3GPP TSG-RAN WG2 #117-e R2-220xxxx

E-Meeting, 21th Feb -3rd March, 2022

Agenda Item: 8.24.1

Source: CATT

**Title: Report of [AT117-e][055][NR17] PUCCH SCell Activation Invalid TA (CATT)**

Document for: Discussion and decision

# 1 Introduction

This is report of the following e-mail discussion:

* [AT117-e][055][NR17] PUCCH SCell Activation Invalid TA (CATT)

 Scope: Delay start of this discussion until R1 has replied to the LS in R2-2200133/R4-2120420, and take the R1 reply into account. Treat [R2-2202149](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2202149.zip), [R2-2203016](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2203016.zip), [R2-2203017](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2203017.zip)

 Intended outcome: Report, Approved LS out (if need for TS change is identified, outcome should also include CRs).

 Deadline: EOM

The offline will have 2 parts: Firstly companies should achieve convergence on all the technical issues, and then we will prepare a draft reply LS based on the conclusion.

* **First phase deadline** for companies feedback on discussion: **14:00 UTC** ,**Tuesday March 01**
* **Second phase deadline** for companies feedback on LS: **14:00 UTC, Wednesday March 02**

**Since the issues in RAN4 LS in are more related to RAN1, in this paper, we will discuss the issues based on the reply LS from RAN1 and contributions in RAN2.**

# 2 Contact Points

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

|  |  |  |
| --- | --- | --- |
| Company | Name | Email Address |
| CATT | Jie Shi | shijie@catt.cn |
| Qualcomm | Linhai He | linhaihe@qti.qualcomm.com |
| vivo | Wenjuan Pu | wenjuan.pu@vivo.com |
| ZTE | Mengjie Zhang | zhang.mengjie@zte.com.cn |
| MediaTek | Felix Tsai | chun-fan.tsai@mediatek.com |
| Apple | Yuqin Chen | yuqin\_chen@apple.com |
| Huawei, HiSilicon | Rui Wang | Wangrui46@huawei.com |
| Nokia | Chunli Wu | Chunli.wu@nokia-sbell.com |
| Ericsson | Mattias Bergström | Mattias.a.bergstrom@gmail.com |
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# 2 Discussion

In [1], RAN4 sends one LS to ask RAN2 and RAN1 opinion on the issue of interruption for PUCCH SCell activation in invalid TA case. In this paper, based on RAN1 reply LS and the other contributions [1]-[3] in RAN2, we give a discussion from the RAN2 perspective and provide a draft reply for LS reply approval.

## Issue#1: On the UE capability *diffNumerologyAcrossPUCCH-Group*

In [1], RAN4 ask RAN1 and RAN2 the question of whether UE capability *diffNumerologyAcrossPUCCH-Group* defined in TS 38.306 can be used to allow indication of UE support of parallel transmission of PRACH on PUCCH SCell and physical channels/signals with different SCS on other activated serving cells.

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| --- |
| **RAN4 LS in*** **Q1:** Can UE capability *diffNumerologyAcrossPUCCH-Group* defined in TS 38.306 be used to allow indication of UE support of parallel transmission of PRACH on PUCCH SCell and physical channels/signals with different SCS on other activated serving cells?
	+ If YES, RAN4 would like to respectfully ask RAN2 to clarify that *diffNumerologyAcrossPUCCH-Group* applies to PRACH in the corresponding “Definitions for parameters” in TS 38.306.
	+ If NO, are there any other existing capabilities that can serve this purpose? If so, RAN4 would like RAN1 to indicate the capabilities.
 |

Based on the description in 38.306 as below, RAN1 reply LS [4] has already discussed and given the answer to the Q1, and [2] also gives the same analysis on this capability. The analysis is, based on the definition in 38.306, the *diffNumerologyAcrossPUCCH-Group* is only related to data/control (data refers to PUSCH and control refers to PUCCH), but not to PRACH transmission according to the capability description in 38.306. Thus, the answer to the Q1 is NO.

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| ***diffNumerologyAcrossPUCCH-Group-CarrierTypes-r16***Indicates whether different numerology across two NR PUCCH groups for data and control channel at a given time in NR CA for UE supporting two PUCCH groups with 3 or more bands with at least two carrier types. UE indicating support of this feature shall indicate support of *twoPUCCH-Grp-ConfigurationsList-r16.* | BC | No | N/A | N/A |

**Question 1: Do companies agree to the answer to Q1 is NO, i.e., UE capability *diffNumerologyAcrossPUCCH-Group* defined in TS 38.306 can not be used to allow indication of UE support of parallel transmission of PRACH on PUCCH SCell and physical channels/signals with different SCS on other activated serving cells” ?**

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| --- | --- | --- |
| Company | Yes / No | Comments |
| CATT | Yes | We confirm the answer is right based on the definition in 38.306, and have the same understanding as RAN1. |
| Qualcomm | Agree |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| MediaTek | Yes | Follow RAN1’s view |
| Apple | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
| Ericsson | Yes |  |

**Summary:** All companies think that the answer to Q1 is NO, and UE capability *diffNumerologyAcrossPUCCH-Group* defined in TS 38.306 cannot be used to allow indication of UE support of parallel transmission of PRACH on PUCCH SCell and physical channels/signals with different SCS on other activated serving cells.

**Proposal1: The answer to Q1 is NO, i.e., UE capability *diffNumerologyAcrossPUCCH-Group* defined in TS 38.306 can not be used to allow indication of UE support of parallel transmission of PRACH on PUCCH SCell and physical channels/signals with different SCS on other activated serving cells.**

## Issue#2: On the UE capability *parallelTxPRACH-SRS-PUCCH-PUSCH*

If the answer to Q1 is NO, RAN4 asked RAN1 whether the other capability could be used for the purpose of UE support of parallel transmission of PRACH on PUCCH SCell and physical channels/signals with different SCS on other activated serving cells. Both RAN1 LS reply [4] and [2] mention that, for inter-band CA, the UE capability *parallelTxPRACH-SRS-PUCCH-PUSCH* is indicated to simultaneously transmit PRACH on PUCCH Scell and physical channels/signals on other activated serving cells regardless of whether the SCS of PRACH and SCS of SRS/PUCCH/PUSCH is the same or different.

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| ***parallelTxPRACH-SRS-PUCCH-PUSCH***Indicates whether the UE supports parallel transmission of PRACH and SRS/PUCCH/PUSCH across CCs in an inter-band CA band combination. | BC | No | N/A | N/A |

**Question 2: Do companies agree to the understanding of UE capability *parallelTxPRACH-SRS-PUCCH-PUSCH*, i.e., for inter-band CA, the capability *parallelTxPRACH-SRS-PUCCH-PUSCH* is used to indicate that UE is able to simultaneously transmit PRACH on PUCCH Scell and physical channels/signals on other activated serving cells regardless of whether the SCS of PRACH and SCS of SRS/PUCCH/PUSCH is the same or different?**

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| --- | --- | --- |
| Company | Yes / No | Comments |
| CATT | Yes | We confirm the answer is right based on the definition in 38.306, and have the same understanding as RAN1. |
| Qualcomm | Agree |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| MediaTek | Yes | Follow RAN1’s view |
| Apple | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
| Ericsson | Yes | RAN1 didn’t state it explicitly, but given the context of the LS, we think it is worth clarifying that there is, in RAN2's mind, no restrictions on which PUCCH groups the "other" cells are in. Or in other words, the following is true:"PRACH on PUCCH Scell and physical channels/signals on other activated serving cells**, even on other activates serving cells in another PUCCH group**"So we want that RAN2 clarifies this in our reply.  |

**Summary:** All companies have the same understanding, i.e., the capability *parallelTxPRACH-SRS-PUCCH-PUSCH* is used to indicate that UE is able to simultaneously transmit PRACH on PUCCH SCell and physical channels/signals on other activated serving cells regardless of whether the SCS of PRACH and SCS of SRS/PUCCH/PUSCH is the same or different. Besides, one company proposed RAN2 could clarify that there is no restrictions on which PUCCH groups the "other" cells are in**,** [Rapporteur](http://www.baidu.com/link?url=5Nr30U0H_xqQ_IOrpwpC9cLfSCyQOzI0bxr6SGCUbpzX_HWRdhlhBNSp9pZ3CYCNCnjhEcNuRoianct9MwW2hNOAs_q-KmFt_UsS2bjV-8K) thinks the clarification on PUCCH groups is related to below Question 4, it is beneficial to help RAN4 to understand the RAN1 description in Q4. So, it is proposed:

**Proposal2: For inter-band CA, UE capability parallelTxPRACH-SRS-PUCCH-PUSCH is used to indicate that UE is able to simultaneously transmit PRACH on PUCCH SCell and physical channels/signals on other activated serving cells regardless of whether the SCS of PRACH and SCS of SRS/PUCCH/PUSCH is the same or different, the PUCCH SCell for PRACH and the other activated serving cells for physical channels/signals could be in the same PUCCH group or different PUCCH group.**

## Issue#3 On UE behavior when a target PUCCH SCell PRACH has a different SCS from SpCell/SCell physical channels/signals

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| **RAN4 LS in*** **Q2:** If the answer in Q1 is NO, and there is no capabilities that can serve the purpose, what would be the expected UE behavior when a target PUCCH SCell PRACH has a different SCS from SpCell/SCell physical channels/signals according to RAN1/2 spec? e.g. Shall UE be able to simultaneously transmit PRACH on PUCCH SCell and physical channels/signals on other activated serving cells irrespective of SCS configurations?
 |

RAN4 also gives above Q2 to RAN1 and RAN2. In [4] and [2], the UE behavior for intra-band CA scenario has also been discussed based on below description in TS 38.214.

|  |
| --- |
| *For single cell operation or for operation with carrier aggregation in a same frequency band, a UE does not transmit PRACH and PUSCH/PUCCH/SRS in a same slot or when a gap between the first or last symbol of a PRACH transmission in a first slot is separated by less than* $N$ *symbols from the last or first symbol, respectively, of a PUSCH/PUCCH/SRS transmission in a second slot where* $N=2$ *for* $μ=0$ *or* $μ=$*1,* $N=4$ *for* $μ=2$ *or* $μ=3$*, and* $μ$ *is the SCS configuration for the active UL BWP. For a PUSCH transmission with repetition Type B, this applies to each actual repetition for PUSCH transmission [6, TS 38.214].* |

Based on above description in 38.214, RAN1 has already given below answer A2 to Q2. [Rapporteur](http://www.baidu.com/link?url=5Nr30U0H_xqQ_IOrpwpC9cLfSCyQOzI0bxr6SGCUbpzX_HWRdhlhBNSp9pZ3CYCNCnjhEcNuRoianct9MwW2hNOAs_q-KmFt_UsS2bjV-8K) think, from the view of RAN2, since the related answer for intra-band CA is based on the spec in RAN1 scope, RAN2 may just need to confirm whether we have different view to RAN1 answer for intra-band CA in below bold black part.

|  |
| --- |
| **RAN1 reply LS*** **A2:**
* For inter-band CA capability of simultaneous PRACH transmission on PUCCH SCell and SRS/PUCCH/PUSCH transmission on other activated serving cells, it is provided by *parallelTxPRACH-SRS-PUCCH-PUSCH* as from 38.306, regardless of the SCS combination. **For intra-band CA, according to 38.213 8.1, UE does not transmit PRACH and PUSCH/PUCCH/SRS in a same slot or when the gap between PRACH transmission and PUSCH/PUCCH/SRS transmission is less than N symbols; hence, UE does not transmit PRACH and PUSCH/PUCCH/SRS simultaneously for intra-band CA.** Besides, it seems RAN4’s question is the case where the UE transmits PRACH on PUCCH SCell in the secondary PUCCH group and PUCCH/PUSCH/SRS on a UL cell in the primary PUCCH group; then to RAN1’s understanding this must be inter-band simultaneous transmissions.
 |

**Question 3: Do companies agree the UE behaviour for intra-band CA, i.e., “For intra-band CA, according to 38.213 8.1, UE does not transmit PRACH and PUSCH/PUCCH/SRS in a same slot or when the gap between PRACH transmission and PUSCH/PUCCH/SRS transmission is less than N symbols; hence, UE does not transmit PRACH and PUSCH/PUCCH/SRS simultaneously for intra-band CA.”?**

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| --- | --- | --- |
| Company | Yes / No | Comments |
| CATT | Yes | We think this is in RAN1 scope, and just follow the answer from RAN1.  |
| Qualcomm | Agree |  |
| vivo | Yes |  |
| ZTE | Yes |  |
| MediaTek | Yes | Follow RAN1’s view |
| Apple | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes | Those are not visible to RAN2 specifications though. We can simply just point out the capability is for inter-band. |

**Summary:** All companies agree that, i.e., for intra-band CA, according to 38.213 8.1, UE does not transmit PRACH and PUSCH/PUCCH/SRS in a same slot or when the gap between PRACH transmission and PUSCH/PUCCH/SRS transmission is less than N symbols; hence, UE does not transmit PRACH and PUSCH/PUCCH/SRS simultaneously for intra-band CA.

**Proposal 3: For intra-band CA, RAN2 agree to RAN1 understanding, i.e., according to 38.213 8.1, UE does not transmit PRACH and PUSCH/PUCCH/SRS in a same slot or when the gap between PRACH transmission and PUSCH/PUCCH/SRS transmission is less than N symbols; hence, UE does not transmit PRACH and PUSCH/PUCCH/SRS simultaneously.**

[Rapporteur](http://www.baidu.com/link?url=5Nr30U0H_xqQ_IOrpwpC9cLfSCyQOzI0bxr6SGCUbpzX_HWRdhlhBNSp9pZ3CYCNCnjhEcNuRoianct9MwW2hNOAs_q-KmFt_UsS2bjV-8K) notice that in RAN1 reply LS, it also mentioned that “Besides, it seems RAN4’s question is the case where the UE transmits PRACH on PUCCH SCell in the secondary PUCCH group and PUCCH/PUSCH/SRS on a UL cell in the primary PUCCH group; then to RAN1’s understanding this must be inter-band simultaneous transmissions.”, the further issue is whether RAN2 needs to include this understanding in RAN2 reply LS**.**

**Question 4: Do companies agree to include the RAN2 reply LS with the description that UE transmission for PRACH on PUCCH SCell in the secondary PUCCH group and PUCCH/PUSCH/SRS on a UL cell in the primary PUCCH group must be in inter-band simultaneous transmissions?**

|  |  |  |
| --- | --- | --- |
| Company | Yes / No | Comments |
| CATT | No | We think this is RAN1 understanding to RAN4 LS and not related to RAN4 question, may be also not in RAN2 expertise, so it is not necessary to include it in RAN2 LS. But we could follow majority view. |
| Qualcomm | Yes | Because the current RAN1 spec already does not support simultaneous Tx of PRACH and PUSCH/PUCCH/SRS. Hence the scenario RAN4 is asking, i.e. simultaneous Tx of PRACH and PUSCH/PUCCH/SRS can only happen in inter-band CA configuration. |
| vivo | No | Agree with CATT. |
| ZTE | No | Agree with CATT. |
| MediaTek | See comment | Actually, we think reply LS from RAN2 is NOT necessary. Or we can simply saying that RAN2 has same view as RAN1. |
| Apple | See comment | From reading RAN1 reply LS, it seems already clear the relevant scenario can only be inter-band CA configuration. And we also don’t see the need to have any RAN2 reply LS.  |
| Huawei, HiSilicon | No | Similar view as others, it is not in RAN2 scope. And RAN4 can take RAN1’s answer if needed. |
| Nokia | No | No need to copy past RAN1’s reply since those are not in RAN2 specifications. From RAN2 point of view, we can quote the capability description and indicate it is for inter-band.  |
| Ericsson | No | The inter-band limitation is not a limitation in RAN2's spec hence RAN2 does not need to mention it. |

**Summary:** 6 companies agree not to include the description of the scenario mentioned in RAN1 scope since it is in RA1 scope and not RAN2 expertise, besides, one of them suggest not to copy the RAN1 reply LS but to quote the capability description and indicate it is for inter-band. 1 company suggest to include the description since it is right from the view of RAN1,1 company suggest to give a simple reply LS to follow the RAN1 answer, 1 company think it is not necessary to reply the LS since it can only be inter-band CA scenario. It can be seen that no company objects to RAN1 understanding, the issue is whether and how to confirm RAN1 understanding to scenario from the view of RAN2, to follow the majority view, it is suggested not include this in the reply LS, RAN4 can take RAN1 answer into account if it is needed.

Regarding the issue of whether a RAN2 reply LS is necessary, [Rapporteur](http://www.baidu.com/link?url=5Nr30U0H_xqQ_IOrpwpC9cLfSCyQOzI0bxr6SGCUbpzX_HWRdhlhBNSp9pZ3CYCNCnjhEcNuRoianct9MwW2hNOAs_q-KmFt_UsS2bjV-8K) agree RAN1 has already given the answer for RAN4 LS, but based on above discussion, we may give our understanding from the view of RAN2 since RAN4 sent it to RAN1/RAN2 and we discuss it by this offline discussion. **In order to avoid the confusing to RAN4 and align to the RAN1 answer, RAN2 reply LS will try to reuse the description in RAN1 reply LS and give some clarification based on above discussion.**

**Proposal 4: RAN2 reply LS will not include the description of UE transmission for PRACH on PUCCH SCell in the secondary PUCCH group and PUCCH/PUSCH/SRS on a UL cell in the primary PUCCH group must be in inter-band simultaneous transmissions from RAN1 LS, RAN4 can take it into account in RAN1 reply LS if it is needed.**

## Issue#4 Others

For any other issues not covered above, please feel free to indicate them into the following table.

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| Company | Discussion points | Comments |
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## Phase2 draft LS

Issue#5 A draft LS is provided in the folder, please give your comment on the draft LS directly or in the below table.

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| --- | --- | --- |
| Company | Discussion points | Comments |
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# 3 Conclusions

Based on the discussion in section 2, we propose the following:

**Proposal1: The answer to Q1 is NO, i.e., UE capability *diffNumerologyAcrossPUCCH-Group* defined in TS 38.306 can not be used to allow indication of UE support of parallel transmission of PRACH on PUCCH SCell and physical channels/signals with different SCS on other activated serving cells.**

**Proposal2: For inter-band CA, UE capability parallelTxPRACH-SRS-PUCCH-PUSCH is used to indicate that UE is able to simultaneously transmit PRACH on PUCCH SCell and physical channels/signals on other activated serving cells regardless of whether the SCS of PRACH and SCS of SRS/PUCCH/PUSCH is the same or different, the PUCCH SCell for PRACH and the other activated serving cells for physical channels/signals could be in the same PUCCH group or different PUCCH group.**

**Proposal 3: For intra-band CA, RAN2 agree to RAN1 understanding, i.e., according to 38.213 8.1, UE does not transmit PRACH and PUSCH/PUCCH/SRS in a same slot or when the gap between PRACH transmission and PUSCH/PUCCH/SRS transmission is less than N symbols; hence, UE does not transmit PRACH and PUSCH/PUCCH/SRS simultaneously.**

**Proposal 4: RAN2 reply LS will not include the description of UE transmission for PRACH on PUCCH SCell in the secondary PUCCH group and PUCCH/PUSCH/SRS on a UL cell in the primary PUCCH group must be in inter-band simultaneous transmissions from RAN1 LS, RAN4 can take it into account in RAN1 reply LS if it is needed.**

**A draft LS is provided in the offline server and to be discussed.**

# 4 References

[1] [R2-2202149](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2202149.zip), LS on interruption for PUCCH SCell activation in invalid TA case (R4-2120420; contact: MediaTek, CATT) RAN4 LS in Rel-17 To:RAN1, RAN2

[2] [R2-2203016](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2203016.zip), Discussion on interruption for PUCCH SCell activation in invalid TA case,CATT

[3] [R2-2203017](file:///C%3A%5CUsers%5Cjohan%5COneDrive%5CDokument%5C3GPP%5Ctsg_ran%5CWG2_RL2%5CTSGR2_117-e%5CDocs%5CR2-2203017.zip), [Draft] Reply LS on interruption for PUCCH SCell activation in invalid TA case, CATT LS out, Rel-17 NR\_RRM\_enh2-Core To:RAN4 Cc:RAN1

[4] R2-2203885, Reply LS on interruption for PUCCH SCell activation in invalid TA case (R1-2202599; contact: MediaTek)