3GPP TSG RAN WG1 Meeting #106-e R1-210xxxx

e-Meeting, August 16th – 27th, 2021

Agenda Item: 7.2.6

Source: Moderator (Qualcomm Inc.)

Title: Summary of [106-e-NR-eMIMO-07] MT.4 (PDSCH repetition counting)

Document for: Discussion and Decision

# Introduction

This document provides summary on the following email discussion;

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| **Issue#MT.4**R1-2107320 Draft CR on sum data rate for tdmSchemeA and fdmSchemeB Qualcomm Incorporated[106-e-NR-eMIMO-07] MT.4 (PDSCH repetition counting) by August 20 – Mostafa (Qualcomm) |

Section#2 provides description of the issue and Email discussions. Section#3 contains the TP in [1].

# Summary of the issue and Email discussions

The following explanation is provided in [1] regarding the issue and reason for change:

In Rel-16 eMIMO, two PDSCH schemes are specified that correspond to multiple (two) repetitions in one slot: In tdmSchemeA, the two repetitions (transmission occasions) have non-overlapping resource allocation in time domain. In fdmSchemeB, the two repetitions (transmission occasions) have non-overlapping resource allocation in frequency domain.

However, in sum data rate limitation in a cell group or data rate limitation for one PDSCH specified in Section 5.1.3 of 38.214, the two repetitions in the above schemes are not considered separately.

This contradicts the corresponding specification for the case of PUSCH with repetition Type B (in which case more than one repetition can exist in one slot similar to tdmSchemeA and fdmSchemeB mntioned above) in Section 6.1.4 of 38.214 where “For PUSCH repetition Type B, each actual repetition is counted separately.” is captured.

From UE complexity point of view with respect to data rate limitation, each repetition should be counted separately due to separate rate matching, which is captured correctly for the case of PUSCH as mentioned above, but not for the case of PDSCH (for tdmSchemeA and fdmSchemeB).

The proposed TP in [1] is copied in Section 3.

## First Round of Email discussions

**Question 1**: Do you agree with the issue described above?

**Question 2**: Do you agree with the TP in [1] (copied in Section 3)?

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| --- | --- |
| ***Company*** | ***View*** |
| Nokia/NSB | Q1: Agree with the described issue. Q2: similar to PUSCH Type repetition Type B, we can add the text suggested in this CR for PDSCH occasions.  |
| Samsung | Question 1: We are supportive on the issue described by moderator.Question 2: We agree with the TP in principle.  |
| Apple | Q1: Agree with the issues described Q2: Agree with the TP in [1] |
| QC | Q1: Agree with the issue.Q2: Agree with the TP. |
| ZTE | Q1: Agree with the issue.Q2: Agree with the TP. |
| OPPO | Q1: Agree with the issueQ2: Agree with the TP |
| LG | Q1: Agree with the issueQ2: Agree with the TP |

# TP in R1-2107320

5.1.3 Modulation order, target code rate, redundancy version and transport block size determination

**<unchanged text omitted>**

Within a cell group, a UE is not required to handle PDSCH(s) transmissions in slot *sj* in serving cell-*j*, and for *j* = 0,1,2.. *J-1*, slot *sj* overlapping with any given point in time, if the following condition is not satisfied at that point in time:

$$\sum\_{j=0}^{J-1}\frac{\sum\_{m=0}^{M-1}V\_{j,m}}{T\_{slot}^{μ(j)}}\leq DataRate$$

where,

- *J* is the number of configured serving cells belonging to a frequency range

- for the *j-th* serving cell,

*- M* is the number of TB(s) transmitted in slot *sj*. If there are two PDSCH transmission occasions of the same TB (in time domain or in frequency domain) in the slot *sj*, each transmission occasion is counted separately.

*- Tslotμ(j)* =10-3/2*μ(j)*, where *μ(j)* is the numerology for PDSCH(s) in slot *sj* of the *j*-th serving cell.

- for the *m*-th TB, $V\_{j,m}=C'∙\left⌊\frac{A}{C}\right⌋$

*- A* is the number of bits in the transport block as defined in Clause 7.2.1 [5, TS 38.212]

*- C* is the total number of code blocks for the transport block defined in Clause 5.2.2 [5, TS 38.212].$ $

*-* $C'$ is the number of scheduled code blocks for the transport block as defined in Clause 5.4.2.1 [5, TS 38.212]

- $DataRate$ [Mbps] is computed as the maximum data rate summed over all the carriers in the frequency range for any signaled band combination and feature set consistent with the configured servings cells, where the data rate value is given by the formula in Clause 4.1.2 in [13, TS 38.306], including the scaling factor *f(i).*

For a *j-*th serving cell, if higher layer parameter *processingType2Enabled* of *PDSCH-ServingCellConfig* is configured for the serving cell and set to '*enable',* or if at least one *IMCS >* *W* for a PDSCH, where *W* = 28 for MCS tables 5.1.3.1-1 and 5.1.3.1-3, and *W* = 27 for MCS table 5.1.3.1-2, the UE is not required to handle PDSCH transmissions, if the following condition is not satisfied:

$$\frac{\sum\_{m=0}^{M-1}V\_{j,m}}{L×T\_{s}^{μ}}\leq DataRateCC$$

where

- $L $is the number of symbols assigned to the PDSCH. For a PDSCH that consists of two PDSCH transmission occasions in time domain in one slot, $L$ is the number of symbols of one transmission occasion.

- M is the number of TB(s) in the PDSCH

- $T\_{s}^{μ}=\frac{10^{-3}}{2^{μ}∙N\_{symb}^{slot}}$ where *μ* is the numerology of the PDSCH

- for the *m*-th TB, $V\_{j,m}=C'∙\left⌊\frac{A}{C}\right⌋$

*- A* is the number of bits in the transport block as defined in Clause 7.2.1 [5, TS 38.212]

*- C* is the total number of code blocks for the transport block defined in Clause 5.2.2 [5, TS 38.212]

*-* $C'$ is the number of scheduled code blocks for the transport block as defined in Clause 5.4.2.1 [5, TS 38.212]

- $DataRateCC$ [Mbps] is computed as the maximum data rate for a carrier in the frequency band of the serving cell for any signaled band combination and feature set consistent with the serving cell, where the data rate value is given by the formula in Clause 4.1.2 in [13, TS 38.306], including the scaling factor *f(i).*

# References

1. R1-2107320, “Draft CR on sum data rate for tdmSchemeA and fdmSchemeB”, Qualcomm, RAN1#106e, August 2021.