal 5: RAN2 do not support MAC-CE based beam reporting** **for unknown PUCCH SCell activation in Rel-17.**

**Question 5: If yes to Q4, any comments on the draft CRs to MAC and RRC spec as in R2-2201504 and R2-2201505?**

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| Company | Comments |
| Nokia | Enough to reuse BFR MAC CE and trigger BFR for the PUCCH SCell upon activation of the PUCCH SCell. No need to introduce new procedure and new MAC CE. |
| OPPO | As comments before these two CRs are not necessary. |
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**Question 6: Do companies agree to support option2, i.e. CBRA is enabled on unknown PUCCH SCell without requiring beam information, if cross-PUCCH group CSI reporting is not conditional mandatory for the UEs supporting PUCCH SCell?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Ericsson | No | As already clarified by RAN1, there is no restriction in the current RAN1 specification that would not allow UE to report CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group. We think that current signalling is enough and we do not need any additional solution for it.This is also in line with the agreements taken by RAN2 in the last meeting:* RAN2 understand the existing RAN2 signalling can allow configuration of CSI reporting of PUCCH SCell over the PCell, and whether UE can report CSI of PUCCH SCell on PCell mainly depends on RAN1.
* RAN2 specifications do not differentiate known/unknown 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 can be supported.
 |
| ZTE | No | We think supporting cross PUCCH group CSI reporting for PUCCH SCell activation is enough. No additional solution is needed. |
| Huawei, HiSilicon | No | We feel the solution has much open issues which cannot be easily concluded in Rel-17. |
| Nokia | - | No big standardization impact as long as the RA resources for PCell and PUCCH SCell results in different RA-RNTI. |
| OPPO | No |  |
| Apple | No | We can just go with capability/configuration methods as discussed above. |
| MediaTek | No |  |
| Docomo | No | Agree with ZTE’s view. |
| CATT  | No |  |
| vivo | No | Cross PUCCH group CSI reporting solution is sufficient.  |
| LGE | No | Agree is ZTE |
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11 companies provide views. 10/11 companies disagree to support the CBRA-based solution. Then the moderator would suggest a similar proposal of MAC CE-based solution:

**Proposal 6: RAN2 do not support CBRA-based solution for unknown PUCCH SCell activation in Rel-17.**

RAN4 and RAN1 should be informed with the above RAN2 agreements concerning the UE capability design of cross-PUCCH group CSI reporting and whether to support other RAN2 solutions in Rel-17. The content would be discussed in phase II.

**Proposal 7: RAN2 send reply LS to RAN4 and RAN1 with the above RAN2 agreements.**

**Proposal 8: To finalize the LS in phase II.**

# 4 Phase II Discussion

Regarding the Phase I proposal 1&4, there was an online-discussion, and almost all companies support the RAN1 agreed capability.

[R2-2201853](file:///D%3A%5C%5CDocuments%5C%5C3GPP%5C%5Ctsg_ran%5C%5CWG2%5C%5CTSGR2_116bis-e%5C%5CDocs%5C%5CR2-2201853.zip%22%20%5Co%20%22D%3ADocuments3GPPtsg_ranWG2TSGR2_116bis-eDocsR2-2201853.zip)

DISCUSSION

* Oppo think that the concept of PUCCH group is confusing
* QC think that this can be easily introduced and a new cap is needed, but prefer to have the UE cap should be from R16. Nokia agrees as there is no functionality change.
* Apple agree that the wording can be improved but agree with the intent. Think R17 is best. Don’t understand why cond mandatory.
* Ericsson support, can accept both R16 R17
* Chair: RAN2 can agree to introduce the UE capability but the details need to be further discussed
* The details of what the existing RRC signalling support to be further clarified offline, continue in current discussion

Although it has already clarified in the previous email that the RAN1 agreed UE capability is to indicate UE can “report CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group”. It does not intent to change the concept of PUCCH group, but treats this as an exceptional case like cross PUCCH group reporting, one company still hold the concern on PUCCH group concept. Then we will further check company views via Phase II discussion.

**Question2.1: Do companies agree to introduce the capability of “report CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group” as indicated in RAN1 LS?**

**If company answers no, please indicate what the issue is, and what the explicit RAN2 RRC spec impact is or the suggested wording for the UE capability.**

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| Company | Yes/No | Comments |
| Qualcomm | Yes |  |
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**Question2.2: Do companies agree that the existing RRC signalling is enough to configure UE to report CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group?**

**If the answer is no, please indicate what signalling is not supported and what is the potential RAN2 signalling.**

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| Company | Yes/No | Comments |
| Qualcomm | Yes |  |
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It is unlikely we can achieve consensus on UE capability support, release, and conditional mandatory v.s. optional in this meeting due to limited time. The moderator thinks RAN4 and RAN1 should be informed with the above RAN2 agreements and situation. It would help them plan the discussion in their later meetings.

**Question2.3: Do companies agree that LS should be sent to RAN1/RAN4 with RAN2 agreements/situation on the UE capability?**

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| --- | --- | --- |
| Company | Yes/No | Comments |
| Qualcomm | Yes | Even if companies can’t converge on the capability attributes, we are fine with sending an LS if proposals in Q2.1 and Q 2.2 can be agreed. Those two agreements may be sufficient for RAN4/1 to use in their work.  |
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# 5 Conclusion

Phase I proposals:

**Proposal 1: RAN2 agree to introduce the UE capability (i.e. UE reports CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group) since Rel-17 as indicated by the RAN1 LS.**

**Proposal 2: RAN2 agree the UE capability indicated in RAN1 LS is conditional mandatory supported by the UEs supporting PUCCH SCell since Rel-17.**

**Proposal 3: RAN2 agree the UE capability indicated in RAN1 LS is per-UE level, and inform RAN1/RAN4 for issue checking.**

**Proposal 4: RAN2 confirm that the existing RRC signalling is enough to configure UE to report CSI of a SCell belonging to secondary/primary PUCCH group by PUSCH or PUCCH of active serving cells belonging to primary/secondary PUCCH group, after knowing the UE supports such reporting from UE capability.**

**Proposal 5: RAN2 do not support MAC-CE based beam reporting for unknown PUCCH SCell activation in Rel-17.**

**Proposal 6: RAN2 do not support CBRA-based solution for unknown PUCCH SCell activation in Rel-17.**

**Proposal 7: RAN2 send reply LS to RAN4 and RAN1 with the above RAN2 agreements.**

**Proposal 8: To finalize the LS in phase II.**

In addition, as OPPO commented there may be misleading on the PUCCH group concept if UE is configured to report CSI of PUCCH SCell via PCell. The moderator’s understanding is that such CSI reporting is only for the Being-activated PUCCH SCell. Thus after the PUCCH SCell is activated if the network adds other SCell into the secondary PUCCH SCell group it should ensure the PUCCH SCell only use its own PUCCH, e.g. via RRC reconfiguration procedure. The moderator would like to check if this is also the understanding of other companies and if this should be captured somewhere, e.g. RAN2 spec or chair notes, and reply LS as well.

# 5 References

1. R2-2200086 Reply LS on beam information of PUCCH SCell in PUCCH SCell activation procedure (R1-2112858; contact: Huawei) RAN1 LS in Rel-17 NR\_RRM\_enh2-Core To:RAN4 Cc:RAN2
2. R2-2201341 PUCCH SCell activation Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_RRM\_enh2-Core
3. R2-2201502 Further discussion on beam information of PUCCH SCell in PUCCH SCell activation (RAN1 LS) Huawei, HiSilicon discussion Rel-17 NR\_RRM\_enh2-Core
4. R2-2201503 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:RAN1, RAN4
5. R2-2201504 Draft CR to TS38.321 for Beam information reporting via MAC CE for PUCCH SCell activation Huawei, HiSilicon draftCR Rel-17 38.321 16.7.0 NR\_RRM\_enh2-Core
6. R2-2201505 Draft CR to TS38.331 for Beam information reporting via MAC CE for PUCCH SCell activation Huawei, HiSilicon draftCR Rel-17 38.331 16.7.0 NR\_RRM\_enh2-Core