**3GPP TSG RAN WG1 #108-e R1-22xxxxx**

**e-Meeting, February 21st – March 3rd, 2022**

**Agenda item:** 7.2.12

**Source:** Moderator (NTT DOCOMO, INC.)

**Title:** Summary on Rel-16 NR others discussion

**Document for:** Discussion and Decision

1. Introduction

This contribution summarizes the discussions and proposals in AI 7.2.12 for Rel-16 NR others discussion not covered by AI 7.2.1-7.2.11.

Based on the discussions summarized in Section 2, the moderator suggests having an email discussion on the proposal in [1] as below.

**FL proposal #1 of email discussion:**

**[108-e-AI7.2.12-NR-Others-01] Email discussion for clarification on PUSCH with UCI Only and DMRS Multiplexing**

* **For Rel-16 and later releases, discuss whether to specify one unified UE behaviour when a UE is scheduled a PUSCH FDMed with DMRS and “UL-SCH indicator” in an UL DCI is 0 or to adopt the following conclusion made at RAN1#107-e**
	+ **“It is up to UE implementation to handle the case where an UL DCI includes UL-SCH indicator = 0 and an indication of FDM between UL-SCH and DMRS”**

Companies are encouraged to check above FL proposal and to provide feedback if any in below.

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| --- | --- |
| Company | Comment |
| CATT | The same contribution is submitted in R1-2202368 under agenda itme 7.1. Given that the issue was discussed in AI 7.1, it is suggested to handle under AI 7.1 in this meeting as well. |
| NTT DOCOMO | Two comments.* Agree with CATT. This issue was discussed under AI 7.1 at the previous meeting. Discussion in this meeting should be done under AI 7.1.
* We do not think email thread for this issue is necessary. At the previous meeting, we have a conclusion as “up to UE implementation”. The conclusion is not limited to Rel-15, thereby the same should be applied to Rel-16 or later unless significant issue is found. Now the proposal is to specify UE behavior further, but we do not see the reason why such a CR is necessary.
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| Moderator (NTT DOCOMO) | Thanks for the feedbacks!As pointed, the issue is also discussed in AI7.1 based on the same contribution from the proponent, and hence I would like to follow the guidance to be provided by RAN1 chair in AI7.1 on how to handle this issue. |

1. Discussion on other issues
	1. Clarification on PUSCH with UCI Only and DMRS Multiplexing [1]

Following proposal is provided in [1], based on the discussion at RAN1#107-e meeting on the same issue [2].

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| --- | --- |
| [1] | When UL-SCH is **NOT** present on PUSCH, i.e., ‘UL-SCH indicator’ in an UL DCI format is 0, there is ambiguity on what to be transmitted on non-DMRS RE(s) in the DMRS symbol(s) if the network indicates data is FDMed with DMRS. Two possible interpretations on UE behaviour are as follows:* **Interpretation #1:** UE does not transmit anything on non-DMRS RE(s) in the DMRS symbol(s) – see Figure 1(a)
* **Interpretation #2:** UE generates and transmits dummy bits on non-DMRS RE(s) in the DMRS symbol(s) – see Figure 1(b)

Figure 1. Two possible UE behaviours if PUSCH with UCI only is allowed to be FDMed with DMRS**Observation 1: When UL-SCH is NOT present on PUSCH, i.e., ‘UL-SCH indicator’ in an UL DCI format is 0, there is ambiguity on what to be transmitted on non-DMRS RE(s) in the DMRS symbol(s) if the network indicates data is FDMed with DMRS. Two possible interpretations on UE behaviour are shown in Figure 1.**This issue was discussed in RAN1 #107e and concluded to be left for UE implementation in R15 as below [1]:**Conclusion**It is up to UE implementation to handle the case where an UL DCI includes UL-SCH indicator = 0 and an indication of FDM between UL-SCH and DMRS.**Observation 2: Although a conclusion for R15 as shown above is achieved in RAN1 #107e, “up to UE implementation” still means network and UE may have different understanding on whether to include non-DMRS RE(s) in DMRS symbol(s) for PUSCH scrambling, which can affect PUSCH decoding.**In order to avoid the ambiguity on UE behaviour and ensure PUSCH performance, we propose:Proposal 1: To amend the spec hole, specify one unified UE behaviour when a UE is scheduled a PUSCH FDMed with DMRS and “UL-SCH indicator” in an UL DCI is 0, in R16 or later releases. |

Regarding the conclusion discussed at the RAN1#107-e meeting, there was a comment that “this conclusion is for both Rel-15 and Rel-16” [2]. Therefore, some companies may think it is already concluded for Rel-16, but the proponent would intend to discuss this issue again for Rel-16 and also possibility to specify one unified UE behaviour for later releases in this meeting.

Based on the above, following proposal can be discussed in RAN1#107-e meeting.

### **Discussion point #1**

* **For Rel-16 and later releases, discuss whether to specify one unified UE behaviour when a UE is scheduled a PUSCH FDMed with DMRS and “UL-SCH indicator” in an UL DCI is 0 or to adopt the following conclusion made at RAN1#107-e**
	+ **“*It is up to UE implementation to handle the case where an UL DCI includes UL-SCH indicator = 0 and an indication of FDM between UL-SCH and DMRS*”**

Reference

[1] R1-2202051 Clarification on PUSCH with UCI Only and DMRS Multiplexing MediaTek Inc.

[2] R1-2112666 Summary for [107-e-NR-7.1CRs-11] #18 PUSCH DMRS with UCI Only Moderator (MediaTek Inc.)