3GPP TSG-RAN WG1 Meeting #109-e R1- 2205262

e-Meeting, May 9th – 20th, 2022

Agenda Item: 7.1

Source: Moderator (Ericsson)

Title: Summary of email discussion [109-e-NR-CRs-08]: Correction for parallel transmission of SRS and PUSCH/PUCCH

Document for: Discussion, Decision

# Introduction

This document summarizes the discussion during RAN1#109-e meeting for the following email discussion tasked by Chair:

[109-e-NR-CRs-08] Correction for parallel transmission of SRS and PUSCH/PUCCH by May 13 – Sorour (Ericsson)

* Relevant tdoc: [R1-2204555](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/R1-2204555.zip)

## Problem description in [R1-2204555](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/R1-2204555.zip)

The following problem was described in [3]:

Based on the agreement RAN1#93 shown below, the following description in TS38.214, clause 6.2.1 with corresponding capability in TS38.306 was implemented:

Agreements(RAN1#93)**:**

* The UE is not expected to be configured to transmit on the same OFDM symbol with an SRS resource and a PUCCH/PUSCH across different CCs in intra-band CA
  + Note: no spec change is needed.
* Parallel SRS and PUCCH/PUSCH transmissions across CCs is supported in inter-band CA.
  + Note: if case parallel SRS and PUCCH/PUSCH is supported, the SRS resource does not belong to a set which is for antenna switching, if the SRS resource set for antenna switching has more than one SRS resource (T < R)
  + Supporting of this feature is subject to UE capability which is a separate capability

Agreements(RAN1#93)**:**

Parallel PRACH and SRS/PUCCH/PUSCH transmissions across CCs is supported in inter-band CA

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| TS 38.214 V15.16.0 [1]6.2.1 UE sounding procedure ....  In case of intra-band carrier aggregation or in inter-band CA band combination if simultaneous SRS and PUCCH/PUSCH transmissions are not supported by UE, the UE is not expected to be configured with SRS from a carrier and PUSCH/UL DM-RS/UL PT-RS/PUCCH formats from a different carrier in the same symbol.  In case of intra-band carrier aggregation or in inter-band CA band combination if simultaneous SRS and PRACH transmissions are not supported by UE, the UE shall not transmit simultaneously SRS resource(s) from a carrier and PRACH from a different carrier.  ..... |
| TS 38.306 V15.16.0 [2]***parallelTxSRS-PUCCH-PUSCH*** Indicates whether the UE supports parallel transmission of SRS and PUCCH/ PUSCH across CCs in an inter-band CA band combination |

The usage of “configured” in the specification text (as well as the agreement) is ambiguous for the following reasons:

Firstly, it is not clear whether the word “configured” is intended for SRS “configuration” or for TDRA//UL DM-RS/UL PT-RS/PUCCH “configurations”. Secondly, the description implies that no entries in the TDRA table or PUCCH resource set configurations would be allowed to overlap with an SRS, even if the gNB would avoid indicating such an entry in a slot with SRS for UEs. Such a consequence clearly imposes severe and meaningless restrictions given that the PUSCH TDRA resources and PUCCH resources are configured, while the collision with SRS can be avoided by scheduling. The intention of the agreements seems to be avoiding collision between the “actual transmissions” rather than any configurations.

Moreover, the source of ambiguity is the formulation of the corresponding agreement for “intra-band CA” for simultaneous transmission of SRS and PUSCH/PUSCH as shown above. This ambiguity is incorrectly reflected for the specification of the “inter-band CA” case while there is no mention of “configuration” in the supporting agreement for this case. In fact, the agreements for support of simultaneous transmission of SRS and PUSCH/PUCCH and simultaneous transmission of SRS and PRACH in the absence of corresponding capabilities, are formulated similarly as shown above but their corresponding specifications are described differently, and without any ambiguity in case of the latter.

**Summary of problem description:**

* The usage of “configured” in the specification text (as well as the agreement) is ambiguous.
  + For intra-band CA and intre-band CA when UE is not capable of simultanoues transmission of SRS and PUSCH/PUCCH, it is not clear if configuration of TDRA table or PUCCH resources that overlap with SRS are permitted, even no collison in actuall transmissions would be planned.
* It seems the intetion of the agreement, as well as the specifcation was “the actual transmission”, and not the corresponding “configuration” for the actual transmission.

## Proposed solution in [R1-2204555](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/R1-2204555.zip)

To solve the problem described in previous section, [3] proposes the following TP for TS 38.214 V15.16.0.

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| 6.2.1 UE sounding procedure  <unchanged text omitted>  In case of intra-band carrier aggregation or in inter-band CA band combination if simultaneous SRS and PUCCH/PUSCH transmissions are not supported by UE, the UE is not expected to transmit SRS from a carrier and PUSCH/UL DM-RS/UL PT-RS/PUCCH from a different carrier in the same symbol.  In case of intra-band carrier aggregation or in inter-band CA band combination if simultaneous SRS and PRACH transmissions are not supported by UE, the UE shall not transmit simultaneously SRS resource(s) from a carrier and PRACH from a different carrier.  <unchanged text omitted> |

# Discussion

## Frist discussion round

### Questionnaire

Please share your view regarding the following questions:

**Question 1:**

* **Do you agree that the intention of the agreement and the corresponding specifcation text that disucssed in section 1.1 was “the actual transmissions” of SRS/PUSCH/PUCCH, and not the “configurations” corresponding to the actual transmissions of SRS/PUSCH/PUCCH?**
  + **If the answer is No**, what is your explanation towards the issues raised in section 1.1?
  + **If the answer is Yes**, please continue with Question 2.

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| **Please share your view regarding Question 1 above.** | |
| **Company** | **Comment** |
| vivo | No. In our understanding the end result is relevant to the actual transmission. However, if ‘configured’ is chaged to ‘transmit’ as proposed, then priority has to be defined in the case when gNB schedules/triggers SRS and PUSCH/PUCCH on same symbol. In current spec, it is gNB’s responsibility make sure SRS and PUSCH/PUCCH transmission doesn’t happen on the same symbol. If it is deemed necessary maybe revise to something like ‘not expected to be configured with SRS for transmission from a carrier and to be scheduled PUSCH/UL DM-RS/UL PT-RS/PUCCH from a different carrier in the same symbol’ |
| ZTE | We share the similar views as vivo. The motivation of the current TS 38.214 is to let gNB avoid such collision. If the wording change impacts the gNB or UE‘s implementation, it should be avoided. |
| QC | Yes. |
| Apple | The meaning of the following is not exactly clear, so we cannot provide a direct Yes or No answer.  **““the actual transmissions” of SRS/PUSCH/PUCCH, and not the “configurations” corresponding to the actual transmissions of SRS/PUSCH/PUCCH”**  Our understanding is that:   * The constraint is not on all the configured TDRA entries or all the configured PUCCH resources in PUCCH-config. * The constraint is on the gNB configuration/scheduling so that   + Scheduled (including Periodic/Semi-Persistent/Aperiodic) SRS transmission shall not conflict with configured PUCCH/PUSCH transmissions.   + Scheduled (including Periodic/Semi-Persistent/Aperiodic) SRS transmission shall not conflict with dynamically scheduled PUCCH/PUSCH transmissions.   The proposed TP implies that the simultaneous configuration/scheduling is allowed and UE needs to have prioritization rules to decide which one to transmit, which is not the intention. We are open to discuss a TP or a conclusion to clarify, but we don’t think the proposed TP correctly captures the intention. We would suggest something like:  “the UE is not expected to be scheduled with an SRS transmission from a carrier and scheduled with PUSCH/UL DM-RS/UL PT-RS/PUCCH transmission from a different carrier in the same symbol.” |
| Fujitsu | Yes |
| LG | We have similar view with vivo and ZTE, by the way, to cover the case of SP-SRS and A-SRS as commented by Apple, current “configured“ can be slightly updated to “scheduled“ or “indicated“ if necessary. |
| OPPO | We think the collision should be avioded by gNB but not UE. The CR has NBC issue. We are fine to clarify it without specification modification or simply use“sheduled to transmit” instread of “configured with”. |
| Samsung | If we only consider the original intention of previous agreement and the corresponding specification, we can say "Yes" which is to avoid the actual transmissions between SRS and PUSCH/UL DMRS/UL PTRS/PUCCH by gNB’s coordination. However, regarding the proposed TP from moderator, it could be interpreted that the "UE" needs to decide based on a certain prioritization rule between SRS and PUSCH/UL DMRS/UL PTRS/PUCCH, since the proposed TP does not preclude gNB’s scheduling for both SRS and PUSCH/UL DMRS/UL PTRS/PUCCH at the same time as mentioned by vivo and Apple. Hence, since it seems that the proposed TP does not capture the intention properly, we cannot answer with a Yes, or a No. |
| DOCOMO | We share the same understanding with Apple. |
| WILUS | We also share the view with Apple and prefer to have a modificaiton by Apple to reflect the original intention well. |
| Nokia, NSB | Yes. If the rule only applies to transmissions that are configured, then DCI-triggered collisions are allowed. For full coverage the text could say “configured or scheduled” as well as changing that “formats” to “transmission(s)” as Apple suggests |
| Huawei, HiSilicon | Our understanding is “the actual transmissions” of SRS and PUSCH/PUCCH should not occur simutaneously, and this principle should be guranteed by gNB implementation. Furthermore, our interpretations on the word “configured” is that the resoruces of SRS transmission is configured by highlayer parameter semi-stataically, rather than a DCI indicates the resource. So “configured” implies the way that how UE achieve the resource. Thus, we think the original wording is understoodable. If A-SRS case is considered, Nokia suggested changes could be a way, i.e. “configured or scheduled”, or “configured or indicated”. |
| Sharp | We share the view from Apple. |
| Intel | We have similar understanding as other companies that it is up to gNB to ensure there is no simultaneous transmission of SRS and PUSCH/UL DMRS/UL PTRS/PUCCH.  We are fine to change the wording to “configured or scheduled”. |

**Question 2 (Only if the answer to Question 1 is Yes):**

* **Which of the following alternatives is preferred? Please indicate if you prefer more than one alternative.**
  + - **Alt-1:** Endorse a Rel-15 TP to align the specifcation description with the intention
      * Use TP in [R1-2204555](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/R1-2204555.zip) as baseline and discuss further updates if needed.
        + Please provide any suggestion to improve the TP, if needed.
    - **Alt-2:** Endorse a Rel-16 TP to align specifcation description with the intention
      * Use TP in [R1-2204555](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/R1-2204555.zip) as baseline and discuss further updates if needed.
      * Add in the cover page a text describing that “It is common understanding that the implementations based on the previous release of the specification is expected to be according to the CR”.
        + Please provide any suggestion to improve the TP and/or additional suggested text for the cover page, if needed.
    - **Alt-3:** Do not endorse any TP. But endorse a conclusion for Rel-15/16 to capture the intention as the following:
      * **Proposed Conclusion**: For intra-band CA and intre-band CA when UE is not capable of simultanoues transmission of SRS and PUSCH/PUCCH, the UE is not expected to transmit simultanouesly SRS from a carrier and PUSCH/UL DM-RS/UL PT-RS/PUCCH from a different carrier in the same symbol. There is no restriction on the corresponding configurations of these UL transmissions with respect to collision in time-domain.
        + Please provide any suggestion to improve the description of the proposed conclusion, if needed.
    - **Alt- 4:** Do nothing.
      * In this case, please explain how the NW can be assured that there is no UE implementation behaving differently than the proposed TP in [R1-2204555](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/R1-2204555.zip).

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| **Please share your view regarding Question 2 above given that the answer is Yes to Question 1.** | |
| **Company** | **Comment** |
| ZTE | We should be very careful to revise Rel-15/16 specification/implementation in such late stage. Hence, we more prefer Alt-4 for safe. |
| QC | At this stage, we prefer not changing Rel-15 specification or draw a conclusion which will impact Rel-15 spec. So we don’t support Alt 1. For Rel-16 spec, we are in general fine with Alt 2 (with the text in the cover page removed) or Alt 3 (with the conclusion only applying to Rel-16). Our rationale is very simple: whatever implemented/deployed in Rel-15 is already in the field. Nothing can do about it, except for fixing a super critical issue. While this issue does not meet the bar for a Rel-15 CR in our view. |
| Apple | The proposed TP in R1-2204555 or the proposed conclusion implies that the simultaneous configuration/scheduling is allowed and UE needs to have prioritization rules to decide which one to transmit, which is not the intention. We are open to discuss a TP or a conclusion to clarify, but we don’t think the proposed TP correctly captures the intention. We would suggest something like the following for either a TP or a conclusion:  “the UE is not expected to be scheduled with an SRS transmission from a carrier and scheduled with PUSCH/UL DM-RS/UL PT-RS/PUCCH transmission from a different carrier in the same symbol.” |
| Fujitsu | Alt 2 or Alt 3 would be a good compromise given the concern from companies(i.e. no change for Rel-15). We are open for the exact wording, and the proposal by Apple is fine. |
| LG | We also prefer Alt-4, or to cover the case of SP-SRS and A-SRS, current “configured“ can be slightly updated to “scheduled“ or “indicated“ if necessary. |
| OPPO | We prefer Alt-3. If a CR is needed, we propose to simply use“sheduled to transmit” instread of “configured with”. |
| Samsung | We agree that we need to be very careful to revise Rel-15/16 specifications, so we don’t support Alt-1 and Alt-2. But we are in favor of a conclusion and support Apple’s suggestion which can clearly capture the intention of previous agreement. The original conclusion could cause a misunderstanding. So, we prefer to revise a conclusion based on Apple’s suggestion and use it for Alt-3 to clarify the intention. |
| DOCOMO | Ok with Alt 2 or Alt 3. Focusing on Rel-16 and/or later is also fine for us.  In case of Alt-2, we support Apple’s modification.  For Alt-3, we support Apple’s modification as well. We also wonder if the following part is common understanding in RAN1. Looking at the inputs from companies, we think it is a matter of gNB scheduler, not prioritization at UE side.   * + - * **Proposed Conclusion**: For intra-band CA and intre-band CA when UE is not capable of simultanoues transmission of SRS and PUSCH/PUCCH, the UE is not expected to transmit simultanouesly SRS from a carrier and PUSCH/UL DM-RS/UL PT-RS/PUCCH from a different carrier in the same symbol. There is no restriction on the corresponding configurations of these UL transmissions with respect to collision in time-domain. |
| WILUS | We prefer not to change Rel-15 specificaiton at least. If it is necessary to change, we support the TP modified by Apple. |
| Nokia, NSB | We don’t really prefer specification through conclusions minuted in the chairman’s notes. The spec today only covers transmissions that are configured. If there indeed are UEs that only worry of configured transmissions, but are OK with dynamically scheduled transmissions, then this is a change of specification. But if, and we believe when, everyone reads this as referring to actual collisions that also take the DCI-triggered transmissions into account, the change is aligning the spec to the reality.  There is a risk that a network implementor reads the spec as it is written, not how the UEs are actually implemented, hence we think a fix would be good. We could go with Rel-16 as this is not extremely critical.  We don’t have an extremely strong view of the TP to be adopted, I think if we have enough support for the change, the moderator can compile a good suggestion based on the comments submitted. |
| Huawei, HiSilicon | We prefer Alt.4.  Based on comments from companies, we think it is already a common understanding that it is not allowed to actually transmissit SRS and PUCCH/PUSCH at same time. However, if comapanies really think a clarification should have on Rel-16/17 spec, we are open to discuss. |
| Sharp | Share the views from DOCOMO. We are fine with Alt2 or Alt3 for Rel-16. As for text proposal, Apple’s modification is preferred. |
| Intel | We slightly prefer Alt-2 for Rel-16. The suggestion from Apple can be considered as starting point with modication from scheduled to “configured or scheduled” to cover all different SRS transmission. |

### Summary

**Question 1:** The discussion shows that the wording of the proposed TP had created confusion since it could be understood that a new behaviour is expected from the UE to perform prioritization to avoid collision which is not aligned with the intention. Apple kindly summarized the intention (copy below) which is the common understanding:

* The constraint is not on all the configured TDRA entries or all the configured PUCCH resources in PUCCH-config.
* The constraint is on the gNB configuration/scheduling so that
  + Scheduled (including Periodic/Semi-Persistent/Aperiodic) SRS transmission shall not conflict with configured PUCCH/PUSCH transmissions.
  + Scheduled (including Periodic/Semi-Persistent/Aperiodic) SRS transmission shall not conflict with dynamically scheduled PUCCH/PUSCH transmissions.

**Question 2:** On the preferred approach, the views are summarized in the table below. Few calrifcation:

* Please note that Moderator has summarized the views based on assuming a modified TP that reflects the intention above, and not the TP proposed in section 1.2 which has caused misunderstanding.
* Please note that Moderator also included “Maybe” when from the feedback it was not clear if the alternative is definitely unacceptable, or acceptable. This classification gives possibility to see in next round if views can be converged when the underlying concerns are addressed.
* The feedback from few companies preferring Alt-4 was not clear since the companies seems also to be interested in improved wording. Hence, Moderator used (?).

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|  | **Alt-1** | **Alt-2** | **Alt-3** | **Alt-4** |
| Yes | Ericsson | Ericsson, QC, Apple, Fujitsu, DCM, Nokia/NSB, Sharp, Intel | QC, Apple, Fujitsu, OPPO, Samsung, DCM, Sharp | HW/HiSi  ZTE?, LG? |
| Maybe |  | WILUS, OPPO, HW/HiSi  LG? | ZTE?, LG? |  |
| No | QC,Samsung, WILUS | Samsung | Ericsson, Nokia/NSB | Ericsson |

**Moderator’s recommendation for next step:**

* With the assumption that hopefully it is OK with LG and ZTE (since their feedback was hinting possibility of other alternatives) Moderator suggests to considered Alt-2 and Alt-3 for the next round with modified TP/text.
* Between Alt-2 and Alt-3, it is important to reflect on the comment made by Nokia/NSB in the first round. Because that was exactly the reason that caused bringing this CR to the meeting. With that explanation, perhaps there will be more flexibility to address the issue properly, while ensuring no change in UE behaviour and the same time provide more clarity for implementation of the specifications by NW vendors.

## Second discussion round

The TP is modified based on the comments in the 1st round. It is also considered as the proposed conclusion.

* **Alt-2: Proposed TP for Rel-16**

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| 6.2.1 UE sounding procedure  <unchanged text omitted>  In case of intra-band carrier aggregation or in inter-band CA band combination if simultaneous SRS and PUCCH/PUSCH transmissions are not supported by UE, the UE is not expected to be indicated with a SRS transmission from a carrier and to be configured or scheduled with a PUSCH/UL DM-RS/UL PT-RS/PUCCH transmission from a different carrier in the same symbol.  <unchanged text omitted> |

* **Alt-3: Proposed Conclusion for Rel-16 (capture TP for Alt-2 as the conclusion)**

In case of intra-band carrier aggregation or in inter-band CA band combination if simultaneous SRS and PUCCH/PUSCH transmissions are not supported by UE, the UE is not expected to be indicated with a SRS transmission from a carrier and to be configured or scheduled with a PUSCH/UL DM-RS/UL PT-RS/PUCCH transmission from a different carrier in the same symbol.

### Questionnaire

**Question:** Which alternative is acceptable? Is the modified TP satisfactory? Also, considering the reasons for Moderator’s Recommendation, is there a possibility for the group to compromise to Alt-2?

* Alt-2: Modified TP in section for Rel-16
* Alt-3: Proposed Conclusion for Rel-16 (capture modified TP for Alt-2 as the conclusion)

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| **Company** | **Comment** |
| Nokia, NSB | Alt-2, we support the specification through specification rather than through chairman’s notes. |
| Samsung | We still think that it is desirable to avoid revisions to Rel-15/16 spec as much as possible. Since the conclusion clearly captures the intention of the agreement as we discussed, so the conclusion seems enough, and spec change is not necessary. Hence, we still prefer Alt-3. |
| Huawei, HiSilicon | Indeed, we think neither TP nor conclusion is needed. If companies really think some clarification are beneficial, we will not object to capture a conclusion in the chair’s note. However, the content in the parentheses of Alt-3 does not make sense. Dose it imply the TP is endorsed or not? So we suggest to only have the conclusion, without the modified TP attached.   * Alt-3: Proposed Conclusion for Rel-16 ~~(capture modified TP for Alt-2 as the conclusion)~~ |
| LG | We prefer Alt-3 since it seems to be sufficient, but also OK with Alt-2 if majority supports it.  @Huawei: Regarding the parentheses of Alt-3, my understanding on the moderator’s intention is just to capture the contents in the TP as conclusion, rather than endorsing the TP. |
| Moderator | @Huawei: As LG explained, the conclusion text is the same as TP text. |
| DOCOMO | Seeing the technical point in TP, we are ok with either Alt-2 or Alt-3. |
| Fujitsu | Our preference is Alt-2. |
| ZTE | Alt 3 |

### Summary

TBD

# Conclusion

TBD

# References

1. 3GPP TS 38.214 NR; Physical layer procedures for data, V15.16.0.
2. 3GPP TS 38.306 NR; User Equipment (UE) radio access capabilities, V15.16.0
3. R1-2204555 Correction for parallel transmission of SRS and PUSCH/PUCCH; Ericsson