**3GPP TSG RAN WG1 #116 R1-24xxxxx**

**Athens, Greece, February 26th – March 1st, 2024**

Agenda Item: 7.1

Source: Google

Title: Summary on PUSCH Rate Matching

Document for: Discussion/Decision

# Introduction

In this contribution, we provide a summary on PUSCH rate matching based on draft CR R1-2400387 as follows.

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| ***Title:***  | Draft CR on Rate Matching for PUSCH |
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| ***Source to WG:*** | Google |
| ***Source to TSG:*** | R1 |
|  |  |
| ***Work item code:*** | NR\_newRAT\_Core  |  | ***Date:*** | 2024-02-19 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | Currently, the buffer size for LBRM is defined based on the UE reported maximum number of layers if the UE is not provided the configuration of the maximum number of layers. However, if the UE supports non-codebook based transmission, it can report two UE capabilities: *maxNumberMIMO-LayersCB-PUSCH* for codebook based transmission scheme and *maxNumberMIMO-LayersNonCB-PUSCH* for non-codebook based transmission scheme. Then how to determine the buffer size for LBRM could be one problem.  |
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| ***Summary of change:*** | Clarify that the maximum number of layers for buffer size determination for LBRM should be determined based on the UE capability for the configured transmission scheme. |
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| ***Consequences if not approved:*** | The LBRM buffer size when the maximum number of layers is not configured is unclear  |
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| ***Clauses affected:*** | 5.4.2.1 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** | **Isolated impact analysis:**No impact as this is common understanding. |
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| ***This CR's revision history:*** | This is the first version for this CR. |

Proposed change

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| 5.4.2.1 Bit selectionThe bit sequence after encoding  from Clause 5.3.2 is written into a circular buffer of length  for the -th coded block, where  is defined in Clause 5.3.2.For the -th code block, let  if  and  otherwise, where, ,  is determined according to Clause 6.1.4.2 in [6, TS 38.214] for UL-SCH and Clause 5.1.3.2 in [6, TS 38.214] for DL-SCH/PCH, assuming the following:- maximum number of layers for one TB for UL-SCH is given by X, where- if the higher layer parameter *maxMIMO-Layers* of *PUSCH-ServingCellConfig* of the serving cell is configured, X is given by that parameter - elseif the higher layer parameter *maxRank* of *pusch-Config* of the serving cell is configured, X is given by the maximum value of *maxRank* across all BWPs of the serving cell- otherwise, X is given by *maxNumberMIMO-LayersNonCB-PUSCH* for the serving cell if *txConfig* is set to ‘*nonCodebook*’, and X is given by *maxNumberMIMO-LayersCB-PUSCH* for the serving cell otherwise  |

# Discussion

Based on the first round of online discussion, there seems to be the following understandings on the default value of X (maximum number of layers for one TB for UL-SCH).

* **Option 1 (Proposal in the draft CR): Default value of X is *maxNumberMIMO-LayersNonCB-PUSCH* for the serving cell if *txConfig* is set to ‘*nonCodebook’*, and X is given by *maxNumberMIMO-LayersCB-PU*SCH for the serving cell otherwise**
* **Option 2: Default value of X is given by the maximum value of *maxNumberMIMO-LayersNonCB-PUSCH* and *maxNumberMIMO-LayersCB-PU*SCH for the serving cell**
* **Option 3: Default value of X is given by *maxNumberMIMO-LayersCB-PUSCH* for the serving cell**
* **Option 4: Default value of X is undefined**
	+ **The gNB should always configure the *maxMIMO-Layers* or *maxRank***
* **Other option (please specify)**

**Companies’ view**

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| Company | Which option is your understanding | Comment |
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# Conclusion

TBD