**3GPP TSG RAN WG1 #100bis R1-200xxxx**

**e-Meeting, April 20th – 30th, 2020**

Source: moderator (vivo)

Title: Editorial correction on ULFPTx

Agenda Item: 7.2.6.4

Document for: Discussion and Decision

1. Introduction

In this contribution, the editorial corrections as identified during email discussion in RAN1#100bis\_e. The TPs are provided for 38.212, 38.213 and 38.214.

1. Editorial corrections
	1. Issue 8: TP for RRC parameter alignment with 38.331 (Editorial)

**TS 38.212**

7.3.1.1.2 Format 0\_1

<Unrelated part omitted>

- Precoding information and number of layers – number of bits determined by the following:

- 0 bits if the higher layer parameter *txConfig = nonCodeBook*;

- 0 bits for 1 antenna port and if the higher layer parameter *txConfig = codebook*;

- 4, 5, or 6 bits according to Table 7.3.1.1.2-2 for 4 antenna ports, if *txConfig = codebook,* *~~ULFPTxModes~~ ul-FullPowerTransmission* is either not configured or configured to *~~Mode2~~ fullpowerMode2,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank*, and *codebookSubset*;

- 4 or 5 bits according to Table 7.3.1.1.2-2A for 4 antenna ports, if *txConfig = codebook,* *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1, maxRank=2,* transform precoder is disabled, and according to the values of higher layer parameter *codebookSubset*;

- 4 or 6 bits according to Table 7.3.1.1.2-2B for 4 antenna ports, if *txConfig = codebook, ~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1,* *maxRank=3 or 4,* transform precoder is disabled, and according to the values of higher layer parameter *codebookSubset*;

- 2, 4, or 5 bits according to Table 7.3.1.1.2-3 for 4 antenna ports, if *txConfig = codebook,* *~~ULFPTxModes~~ ul-FullPowerTransmission* is either not configured or configured to *~~Mode2~~ fullpowerMode2,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank*, and *codebookSubset*;

- 3 or 4 bits according to Table 7.3.1.1.2-3A for 4 antenna ports, if *txConfig = codebook,* *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1*, *maxRank=1*, and according to whether transform precoder is enabled or disabled, and the values of higher layer parameter *codebookSubset*;

- 2 or 4 bits according to Table7.3.1.1.2-4 for 2 antenna ports, if *txConfig = codebook,* *~~ULFPTxModes~~ ul-FullPowerTransmission* is either not configured or configured to *~~Mode2~~ fullpowerMode2,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank* and *codebookSubset*;

- 2 bits according to Table 7.3.1.1.2-4A for 2 antenna ports, if *txConfig = codebook,* *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1*, transform precoder is disabled, *maxRank=2*, and *codebookSubset=nonCoherent*;

- 1 or 3 bits according to Table7.3.1.1.2-5 for 2 antenna ports, if *txConfig = codebook,* *~~ULFPTxModes~~ ul-FullPowerTransmission* is either not configured or configured to *~~Mode2~~ fullpowerMode2,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank* and *codebookSubset*;

- 2 bits according to Table 7.3.1.1.2-5A for 2 antenna ports, if *txConfig = codebook,* *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1*, *maxRank=1*, and according to whether transform precoder is enabled or disabled, and the values of higher layer parameter *codebookSubset*;

For the higher layer parameter *txConfig=codebook*, if *~~ULFPTxModes~~ ul-FullPowerTransmission* is configured to *~~Mode2~~ fullpowerMode2*, maxRank is configured to be larger than 2, and at least one SRS resource with 4 antenna ports is configured in an SRS resource set with usage set to 'codebook' and an SRS resource with 2 antenna ports is indicated via SRI in the same SRS resource set, then Table 7.3.1.1.2-4 is used.

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Table 7.3.1.1.2-2: Precoding information and number of layers, for 4 antenna ports, if transform precoder is disabled, *maxRank* = 2 or 3 or 4, and *~~ULFPTxModes~~ ul-FullPowerTransmission* is either not configured or configured to *~~Mode2~~ fullpowerMode2*

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Table 7.3.1.1.2-2A: Precoding information and number of layers for 4 antenna ports, if transform precoder is disabled, *maxRank* = 2, and *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1*

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Table 7.3.1.1.2-2B: Precoding information and number of layers for 4 antenna ports, if transform precoder is disabled, *maxRank* = 3 or 4, and *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1*

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Table 7.3.1.1.2-3: Precoding information and number of layers for 4 antenna ports, if transform precoder is enabled and *~~ULFPTxModes~~ ul-FullPowerTransmission* is either not configured or configured to *~~Mode2~~ fullpowerMode2*, or if transform precoder is disabled, *maxRank* = 1, and *~~ULFPTxModes~~ ul-FullPowerTransmission* is either not configured or configured to *~~Mode2~~ fullpowerMode2*

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Table 7.3.1.1.2-3A: Precoding information and number of layers for 4 antenna ports, if transform precoder is enabled and *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1*, or if transform precoder is disabled, *maxRank* = 1, and *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1*

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Table 7.3.1.1.2-4: Precoding information and number of layers, for 2 antenna ports, if transform precoder is disabled, *maxRank* = 2, and *~~ULFPTxModes~~ ul-FullPowerTransmission* is either not configured or configured to *~~Mode2~~ fullpowerMode2*

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Table 7.3.1.1.2-4A: Precoding information and number of layers, for 2 antenna ports, if transform precoder is disabled*, maxRank* = 2, and *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1*

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Table 7.3.1.1.2-5: Precoding information and number of layers, for 2 antenna ports, if transform precoder is enabled and *~~ULFPTxModes~~ ul-FullPowerTransmission* is either not configured or configured to *~~Mode2~~ fullpowerMode2*, or if transform precoder is disabled, *maxRank* = 1, and and *~~ULFPTxModes~~ ul-FullPowerTransmission* is either not configured or configured to *~~Mode2~~ fullpowerMode2*

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Table 7.3.1.1.2-5A: Precoding information and number of layers, for 2 antenna ports, if transform precoder is enabled and *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode1~~ fullpowerMode1*, or if transform precoder is disabled*, maxRank* = 1, and *~~ULFPTxModes~~ ul-FullPowerTransmission* =*~~Mode1~~ fullpowerMode1*

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Table 7.3.1.1.2-32: SRI indication for codebook based PUSCH transmission, if *~~ULFPTxModes~~ ul-FullPowerTransmission* is not configured, or *~~ULFPTxModes~~ ul-FullPowerTransmission =~~Mode1~~ fullpowerMode1, or ~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode2~~ fullpowerMode2* and$N\_{SRS}=2$

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Table 7.3.1.1.2-32A: SRI indication for codebook based PUSCH transmission, if *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode2~~ fullpowerMode2* and$N\_{SRS}=3$

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Table 7.3.1.1.2-32B: SRI indication for codebook based PUSCH transmission, if *~~ULFPTxModes~~ ul-FullPowerTransmission* *=~~Mode2~~ fullpowerMode2* and$N\_{SRS}=4$

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* 1. Issue 6: TP for clarity on bitwidth of precoding information (Editorial)

**TS 38.212**

7.3.1.1.2 Format 0\_1

DCI format 0\_1 is used for the scheduling of one or multiple PUSCH in one cell, or indicating CG downlink feedback information (CG-DFI) to a UE.

The following information is transmitted by means of the DCI format 0\_1 with CRC scrambled by C-RNTI or CS-RNTI or SP-CSI-RNTI or MCS-C-RNTI:

<unchanged part removed>

For the higher layer parameter *txConfig = codebook*, if different SRS resources with different number of antenna ports are configured, the bitwidth is determined according to the maximum number of ports in an SRS resource among the configured SRS resources in an SRS resource set with usage set to ‘codebook’. If the number of ports for a configured SRS resource in the set is less than the maximum number of ports in an SRS resource among the configured SRS resources, a number of most significant bits with value set to '0' are inserted to the field.

* 1. Issue 5: TP for UL full power transmission with DCI 0\_2

**TS 38.212**

7.3.1.1.3 Format 0\_2

- Precoding information and number of layers – number of bits determined by the following:

- 0 bits if the higher layer parameter *txConfig = nonCodeBook*;

- 0 bits for 1 antenna port and if the higher layer parameter *txConfig = codebook*;

- 4, 5, or 6 bits according to Table 7.3.1.1.2-2 for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission* is either not configured or configured to *fullpowerMode2,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank-ForDCIFormat0\_2*, and *codebookSubset-ForDCIFormat0\_2*;

- 4 or 5 bits according to Table 7.3.1.1.2-2A for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission=fullpowerMode1,* the values of higher layer parameters *maxRank-ForDCIFormat0\_2=2,* transform precoder is disabled, and *codebookSubset-ForDCIFormat0\_2*;

- 4 or 6 bits according to Table 7.3.1.1.2-2B for 4 antenna ports, if *txConfig = codebook, ul-FullPowerTransmission=fullpowerMode1,* the values of higher layer parameters *maxRank-ForDCIFormat0\_2=3 or 4,* transform precoder is disabled, and *codebookSubset-ForDCIFormat0\_2*;

- 2, 4, or 5 bits according to Table 7.3.1.1.2-3 for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission* is either not configured or configured to *fullpowerMode2,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank-ForDCIFormat0\_2*, and *codebookSubset-ForDCIFormat0\_2*;

- 3 or 4 bits according to Table 7.3.1.1.2-3A for 4 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission=fullpowerMode1*, the values of higher layer parameters *maxRank-ForDCIFormat0\_2=1*, and according to whether transform precoder is enabled or disabled, and *codebookSubset-ForDCIFormat0\_2*;

- 2 or 4 bits according to Table7.3.1.1.2-4 for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission* is either not configured or configured to *fullpowerMode2,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank-ForDCIFormat0\_2* and *codebookSubset-ForDCIFormat0\_2*;

- 2 bits according to Table 7.3.1.1.2-4A for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission=fullpowerMode1*, transform precoder is disabled, the values of higher layer parameters *maxRank-ForDCIFormat0\_2=2*, and *codebookSubset-ForDCIFormat0\_2=nonCoherent*;

- 1 or 3 bits according to Table7.3.1.1.2-5 for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission* is either not configured or configured to *fullpowerMode2,* and according to whether transform precoder is enabled or disabled, and the values of higher layer parameters *maxRank-ForDCIFormat0\_2* and *codebookSubset-ForDCIFormat0\_2*.

- 2 bits according to Table 7.3.1.1.2-5A for 2 antenna ports, if *txConfig = codebook,* *ul-FullPowerTransmission=fullpowerMode1*, the values of higher layer parameters *maxRank-ForDCIFormat0\_2=1*, and according to whether transform precoder is enabled or disabled, and *codebookSubset-ForDCIFormat0\_2*;

For the higher layer parameter *txConfig=codebook*, if *ul-FullPowerTransmission* is configured to *fullpowerMode2*, the values of higher layer parameters *maxRank-ForDCIFormat0\_2* is configured to be larger than 2, and at least one SRS resource with 4 antenna ports is configured in an SRS resource set with usage set to 'codebook' and an SRS resource with 2 antenna ports is indicated via SRI in the same SRS resource set, then Table 7.3.1.1.2-4 is used.

For the higher layer parameter *txConfig = codebook*, if different SRS resources with different number of antenna ports are configured, the bitwidth is determined according to the maximum number of ports in an SRS resource among the configured SRS resources in an SRS resource set with usage set to ‘codebook’. If the number of ports for a configured SRS resource in the set is less than the maximum number of ports in an SRS resource among the configured SRS resources, a number of most significant bits with value set to '0' are inserted to the field.

* 1. Issue 7: TP on RRC parameter names and maximum number of configurable spatial relation (Editorial)

**TS 38.213**

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7.1 Physical uplink shared channel

<Unrelated part omitted>

For a PUSCH transmission on active UL BWP , as described in Clause 12, of carrier  of serving cell , a UE first calculates a linear value  of the transmit power , with parameters as defined in Clause 7.1.1. For a PUSCH transmission scheduled by a DCI format or configured by *ConfiguredGrantConfig* or *semiPersistentOnPUSCH*, if *txConfig* in *PUSCH-Config* is set to 'codebook',

- if ~~ULFPTx~~ *ul-FullPowerTransmission* in *PUSCH-Config* is provided and *codebookSubset* in *PUSCH-Config* is set to nonCoherent or partialAndNonCoherent, the UE scales $\hat{P}\_{PUSCH,b,f,c}(i,j,q\_{d},l)$ by $s$ where:

- if ~~ULFPTxModes~~ *ul-FullPowerTransmission* in *PUSCH-Config* is set to ~~Mode1~~ *fullpowerMode1*, and each SRS resource in the *SRS-ResourceSet* with *usage* set to 'codebook' has more than one SRS port', $s$ is the ratio of a number of antenna ports with non-zero PUSCH transmission power over the maximum number of SRS ports supported by the UE in one SRS resource

- if ~~ULFPTxModes~~ *ul-FullPowerTransmission* in *PUSCH-Config* is set to ~~Mode2~~ *fullpowerMode2*, $s=1$ for full power TPMIs reported by the UE [16, TS 38.306], and $s$ is the ratio of a number of antenna ports with non-zero PUSCH transmission power over a number of SRS ports for remaining TPMIs, where the number of SRS ports is associated with a SRS resource indicated by SRI if more than one SRS resource- is configured in the *SRS-ResourceSet* with *usage* set to 'codebook', or the number of SRS ports is associated with the SRS resource if only one SRS resource is configured in the *SRS-ResourceSet* with *usage* set to 'codebook', and

- otherwise, $s=1$

- else, if each SRS resource in the SRS-ResourceSet with usage set to 'codebook' has more than one SRS port, the UE scales the linear value by the ratio of the number of antenna ports with a non-zero PUSCH transmission power to the maximum number of SRS ports supported by the UE in one SRS resource.

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**TS 38.214**

6.1.1.1 Codebook based UL transmission

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<Unrelated part omitted>

When higher layer parameter *ULFPTxModes* is set to 'Mode 2',

- the UE can be configured with one SRS resource or multiple SRS resources with same or different number of SRS ports within an SRS resource set with *usage* set to '*codebook*'.

- up to 2 different spatial relations ~~(~~*~~maxNumberConfiguredSpatialRelations)~~* can be configured for all SRS resources with usage set to 'codebook'.

- subject to UE capability, a maximum of 2 or 4 SRS resources are supported in an SRS resource set with *usage* set to 'codebook'

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up to 2 different spatial relations (*maxNumberConfiguredSpatialRelations)* can be configured for all SRS resources in the SRS resource set with usage set to 'codebook' when multiple SRS resources are configured in the SRS resource set.

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**TS 38.214**

6.1.1.1 Codebook based UL transmission

<Unrelated part omitted>

For codebook based transmission, the UE may be configured with a single *SRS-ResourceSet* with *usage* set to 'codebook' and only one SRS resource can be indicated based on the SRI from within the SRS resource set. Except when higher layer parameter *~~ULFPTxModes~~ ul-FullPowerTransmission* is set to ~~'Mode 2~~ *fullpowerMode2*', the maximum number of configured SRS resources for codebook based transmission is 2. If aperiodic SRS is configured for a UE, the SRS request field in DCI triggers the transmission of aperiodic SRS resources.

The UE shall transmit PUSCH using the same antenna port(s) as the SRS port(s) in the SRS resource indicated by the DCI format 0\_1 or 0\_2 or by *configuredGrantConfig* according to clause 6.1.2.3.

The DM-RS antenna ports  in Clause 6.4.1.1.3 of [4, TS38.211] are determined according to the ordering of DM-RS port(s) given by Tables 7.3.1.1.2-6 to 7.3.1.1.2-23 in Clause 7.3.1.1.2 of [5, TS 38.212].

Except when higher layer parameter *~~ULFPTxModes~~ ul-FullPowerTransmission* is set to '~~Mode 2~~ *fullpowerMode2*', when multiple SRS resources are configured by *SRS-ResourceSet* with *usage* set to 'codebook', the UE shall expect that higher layer parameters *nrofSRS-Ports* in *SRS-Resource* in *SRS-ResourceSet* shall be configured with the same value for all these SRS resources.

When higher layer parameter *~~ULFPTxModes~~ ul-FullPowerTransmission* is set to '~~Mode 2~~ *fullpowerMode2*',

- the UE can be configured with one SRS resource or multiple SRS resources with same or different number of SRS ports within an SRS resource set with *usage* set to '*codebook*'.

- up to 2 different spatial relations (*maxNumberConfiguredSpatialRelations)* can be configured for all SRS resources with usage set to 'codebook'.

- subject to UE capability, a maximum of 2 or 4 SRS resources are supported in an SRS resource set with *usage* set to 'codebook'

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# References

[1] R1-2002746, “Summary of prep email discussion on ULFPTx”, RAN1#100bis-e