**3GPP TSG-RAN WG1 Meeting #114 R1-23xxxxx**

**Toulouse, France, 21-25 August, 2023**

**Agenda Item: 9.17**

**Source: Moderator (Huawei)**

**Title: Summary of email discussion [Post114-38.212-NR\_cov\_enh2-Core]**

**Document for: Discussion and Decision**

# Introduction

This document summarizes the discussions on the 38.212 draft CR on further NR Coverage enhancement, and aims to stabilize the 38.212 draft CR.

[Post114-38.212-NR\_cov\_enh2-Core] Email discussion on Rel-18 draft CRs by September 7 – Editors

# First round discussions

This section summarize the first round email discussions on draft CR v00. Companies are encouraged to provide the first round views by 09/05 (Tuesday), 6:00am UTC, then we can update the draft CR accordingly for the next step discussions.

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| *Company* | *View* |
| Intel | Based on the following conclusion, dynamic waveform switching for Type 2 configured grant PUSCH is not supported. We suggest to remove the following highlighted text in the draft CR.

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| - 1 bit if the higher layer parameter *dynamicTransformPrecoderIndicationDCI-0-1* is configured to 'enabled ' and if the UE is configured to monitor DCI format 0\_1 with CRC scrambled by C-RNTI or CS-RNTI or MCS-C-RNTI, where the bit value of 0 indicates that transform precoder is enabled and the bit value of 1 indicates that transform precoder is disabled. For a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 1, or for a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the bit is reserved. - 0 bit otherwise. |

ConclusionThere is no consensus to support “Dynamic waveform switching to PUSCH transmissions with a Type 2 configured grant” in R18.[Chengyan]: Yes the change here is to reflect agreements for CG-PUSCH retransmission. |
| NTT DOCOMO | On Intel’s point above, we agree Type 2 CG is not supported. Meanwhile, we think Editor’s draft here is rather correct. Because we do not think DCI size should be changed depending on RNTI. Our interpretation of the Conclusion is that DWS field (Transform precoder indicator) doesn’t have a valid meaning in its codepoint. It doesn’t necessarily mean the whole field shouldn’t exist. [Chengyan]: Yes as you said above that is the intention to have the sentence for ‘reserved’, though there is a typo in the sentence, “new data indicator field is 1” should be changed to “new data indicator field is 0”, it will be reflected in the next update as below:*For a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 0, or for a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the bit is reserved.*  |
| vivo  | According to following agreement, CS-RNTI is only supported with DWS for retransmissions in CG case:

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| **Agreement**Dynamic waveform switching enhancement in R18 is applicable to PUSCH scheduled by DCI format 0\_1 or 0\_2 in PDCCH with CRC scrambled with C-RNTI, MCS-C-RNTI, or CS-RNTI with NDI=1.* Note: The above does not imply that dynamic switching enhancement in R18 is applicable or not applicable to other cases of PUSCH (e.g. PUSCH transmission with a Type 1 or Type 2 configured grant, PUSCH scheduled by DCI format 0\_0).
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Therefore, some update is needed:

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| Transform precoder indicator – 0 or 1 bit- 1 bit if the higher layer parameter *dynamicTransformPrecoderIndicationDCI-0-1* is configured to 'enabled ' and if the UE is configured to monitor DCI format 0\_1 with CRC scrambled by C-RNTI or CS-RNTI with the value indicated by new data indicator field is 1 or MCS-C-RNTI, where the bit value of 0 indicates that transform precoder is enabled and the bit value of 1 indicates that transform precoder is disabled. ~~For a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 1, or for a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the bit is reserved.~~ - 0 bit otherwise. |

[Chengyan]: Please check my reply to DCM above. Briefly speaking, the sentence you deleted is needed, otherwise it will have impact on PDCCH blind decoding. In addition, “with the value indicated by new data field is 1” should not be added, no matter whether it is CS-RNTI with NDI=0 or CSI-RNTI with NDI=1, the bitwidth here should be 1 bit, just when NDI=0 it is reserved. As I replied to DCM above, I will correct the typo in the next update. For the update below, could you clarify which agreement it is based on?

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| - DMRS sequence initialization – 0 bit if transform precoder is enabled; 1 bit if transform precoder is disabled or if the Transform precoder indicator field is present.  |

Same comments for DCI 0\_2.[Chengyan]: It corresponds to the following agreement. When the field exits, it has to be always 1 bit, since when t transform precoder enabled, it is 1 bit. AgreementFor DCI format 0\_1/0\_2 containing dynamic waveform indication, bit width of each field is set to the maximum between the bit width of the field if transform precoding is disabled and the bit width of the field if transform precoding is enabled, if different.* If, for the waveform indicated in the DCI, the bit width N of a field would be smaller than the bit width of the field set as per the above, UE decodes the field using N least significant bits. If N=0, the UE ignores the field for the indicated waveform.
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| Sharp | Regarding the input by companies, we agree vivo that DWS is supported for CS-RNTI with NDI=1 (retransmission case).Then, reserved bit is necessary for the case with CS-RNTI with NDI = “0” even though it is not supported. [Chengyan]: Right, I will correct the typo in the next update.  |
| CATT | Based on the agreements, our suggestion is as follows. The same applies for DCI format 0\_2.

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| Transform precoder indicator – 0 or 1 bit- 1 bit if the higher layer parameter *dynamicTransformPrecoderIndicationDCI-0-1* is configured to 'enabled ' and if the UE is configured to monitor DCI format 0\_1 with CRC scrambled by C-RNTI or CS-RNTI with the value indicated by new data indicator field is 1 or MCS-C-RNTI, where the bit value of 0 indicates that transform precoder is enabled and the bit value of 1 indicates that transform precoder is disabled. For a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 0~~1~~, or for a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the bit is reserved. - 0 bit otherwise.[Chengyan]: As I replied to vivo above, “with the value indicated by new data field is 1” should not be added, no matter whether it is CS-RNTI with NDI=0 or CSI-RNTI with NDI=1, the bitwidth here should be 1 bit, just when NDI=0 it is reserved. I will correct the typo “new data indicator field is 1” to “new data indicator field is 0” in the next update.  |

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| Nokia, NSB | We share similar view as CATT. Alternatively, we simply replace “1” by “0” in “For a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 0~~1~~, or for a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the bit is reserved.”[Chengyan]: As I replied to CATT above, I will just correct the typo “new data indicator field is 1” to “new data indicator field is 0”.  |
| Intel2 | We agree with other companies that DWS is only supported for CG-PUSCH retransmission. The update from Vivo looks fine with us. We also do not think the following text is needed. [Chengyan]: Please check my reply to vivo above.

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| ~~For a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 1, or for a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the bit is reserved~~ |

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| LGE | We agree with CATT and Nokia’s view such that “For a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 0~~1~~, or for a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the bit is reserved.” in order to support the same size of DCI as much as possible regardless of a specific RNTI. It could prevent unnecessary implementation complexity (E.g., blind detection.) given *dynamicTransformPrecoderIndicationDCI-0-1* configured to 'enabled’. Same comment to “*dynamicTransformPrecoderIndicationDCI-0-2”*[Chengyan]: As I replied to CATT above, I will just correct the typo “new data indicator field is 1” to “new data indicator field is 0”. |
| Samsung | Regarding the descriptions of - Transform precoder indicator – 0 or 1 bitIn addition to the agreement and conclusion cited by Vivo and Intel, respectively, there is also the following agreement:Agreement (RAN1#112)Dynamic waveform switching in R18 is not applicable to PUSCH transmissions with a Type 1 configured grant.Thus, we suggest the following changes:- 1 bit if the higher layer parameter *dynamicTransformPrecoderIndicationDCI-0-1* is configured to 'enabled ' and if the UE is configured to monitor DCI format 0\_1 with CRC scrambled by C-RNTI ~~or CS-RNTI~~ or MCS-C-RNTI, where the bit value of 0 indicates that transform precoder is enabled and the bit value of 1 indicates that transform precoder is disabled. ~~For a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 1, or for a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the bit is reserved.~~ - 0 bit otherwise.[Chengyan]: As I replied to CATT above, I will just correct the typo “new data indicator field is 1” to “new data indicator field is 0”.Regarding the following update in the draft CR:

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| - DMRS sequence initialization – 0 bit if transform precoder is enabled; 1 bit if transform precoder is disabled or if the Transform precoder indicator field is present.  |

We have no agreement on this. But, why to add the condition for the presence of the new indicator. Shouldn’t it be “if the Transform precoder indicator field has value 1”?[Chengyan]: Please check my reply to vivo above.  |
| ZTE | We support the revision from CATT to address the case of NDI=0 when CRC is scrambled by CS-RNTI. The reason has been mentioned by NTT DOCOMO that the DCI size should NOT be changed when the same RNTI type is used.[Chengyan]: Please check my reply to CATT above.  |
| InterDigital | [Try to merge the threads]Agree with the editor that the only correction needed is to change the “1” to “0” in the original editor version. There should not be a condition on the value of NDI for size of the field.[Chengyan]: Thanks for the confirmation. This will be reflected in the next update.  |
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# Second round discussions

Please find the updated [draft CR v1](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_114/Inbox/drafts/9.17%28Other%29/38.212%20draft%20CRs/%5BPost114-38.212-NR_cov_enh2-Core%5D/R1-23xxxxx%20Introduction%20of%20Rel-18%20further%20NR%20Coverage%20enhancement%20v1.docx) based on inputs from the first round. Companies are encouraged to provide the second round views by 09/06 (Wednesday), 16:00pm UTC if any.

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| *Company* | *View* |
| Sharp | After further consideration, we noticed that the existing field size matching between C-RNTI and CS-RNTI (see below) solves the issue on CS-RNTI with NDI=0, In other words, even if the “Transform precoder indicator” field description says that the size is 0 bit for CS-RNTI with NDI=0, zero-padding has to be done to align with the Transform precoder indicator field size of C-RNTI (i.e., 1bit) according to the existing procedure.

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| A UE does not expect that the bit width of a field in DCI format 0\_1 with CRC scrambled by CS-RNTI is larger than corresponding bit width of same field in DCI format 0\_1 with CRC scrambled by C-RNTI for the same serving cell. If the bit width of a field in the DCI format 0\_1 with CRC scrambled by CS-RNTI is not equal to that of the corresponding field in the DCI format 0\_1 with CRC scrambled by C-RNTI for the same serving cell, a number of most significant bits with value set to '0' are inserted to the field in DCI format 0\_1 with CRC scrambled by CS-RNTI until the bit width equals that of the corresponding field in the DCI format 0\_1 with CRC scrambled by C-RNTI for the same serving cell.  |

Therefore, we are now thinking that it would be better not to capture the behavior (1 bit as reserved for CS-RNTI with NDI=0) that has not been agreed yet. [Chengyan]: The problem here is that for CS-RNTI, the field is meaningful when NDI=1. However, before decoding the DCI, UE doesn’t know whether NDI=1 or NDI=0. Therefore, we cannot rely on the paragraph you cited above to solve the alignment of the bitwidth. Instead, we just clarify here that when NDI=0, then it is reserved. Yes, SP-CSI-RNTI situation is as what you described below. On the other hand, SP-CSI-RNTI is a different story. In order to make sure the size alignment between SP-CSI-RNTI and the other RNTIs, “1 bit as reserved for SP-CSI-RNTI” needs to be kept. Although such behavior has not agreed yet, it does not work well without this descrption.Therefore, we suggest the following.

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| - Transform precoder indicator – 0 or 1 bit- 1 bit if the higher layer parameter *dynamicTransformPrecoderIndicationDCI-0-1* is configured to 'enabled ' and if the UE is configured to monitor DCI format 0\_1 with CRC scrambled by C-RNTI or CS-RNTI with the value indicated by new data indicator field set to 1 or MCS-C-RNTI, where the bit value of 0 indicates that transform precoder is enabled and the bit value of 1 indicates that transform precoder is disabled. For ~~a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 0, or for~~ a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the bit is reserved. - 0 bit otherwise. |

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| Samsung | Thanks to the Editor for the further updates. We prefer that the CR captures only what already agreed. Further agreements on the points raised in 1st round and by Sharp in 2nd round can be made during the maintenance phase. Based on the existing agreements/conclusion/note, we suggest the following:

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| - Transform precoder indicator – 0 or 1 bit- 1 bit if the higher layer parameter *dynamicTransformPrecoderIndicationDCI-0-1* is configured to 'enabled ' and if the UE is configured to monitor DCI format 0\_1 with CRC scrambled by C-RNTI ~~or CS-RNTI~~ or MCS-C-RNTI, where the bit value of 0 indicates that transform precoder is enabled and the bit value of 1 indicates that transform precoder is disabled. ~~For a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 0, or for a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI, the bit is reserved.~~ - 0 bit otherwise. |

In the above text, we can be also fine with “or CS-RNTI with the value indicated by new data indicator field is 1” (instead of ~~or CS-RNTI~~) because that is the description used in the agreement. [Chengyan]: The change here is to reflect the agreement below, so it is what agreed. If we made the changes as you mentioned above, then we didn’t reflect the agreement on CS-RNTI. For the “reserved” sentence, it is just normal way for DCI format handling, there are quite many similar cases in the current 38.212, it is not something new, e.g. DFI flag in DCI format 0\_1. In addition, as I replied in the first round, “with the value indicated by new data field is 1” should not be added, no matter whether it is CS-RNTI with NDI=0 or CSI-RNTI with NDI=1, the bitwidth here should be 1 bit, just when NDI=0 it is reserved. If we delete these changes, I will say the spec is not complete/correct. **Agreement**Dynamic waveform switching enhancement in R18 is applicable to PUSCH scheduled by DCI format 0\_1 or 0\_2 in PDCCH with CRC scrambled with C-RNTI, MCS-C-RNTI, or CS-RNTI with NDI=1.Note: The above does not imply that dynamic switching enhancement in R18 is applicable or not applicable to other cases of PUSCH (e.g. PUSCH transmission with a Type 1 or Type 2 configured grant, PUSCH scheduled by DCI format 0\_0). |
| **QC** | We are okay with the editor’s wording, but we wonder if a bit being reserved would guarantee that the bit is set to 0. If not, rather than saying its reserved, it might be better to say that the bit is set to 0.This ensures that the final outcome would be the same as that achieved after C-RNTI and CS-RNTI alignment procedure. A UE may have some verification logic after a PDCCH is detected to ensure any padded bits in the DCI are indeed mapped to 0.[Chengyan]: Usually when we say a field is “reserved”, then it doesn’t matter what bit to be transmitted here, since the UE will just ignore whatever transmitted here. If as you commented above to set to 0 for verification, then I think that needs further agreement. By the way, in the existing spec, some field are reserved, while some other fields clearly say reserved with value set to 0, depending on whether there is clear agreement.  |
| **NEC** | We think it’s better to separate discuss what’s the number of bit field and how to interpret the bit field. Thus, we suggest the following changes.

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| - Transform precoder indicator – 0 or 1 bit- 1 bit if the higher layer parameter dynamicTransformPrecoderIndicationDCI-0-1 is configured to 'enabled '. ~~and if the UE is configured to monitor~~ For a DCI format 0\_1 with CRC scrambled by C-RNTI or CS-RNTI with the value indicated by new data indicator field is 1 or MCS-C-RNTI, ~~where~~ the bit value of 0 indicates that transform precoder is enabled and the bit value of 1 indicates that transform precoder is disabled. ~~For a DCI format 0\_1 with CRC scrambled by CS-RNTI and the value indicated by new data indicator field is 0, or for a DCI format 0\_1 with CRC scrambled by SP-CSI-RNTI~~ Otherwise, the bit is reserved.- 0 bit otherwise. |
| [Chengyan]: Per the agreement below, RNTI is also one of the condition to decide whether the field is present or not. For example, if the RRC parameter is enabled, but UE is not configured to monitor any of the applicable RNTI, then this field is not needed. I think I explained above already several times why we cannot add “with the value indicated by new data field is 1”. **Agreement**Dynamic waveform switching enhancement in R18 is applicable to PUSCH scheduled by DCI format 0\_1 or 0\_2 in PDCCH with CRC scrambled with C-RNTI, MCS-C-RNTI, or CS-RNTI with NDI=1.Note: The above does not imply that dynamic switching enhancement in R18 is applicable or not applicable to other cases of PUSCH (e.g. PUSCH transmission with a Type 1 or Type 2 configured grant, PUSCH scheduled by DCI format 0\_0). |

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| **Editor** | @allAlthough I really don’t think there is any problem with the current draft CR, since some companies still are wondering what the best way to handle or have different interpretations, I am fine to delete the corresponding changes for now, especially considering that the deadline is here we may have no sufficient time to discuss more. We can update next time, per your further discussion in RAN1.Please find the [draft CR v2](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_114/Inbox/drafts/9.17%28Other%29/38.212%20draft%20CRs/%5BPost114-38.212-NR_cov_enh2-Core%5D/R1-23xxxxx%20Introduction%20of%20Rel-18%20further%20NR%20Coverage%20enhancement%20v2.docx). If you have any further comments, please share ASAP.  |
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