**3GPP TSG RAN WG1 #106bis-e R1-21xxxxx**

**e-Meeting, October 11th – 19th, 2021**

**Agenda Item: 8.8**

**Source: Moderator (China Telecom, Sharp, Nokia, Qualcomm, ZTE)**

**Title: [106bis-e-R17-RRC-CovEnh] Email discussion on Rel-17 RRC parameters for Coverage Enhancement**

**Document for: Discussion**

1. Introduction

There was an initial email discussion on RRC parameters for NR coverage enhancements [1]. This contribution is a summary of the following email discussion:

[106bis-e-R17-RRC-CovEnh] Email discussion on Rel-17 RRC parameters for Coverage Enhancement

* 1st check point: October 14
* Final check point: October 19

1. Discussion on RRC parameters for AI 8.8.1.1
2. Discussion on RRC parameters for AI 8.8.1.2
3. Discussion on RRC parameters for AI 8.8.1.3

Table 4.1 RRC parameters for AI 8.8.1.3 from [1]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **WI code** | **Sub-feature group** | **RAN2 Parent IE** | **Parameter name in the spec** | **New or existing?** | **Description** | **Value range** | **UE-specific or Cell-specific** | **Specification** | **Comment** |
| NR\_cov\_enh-Core | DM-RS bundling for PUSCH |  | *~~PUSCH-TimeDomainWindow-r17~~* [*PUSCH-DMRS-Bundling*] | new | Enabling/disabling of DM-RS bundling and time domain window for PUSCH. | ENUMERATED {enabled, disable } | [UE-specific] | 38.331 | Agreement • Joint channel estimation for PUSCH transmissions and the time domain window are jointly enabled or disabled via RRC configuration for a UE. o Note: Enabling/disabling of joint channel estimation for PUSCH transmissions means enabling/disabling of DMRS bundling for PUSCH transmissions under the condition of power consistency and phase continuity. |
| NR\_cov\_enh-Core | DM-RS bundling for PUSCH | [PUSCH-Config] | *PUSCH-TimeDomainWindowLength* | new | [Enabling/disabling of DM-RS bundling and time domain window for PUSCH.] Length of a configured time domain window in slots for DMRS bundling for PUSCH. | FFS | [UE-specific] | 38.331 | Working assumption For joint channel estimation for PUSCH repetition type A of PUSCH repetitions of the same TB, all the repetitions are covered by one or multiple consecutive/non-consecutive configured TDWs.  Each configured TDW consists of one or multiple consecutive physical slots.  The window length L of the configured TDW(s) can be explicitly configured with a single value |

R1-2108847 has the following proposal.

Proposal: Only introduce one IE (i.e. *PUSCH-TimeDomainWindowLength*) to indicate both the enabling of JCE and the length of configured TDW for JCE of PUSCH transmissions.

R1-2108991 proposes the followings.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parameter Name** | **RAN1 spec/ section** | **Values range** | **New R17 vs extension of R15/16** | **Per (UE, cell, TRP, …)** | **Broadcast/**  **dedicated** | **Description** | **RAN2 spec** |
| PUSCH-DMRS-Bundling | 38.214 | ENUMERATED {enabled, disable } | New | Per UE | dedicated | Enabling/disabling of DM-RS bundling and TDW for PUSCH | 38.331 |
| PUSCH-TimeDomainWindowLength | 38.214 | INTEGER(2,3, … , the maximum duration) | New | Per UE | dedicated | Length of a configured TDW in slots for DMRS bundling for PUSCH. | 38.331 |

R1-2109509 has the following proposal.

Proposal 3: Introduce one parameter to indicate enabling of DM-RS bundling and TDW length, with value range same as *numberOfRepetitions-r17*. For example, {2, 3, 4, 7, 8, 12, 16, 20, 24, 28, 32}.

R1-2110002 has the following proposal.

Proposal: Two RRC parameters for enabling/disabling of DMRS bundling and the window length L should be separately configured.

R1-2110124 proposes a new RRC parameter should be defined for when UE restarts a PUCSH bundling window.

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| --- | --- | --- | --- | --- |
| **Sub-feature group** | **RAN2 Parent IE** | **Parameter name in the spec** | **Description** | **Value range** |
| DM-RS bundling for PUSCH |  | ~~[~~*PUSCH-DMRS-Bundling*~~]~~ | Enabling/disabling of DM-RS bundling and time domain window for PUSCH. | ENUMERATED {enabled, disable } |
| DM-RS bundling for PUSCH | [PUSCH-Config] | *PUSCH-TimeDomainWindowLength* | ~~[Enabling/disabling of DM-RS bundling and time domain window for PUSCH.]~~ Length of a configured time domain window in slots for DMRS bundling for PUSCH. | FFS |
| DM-RS bundling for PUSCH | [PUSCH-Config] | *PUSCH-Window-Restart* | UE bundles PUSCH DM-RS slots remaining in a bundling window after a slot for which events violate power consistency and phase continuity requirements | ENUMERATED {enabled, disable } |

## 4.1 1st round discussion

**FL comments:** The outcome of [1] can be the starting point for the discussion. Based on the guideline in [2], “RAN2 parent IE” in column E should be moved to column M. RRC parameters for AI 8.8.1.3 is updated in the following table.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **WI code** | **Sub-feature group** | **Parameter name in the spec** | **New or existing?** | **Description** | **Value range** | **Per (UE, cell, TRP, …)** | **UE-specific or Cell-specific** | **Specification** | **Comment** |
| NR\_cov\_enh-Core | DM-RS bundling for PUSCH | *~~PUSCH-TimeDomainWindow-r17~~* [*PUSCH-DMRS-Bundling*] | new | Enabling/disabling of DM-RS bundling and time domain window for PUSCH. | ENUMERATED {enabled, disable } |  | [UE-specific] | 38.331 | Agreement • Joint channel estimation for PUSCH transmissions and the time domain window are jointly enabled or disabled via RRC configuration for a UE. o Note: Enabling/disabling of joint channel estimation for PUSCH transmissions means enabling/disabling of DMRS bundling for PUSCH transmissions under the condition of power consistency and phase continuity. |
| NR\_cov\_enh-Core | DM-RS bundling for PUSCH | *PUSCH-TimeDomainWindowLength* | new | [Enabling/disabling of DM-RS bundling and time domain window for PUSCH.] Length of a configured time domain window in slots for DMRS bundling for PUSCH. | FFS | in [PUSCH-Config] | [UE-specific] | 38.331 | Working assumption For joint channel estimation for PUSCH repetition type A of PUSCH repetitions of the same TB, all the repetitions are covered by one or multiple consecutive/non-consecutive configured TDWs.  Each configured TDW consists of one or multiple consecutive physical slots.  The window length L of the configured TDW(s) can be explicitly configured with a single value |

Companies are encouraged to provide comments on RRC parameters for AI 8.8.1.3.

* Whether to introduce two RRC parameters to indicate enabling of DM-RS bundling and the window length of the configured TDW respectively or introduce only one RRC parameter to indicate both of them?
* Whether to introduce a new RRC parameter for when UE restarts a PUCSH bundling window?
* Any other comments?

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| **Companies** | **Comments** |
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## 4.2 2nd round discussion

1. Discussion on RRC parameters for AI 8.8.2
2. Discussion on RRC parameters for AI 8.8.3
3. References
4. R1-2108673, [Post-106-e-Rel17-RRC-08] NR coverage enhancement, Moderator (China Telecom), RAN1#106-e, August 16th – 27th, 2021.
5. R1-2110415, Recommendations for RAN1 RRC Parameter Preparation, Moderator (Ericsson), RAN1#106-e, August 16th – 27th, 2021.
6. R1-2108847, Discussion on joint channel estimation for PUSCH, ZTE, RAN1#106-e, August 16th – 27th, 2021.
7. R1-2108991, Discussion on Joint channel estimation for PUSCH, vivo, RAN1#106-e, August 16th – 27th, 2021.
8. R1-2109509, Considerations on Rel-17 RRC parameters for Coverage Enhancement, Samsung, RAN1#106-e, August 16th – 27th, 2021.
9. R1-2110002, Joint channel estimation for multiple PUSCH transmission, Sharp, RAN1#106-e, August 16th – 27th, 2021.
10. R1-2110124, Joint Channel Estimation for PUSCH, Ericsson, RAN1#106-e, August 16th – 27th, 2021.