**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:\Users\10234951\AppData\Local\Temp\Temp1_Chair's%2520notes%2520RAN1%2523110bis-e%2520v03.zip\../../Docs/R1-2209184.zip) Discussion on PUSCH TDRA misalignment issue ZTE, Sanechips

[R1-2209185](file:///C:\Users\10234951\AppData\Local\Temp\Temp1_Chair's%2520notes%2520RAN1%2523110bis-e%2520v03.zip\../../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 in  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* |

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:\Users\youns\OneDrive\Documents\3GPP\RAN1%20tdocs\TSGR1_107-e\Docs\R1-2111211.zip) Correction on determination of TDRA table to be used for PUSCH CATT  [R1-2111212](file:///C:\Users\youns\OneDrive\Documents\3GPP\RAN1%20tdocs\TSGR1_107-e\Docs\R1-2111212.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 Samsung  1) Configure type1 CSS associated with CORESET#0 – UE uses common TDRA table configured in SIB1  2) Configure type1 CSS associated with CORESET#X other than 0 and the same dedicated TDRA table – UE use the same dedicated TDRA table  3) 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. |

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 list  Option 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 limited  It 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** |
|  |  |
|  |  |

# 3 Summary

TBD

# 4 References

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