**3GPP TSG-RAN WG1 Meeting #102-e R1-200xxxx**

**e-Meeting, August 17th – 28th, 2020**

**Agenda Item: 7.2.1**

**Source: Moderator (ZTE)**

**Title: Email discussion #2 for 2-step RACH**

**Document for: Discussion**

# Introduction

This document is intended to address the following remaining issues by email discussion.

[102-e-NR-2step-RACH-02] Email discussion/approval of addressing issues #2, #7.2, #8 as in the summary:

* Modulation order of MsgB PDSCH
* Default TDRA table for extended CP
* Resource overhead of MsgA PUSCH

By 8/20, with follow-up potential CR(s) by 8/25 – Li (ZTE)

# Modulation order of MsgB PDSCH (issue #2)

R1-2005605 proposed to limit the modulation order of MsgB PDSCH, similar to the principle of Msg2 PDSCH scheduled with RA-RNTI.

***Proposal 1:***

* Adopt the TP#1 in 38.214, to limit the modulation order of MsgB PDSCH.

**Reasons for change**

To limit the modulation order of MsgB PDSCH, similar to the PDSCH scheduled with RA-RNTI

**Summary of changes**

Implement the above update

**Specs/Sections impacted**

TS 38.214, Section 5.1.3.1

-------------------------**Text proposal #1 starts for TS 38.214** ----------------------------

5.1.3.1 Modulation order and target code rate determination

<Unchanged Text Omitted>

The UE is not expected to decode a PDSCH scheduled with P-RNTI, RA-RNTI, MsgB-RNTI, SI-RNTI and *Qm* > 2

<Unchanged Text Omitted>

------------------------- **Text proposal #1 ends for TS 38.214** -------------------------------

Any comments?

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | OK for TP#1 |
| Intel | It is not clear to us why we need to restrict MsgB PDSCH with QPSK. In our view, MsgB may include RRC message, which is similar to Msg4 and can have large payload size. In this case, higher modulation order can be used to reduce amount of resource for MsgB PDSCH.  Hence, we do not need this TP. |
| Qualcomm | We are ok to support TP#1.  Similar to msg2 PDSCH, msgB PDSCH is scheduled by a group-common DCI and is expected to be decoded by multiple UEs monitoring a same msgB-RNTI. Typically, the payload size of msgB PDSCH is larger than that of msg2 PDSCH. To ensure the reliability of demodulation and decoding, it makes sense to restrict the modulation order in a similar way as msg2 PDSCH. |
| Ericsson | OK. Just one minor comment, msgB-RNTI should be updated to MsgB-RNTI. |
| CATT | We are fine with TP#1 with Ericsson’s editorial change. |
| Apple | We are ok with TP#1. |
| Spreadtrum | We are fine with TP#1. |
| FL | It seems the TP is acceptable to the majority with the editorial change suggested by Ericsson. Hopefully the motivation mentioned by QC can address Intel’s concern. |
| Intel | It is still unclear to us why we need to restrict MsgB PDSCH modulation order to QPSK. Note that MsgB would include a combination of Msg2 and Msg4. When MsgB includes RRC message, which typically has large size, we think it is more appropriate to use higher modulation order for MsgB PDSCH transmission like Msg4. In addition, given that RACH type selection was already defined between 2-step and 4-step RACH, typically 2-step RACH is mainly targeted for cell center UE, who has good coverage. This indicates that higher modulation order would work well for these UEs.  Having said this, we are still not convinced to restrict MsgB PDSCH with QPSK. |

# Default TDRA table for extended CP (issue #7.2)

R1-2006609 proposed to capture the default TDRA table 6.1.2.1.1-3 for extended CP for MsgA PUSCH, since both normal CP and extended CP are expected be supported for MsgA PUSCH.

***Proposal 2:***

* Adopt the TP#2 in 38.213, to capture the default TDRA table of extended CP for MsgA PUSCH.

**Reasons for change**

To capture the default TDRA table 6.1.2.1.1-3 of extended CP for MsgA PUSCH

**Summary of changes**

Implement the above updates

**Specs/Sections impacted**

TS 38.213 Section 8.1A

-------------------------**Text proposal #2 starts for TS 38.213** ----------------------------

8.1A PUSCH for Type-2 random access procedure

<Unchanged Text Omitted>

If a UE does not have dedicated RRC configuration, or has an initial UL BWP as an active UL BWP, or is not provided *startSymbolAndLengthMsgA-PO*, *msgA-PUSCH-timeDomainAllocation* provides a SLIV and a PUSCH mapping type for a PUSCH transmission by indicating

- first *maxNrofUL-Allocations* values from *PUSCH-TimeDomainResourceAllocationList*, if *PUSCH-TimeDomainResourceAllocationList* is provided in *PUSCH-ConfigCommon*

- entries from table 6.1.2.1.1-2 or table 6.1.2.1.1-3 in [6, TS 38.214], if *PUSCH-TimeDomainResourceAllocationList* is not provided in *PUSCH-ConfigCommon*

<Unchanged Text Omitted>

------------------------- **Text proposal #2 ends for TS 38.213** -------------------------------

Any comments?

|  |  |
| --- | --- |
| Company | Comment |
| Nokia | OK for TP#2 |
| Intel | We are fine with the TP |
| Qualcomm | No need to have TP#2. The wording in current release is clear enough. |
| Ericsson | The TP is needed, otherwise we may need agreement to not support ECP for 2-step RACH, while in earlier releases only SIB1 is supposed to only support normal CP.  We’re fine if companies can reach agreement on this normal CP limitation on 2-step RACH, but this means we may need TPs in 38.214 to restrict MsgA PUSCH, MsgB PDSCH to only use default table A for normal CP for uplink and downlink respectively, which might be not pursed by us at this stage.  Our view is to simply follow 4-step RACH and legacy, i.e. simply include the table 6.1.2.1.1-3 table as well as indicated by this TP. |
| CATT | We are fine with TP#2 with ECP support. |
| Apple | We are ok with TP#2. |
| Spreadtrum | We are fine with TP#2. |
| FL | I think the question from Ericsson needs to be addressed. Since we do not have agreement to exclude ECP in 2-step RACH, the simpler solution is to have the TP. Probably to address QC’s concern, we may not need to mention the parameter of *cyclicPrefix* here? |
| Intel | We are fine with updated TP without mentioning *cyclicPrefix.* |

# Resource overhead of MsgA PUSCH (issue #7.1)

R1-2006609 proposed to capture the same assumption of Msg3 resource overhead for MsgA. The resource overhead per PRB is assumed to be zero for Msg3, which should also be applied for MsgA PUSCH

***Proposal 3:***

* Adopt the TP#3 in 38.214, to capture the assumption of resource overhead for MsgA.

**Reasons for change**

To capture the same assumption of Msg3 resource overhead for MsgA

**Summary of changes**

Implement the above updates

**Specs/Sections impacted**

TS 38.214 Section 6.1.4.2

-------------------------**Text proposal #3 starts for TS 38.214** ----------------------------

#### 6.1.4.2 Transport block size determination

<Unchanged Text Omitted>

The UE shall first determine the number of REs (*NRE*) within the slot:

- A UE first determines the number of REs allocated for PUSCH within a PRB  by

- , where is the number of subcarriers in the frequency domain in a physical resource block,  is the number of symbols *L* of the PUSCH allocation according to Clause 6.1.2.1 for scheduled PUSCH or Clause 6.1.2.3 for configured PUSCH,  is the number of REs for DM-RS per PRB in the allocated duration including the overhead of the DM-RS CDM groups without data, as described for PUSCH with a configured grant in Clause 6.1.2.3 or as indicated by DCI format 0\_1 or DCI format 0\_2 or as described for DCI format 0\_0 in Clause 6.2.2, and  is the overhead configured by higher layer parameter *xOverhead* in*PUSCH-ServingCellConfig*. If the  is not configured (a value from 6, 12, or 18), the  is assumed to be 0. For Msg3 or MsgA PUSCH transmission the  is always set to 0. In case of PUSCH repetition Type B,  is determined assuming a nominal repetition with the duration of *L* symbols without segmentation.

<Unchanged Text Omitted>

------------------------- **Text proposal #3 ends for TS 38.214** -------------------------------

Any comments?

|  |  |
| --- | --- |
| Company | Comment |
| Nokia | OK for TP#3 |
| Intel | We are fine with the TP |
| Qualcomm | TP#3 looks good to us. |
| Ericsson | OK. |
| CATT | We are fine with TP#3 because PTRS/SRS transmission won’t be configured/executed when MsgA PUSCH transmission is implemented |
| Apple | We are ok with TP#3. |
| Spreadtrum | We are fine with the TP. |

# Summary

Based on the first round discussions, the following TPs will be proposed for approval. And the potential CRs to 38.213 and 38.214 will be prepared accordingly…

***Proposal 1:***

* Adopt the TP#1 in 38.214, to limit the modulation order of MsgB PDSCH.

**Reasons for change**

To limit the modulation order of MsgB PDSCH, similar to the PDSCH scheduled with RA-RNTI

**Summary of changes**

Implement the above update

**Specs/Sections impacted**

TS 38.214, Section 5.1.3.1

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5.1.3.1 Modulation order and target code rate determination

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The UE is not expected to decode a PDSCH scheduled with P-RNTI, RA-RNTI, MsgB-RNTI, SI-RNTI and *Qm* > 2

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***Proposal 2:***

* Adopt the TP#2 in 38.213, to capture the default TDRA table of extended CP for MsgA PUSCH.

**Reasons for change**

To capture the default TDRA table 6.1.2.1.1-3 of extended CP for MsgA PUSCH

**Summary of changes**

Implement the above updates

**Specs/Sections impacted**

TS 38.213 Section 8.1A

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8.1A PUSCH for Type-2 random access procedure

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If a UE does not have dedicated RRC configuration, or has an initial UL BWP as an active UL BWP, or is not provided *startSymbolAndLengthMsgA-PO*, *msgA-PUSCH-timeDomainAllocation* provides a SLIV and a PUSCH mapping type for a PUSCH transmission by indicating

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<Unchanged Text Omitted>

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***Proposal 3:***

* Adopt the TP#3 in 38.214, to capture the assumption of resource overhead for MsgA.

**Reasons for change**

To capture the same assumption of Msg3 resource overhead for MsgA

**Summary of changes**

Implement the above updates

**Specs/Sections impacted**

TS 38.214 Section 6.1.4.2

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#### 6.1.4.2 Transport block size determination

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The UE shall first determine the number of REs (*NRE*) within the slot:

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- , where is the number of subcarriers in the frequency domain in a physical resource block,  is the number of symbols *L* of the PUSCH allocation according to Clause 6.1.2.1 for scheduled PUSCH or Clause 6.1.2.3 for configured PUSCH,  is the number of REs for DM-RS per PRB in the allocated duration including the overhead of the DM-RS CDM groups without data, as described for PUSCH with a configured grant in Clause 6.1.2.3 or as indicated by DCI format 0\_1 or DCI format 0\_2 or as described for DCI format 0\_0 in Clause 6.2.2, and  is the overhead configured by higher layer parameter *xOverhead* in *PUSCH-ServingCellConfig*. If the  is not configured (a value from 6, 12, or 18), the  is assumed to be 0. For Msg3 or MsgA PUSCH transmission the  is always set to 0. In case of PUSCH repetition Type B,  is determined assuming a nominal repetition with the duration of *L* symbols without segmentation.

<Unchanged Text Omitted>

------------------------- **Text proposal #3 ends for TS 38.214** -------------------------------