**3GPP TSG RAN WG1 #110bis-e R1- 220xxxx**

**e-Meeting, October 10th – 19th, 2022**

**Agenda item:** 7.1

**Source:** Moderator (ZTE)

**Title:** Summary of discussion on PUSCH TDRA misalignment issue

**Document for:** Discussion and Decision

# 1 Introduction

Per chair’s guidance, the following email thread is triggered.

[110bis-e-NR-R15-03] Discussion on PUSCH TDRA misalignment issue by Oct 14 – Youjun (ZTE)

[R1-2209184](file:///C%3A%5C%5CUsers%5C%5C10234951%5C%5CAppData%5C%5CLocal%5C%5CTemp%5C%5CTemp1_Chair%27s%2520notes%2520RAN1%2523110bis-e%2520v03.zip%5C%5C../../Docs/R1-2209184.zip) Discussion on PUSCH TDRA misalignment issue ZTE, Sanechips

[R1-2209185](file:///C%3A%5C%5CUsers%5C%5C10234951%5C%5CAppData%5C%5CLocal%5C%5CTemp%5C%5CTemp1_Chair%27s%2520notes%2520RAN1%2523110bis-e%2520v03.zip%5C%5C../../Docs/R1-2209185.zip) Correction on TDRA misalignment of PUSCH ZTE, Sanechips

Please provide your first round comments by **11th Oct 23:59 UTC**.

# 2 Discussion

According to the discussion in [1], there would be some misalignment issues for TDRA list assumption between gNB and UE, e.g., highlighted with yellow in the following table, when TC-RNTI scrambled DCI is used in CSS not associated to CORESET#0 in initial DL BWP.

Table 6.1.2.1.1-1: Applicable PUSCH time domain resource allocation for common search space and DCI format 0\_0 in UE specific search space

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RNTI | PDCCH search space | *pusch-ConfigCommon* includes *pusch-TimeDomainAllocationList* | *pusch-Config* includes *pusch-TimeDomainAllocationList* | PUSCH time domain resource allocation to apply |
| PUSCH scheduled by MAC RAR as described in clause 8.2 of [6, TS 38.213] or MAC fallbackRAR as described in clause 8.2A of [6, 38.213] or for MsgA PUSCH transmission | No | - | Default A |
| Yes |  | *pusch-TimeDomainAllocationList* provided in *pusch-ConfigCommon* |
| C-RNTI, MCS-C-RNTI, TC-RNTI, CS-RNTI | Any common search space associated with CORESET 0 | No | - | Default A |
| Yes |  | *pusch-TimeDomainAllocationList* provided in *pusch-ConfigCommon* |
| C-RNTI, MCS-C-RNTI, TC-RNTI, CS-RNTI | Any common search space not associated with CORESET 0,DCI format 0\_0 inUE specific search space | No | No | Default A |
| Yes | No | *pusch-TimeDomainAllocationList* provided in *pusch-ConfigCommon*  |
| No/Yes | Yes | *pusch-TimeDomainAllocationList* provided in *pusch-Config* |

Some solutions are put on the table for discussion in [1] and a candidate solution is also proposed in [2]. This document summarizes the discussion on the issue of PUSCH TDRA misalignment issue proposed by [1][2].

According to the discussion in [1], some observations and proposals are made as follows:

**Observation 1: For NR UE in initial DL BWP, time domain resource allocation of PUSCH scheduled by DCI in common search space not associated to CORESET#0 should be determined by**

* **Default A or *pusch-TimeDomainAllocationList* provided in *pusch-ConfigCommon* before RRC connected mode**
* ***pusch-TimeDomainAllocationList* provided in *pusch-Config* if configured when UE is in RRC connected mode**

**Observation 2: For a NR UE initiating a CBRA procedure in initial DL BWP, it is hard for gNB to distinguish whether the UE is in connected mode or not.**

**Observation 3: The TDRA list assumption for PUSCH scheduling from gNB side and UE side would be misaligned, when the PUSCH is scheduled by a TC-RNTI scrambled DCI in common search space not associated to CORESET#0 during the CBRA procedure.**

**Proposal 1: Consider whether/how to solve the TDRA list assumption misalignment issue for PUSCH time domain resource allocation scheduled by TC-RNTI scrambled DCI in common search space not associated to CORESET#0 in initial DL BWP.**

The mentioned issue would be: for a NR UE initiating a CBRA procedure in initial DL BWP, when the PUSCH is scheduled by a TC-RNTI scrambled DCI in common search space not associated to CORESET#0 during the CBRA procedure, the UE and gNB may have different understanding on the assumed TDRA table.

## **2.1 Question #1**

**Q1**: Companies are invited to share the views on whether this issue should be addressed. If the answer is NO, please clarify the reason.

|  |  |
| --- | --- |
| **Company name** | **Comments** |
| Samsung | This issue was discussed in RAN1#107-e meeting, and rejected due to NBC issue. Therefore, in our view no further discussion is needed.[R1-2111211](file:///C%3A%5C%5CUsers%5C%5Cyouns%5C%5COneDrive%5C%5CDocuments%5C%5C3GPP%5C%5CRAN1%20tdocs%5C%5CTSGR1_107-e%5C%5CDocs%5C%5CR1-2111211.zip) Correction on determination of TDRA table to be used for PUSCH CATT[R1-2111212](file:///C%3A%5C%5CUsers%5C%5Cyouns%5C%5COneDrive%5C%5CDocuments%5C%5C3GPP%5C%5CRAN1%20tdocs%5C%5CTSGR1_107-e%5C%5CDocs%5C%5CR1-2111212.zip) Correction on determination of TDRA table to be used for PUSCH CATT |
| Ericsson | Thanks Samsung for reminding us the previous discussions. We also think this CR is NBC and we should not discuss this again on this meeting. |
| CATT | As pointed out by Samsung, the same issue was brought up earlier by us and companies including ZTE objected to the CR as summarized in R1-2112738 claiming that the issue can be avoid by gNB implementation. |
| Nokia, NSB | The potential problem (we are not fully sure the problematic case can actually happen) is easily avoidable by network configuration, while the CR would lead to a non-backwards compatible change. Hence we don’t support changing the specification. |
| Apple  | We acknowledged the issue identified by ZTE (and previously CATT). We should keep the previous conclusion i.e., leaving for gNB implementation.  |
| Spreadtrum | We share the same view as other companies, up to gNB implementation can solve this issue.  |
| Huawei | We are fine with no further action.  |
| DOCOMO | We share the same view as other companies that it can be avoided by gNB implementation. |
| Intel | Share the views expressed above that this was discussed in the past with the conclusion that it can be addressed by gNB implementation. Hence, no spec change necessary. |
| ZTE, Sanechips | For NR UE, it is possible to leave it for gNB implementation, e.g., as mentioned by Samsung1) Configure type1 CSS associated with CORESET#0 – UE uses common TDRA table configured in SIB12) Configure type1 CSS associated with CORESET#X other than 0 and the same dedicated TDRA table – UE use the same dedicated TDRA table3) Configure type1 CSS associated with CORESET#X other than 0 and at least one common SLIV in dedicated TDRA table – UE use the dedicated TDRA table, but gNB can indicate the common SLIV However, for Rel-17 RedCap UE, since separate initial DL BWP without CORESET#0 is an important deployment case, and it not possible to configure type 1 CSS associated with CORESET#0 in this case. Actually, the above three kinds of implementation indicate that only common TDRA table can be used for retransmitted PUSCH in RACH procedure.Therefore, we think at least a Rel-17 CR can be considered to provide the clear clarification at least beneficial for RedCap UE deployment, if NBC issue is the concern.  |
| Qualcomm | We may miss a point, but it is a bit unclear how/why the concern can be resolved by using whether or not “the CSS is in initial DL BWP” as the condition for common vs dedicated TDRA table.When a dedicated DL BWP covers initial DL BWP, if type-1 CSS is configured in the initial DL BWP, the UE uses common TDRA table; otherwise if type-1 CSS is configured in the dedicated DL BWP, the UE uses dedicated TDRA table. In this case, the concern can be resolved only if type-1 CSS for all these UEs is configured in the initial DL BWP.When a dedicated DL BWP does not overlap with initial DL BWP, type-1 CSS is configured in the dedicated DL BWP and the UE uses dedicated TDRA table. In this case, the concern cannot be resolved. |
| LG | We also share the same view with other companies that it can be left to gNB implementation. |
| MTK | We are fine to address/clarify this issue. |
| Moderator | Regarding the point raised by Qualcomm, when a dedicated DL BWP does not overlap with initial DL BWP and type-1 CSS is configured in the dedicated DL BWP, different UE may share the same type-1 CSS and has different TDRA list configuration. In this case, the concern becomes that the gNB can not differentiate the different UE, and then the gNB does not know how to use the TDRA table for each UE. gNB implementation also can be a method to solve this, e.g., the different UE may share the same TDRA table.Regarding the point raised by ZTE, for Rel-17 RedCap UE, since separate initial DL BWP without CORESET#0 is an important deployment case, and it not possible to configure type 1 CSS associated with CORESET#0 in this case, some further discussion for RedCap if needed may not be precluded. |

To solve above issue, some solutions are put on table as follows:

|  |  |  |
| --- | --- | --- |
| Options | Options description | Brief comments |
| Option 1 | In initial DL BWP, if TC-RNTI scrambled DCI is monitored in CSS, *pusch-TimeDomainAllocationList* would not be provided in *pusch-Config* | The UE-specific scheduling would also be impacted due to limited TDRA list.Option 1 can be achieved by gNB configuration/implementation. |
| Option 2 | In initial DL BWP, if TC-RNTI scrambled DCI is monitored in CSS, *pusch-TimeDomainAllocationList* provided in *pusch-Config* are the same with *pusch-TimeDomainAllocationList* provided in *pusch-ConfigCommon*  | gNB configuration is limited and the UE-specific scheduling also would be impacted due to limited TDRA listOption 2 can be achieved by gNB configuration/implementation. |
| Option 3 | In initial DL BWP, if TC-RNTI scrambled DCI can be monitored in CSS, the applicable TDRA list for PUSCH scheduled by the DCI in common search space not associated with CORESET 0 is determined by Default A or *pusch-TimeDomainAllocationList* provided in *pusch-ConfigCommon*  | Spec corrections are needed. |
| Option 4 | In initial DL BWP, if TC-RNTI scrambled DCI is monitored in CSS, use msg1 to identify whether it is in connected mode or idle/inactive mode. | Large spec impacts including RAN2 impacts are needed. |
| Option 5 | In initial DL BWP, if TC-RNTI scrambled DCI is monitored in CSS, mandate that RA-searchspace CSS in initial DL BWP is associated to CORESET#0  | gNB configuration is limitedIt is not applicable for RedCap UE when separate initial DL BWP is configured without CORESET#0 |

And a candidate solution based on proposal 2 in [2] is proposed:

**Proposal 2:** **Consider option 3 as a starting point to solve the TDRA list misalignment problem between gNB and UE**

**Table 6.1.2.1.1-1: Applicable PUSCH time domain resource allocation**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **RNTI** | **PDCCH search space** | ***pusch-ConfigCommon* includes *pusch-TimeDomainAllocationList*** | ***pusch-Config* includes *pusch-TimeDomainAllocationList*** | **PUSCH time domain resource allocation to apply** |
| PUSCH scheduled by MAC RAR as described in clause 8.2 of [6, TS 38.213] | No | - | Default A |
| Yes |  | *pusch-TimeDomainAllocationList* provided in *pusch-ConfigCommon* |
| C-RNTI, MCS-C-RNTI, ~~TC-RNTI,~~ CS-RNTI | Any common search space associated with CORESET 0 | No | - | Default A |
| Yes |  | *pusch-AlloTimeDomaincationList* provided in *pusch-ConfigCommon* |
| TC-RNTI | Any common search space associated with CORESET 0,Any common search space in initial DL BWP | No | - | Default A |
| Yes |  | *pusch-AlloTimeDomaincationList* provided in *pusch-ConfigCommon* |
| C-RNTI, MCS-C-RNTI, ~~TC-RNTI,~~ CS-RNTI, SP-CSI-RNTI | Any common search space not associated with CORESET 0,UE specific search space | No | No | Default A |
| Yes | No | *pusch-TimeDomainAllocationList* provided in *pusch-ConfigCommon*  |
| No/Yes | Yes | *pusch-TimeDomainAllocationList* provided in *pusch-Config* |
| TC-RNTI | Any common search space not in initial DL BWP | No | No | Default A |
| Yes | No | *pusch-TimeDomainAllocationList* provided in *pusch-ConfigCommon*  |
| No/Yes | Yes | *pusch-TimeDomainAllocationList* provided in *pusch-Config* |

**<Unchanged parts are omitted>**

## **2.2 Question #2**

**Q2**: Companies are invited to share the views on which solution can be the starting point if this issue needs to be addressed.

|  |  |
| --- | --- |
| **Company name** | **Comments** |
| MTK | We are fine to consider option 3 as a starting point to solve the TDRA list misalignment problem. |
|  |  |

# 3 Summary

Majority companies think this could be solved by gNB implementation and few companies think this issue could be clarified. Per chairman’s suggestion and majority view, we may close this email discussion and the documents R1-2209184/R1-2209185 are marked as rejected.

# 4 References

1. R1-2209184 Discussion on PUSCH TDRA misalignment issue ZTE, Sanechips
2. R1-2209185 Correction on TDRA misalignment of PUSCH ZTE, Sanechips