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

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

Source: moderator (vivo)

Title: Feature lead summary on ULFPTx-03

Agenda Item: 7.2.6.4

Document for: Discussion and Decision

1. Summary

Following email thread is assigned for discussion:

[100b-e-NR-eMIMO-ULFPTx-03] Email discussion on Issue #4 in R1-2002746: TP for power scaling for Mode2. By 4/24 and corresponding TP (if any) by 4/30 – Rakesh (vivo)

1. Discussion on issue 4[1]
   1. Issue 4: TP for power scaling for Mode2
      1. TP1

**TS 38.213**

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7.1 Physical uplink shared channel

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',

- ….. set to 'nonCoherent' or 'partialAndNonCoherent', the UE scales by where:

- ….

- ….. for full power TPMIs reported by the UE [16, TS 38.306] corresponding to the value of *codebookSubset*, ~~and~~ is the ratio of a number of antenna ports with non-zero PUSCH transmission power over a number of SRS ports for the remaining TPMIs and corresponding *codebookSubset*, where the number of SRS ports is associated with the ~~a~~ SRS resource indicated by SRI if more than one SRS resource~~s are~~ is configured in the *….* set to 'codebook', or the number of SRS ports is associated with the SRS resource if only one SRS resource is configured in the *….* set to 'codebook', and

- if *….*is not provided,

- else, if each SRS resource in the *…*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.

The UE splits the power equally across the antenna ports on which the UE transmits the PUSCH with non-zero power.

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Please provide your views/comments in the table below

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| Company/organization | comments |
| OPPO | Not needed. For 4 Tx ports, a non-coherent UE will report UE capability via 2 bits and a partial-coherent UE will use 4 bits. In the tdoc proposing the above-mentioned TP, UE may use 6 bits, where 2 of which report capability for non-coherent operation and the other 4 bits report capability for partial coherent operation. From our understanding, the tdoc misunderstood the agreement. |
| CMCC | It seems that companies have different understandings regarding the following agreements. In our understanding, for 2Tx UE reporting ‘non-coherent’ capability in 2-13, UE can report 2-port TPMI(s) in *codebookSubset = nonCoherent* that can support full power transmission. For 4Tx UE reporting ‘non-coherent’ capability in 2-13, UE can report 2-port and/or 4-port TPMI(s) in *codebookSubset = nonCoherent* that can support full power transmission. For 4Tx UE reporting ‘partial/non-coherent’ capability in 2-13, UE can report 2-port TPMI(s) in *codebookSubset = nonCoherent* and/or 4-port TPMI(s) in *codebookSubset = nonCoherent* and/or 4-port TPMI(s) in *codebookSubset = partialandNonCoherent* that can support full power transmission. We think we should first clarify whether this understanding is correct or not, then we can decide whether this TP is needed or not.  **Agreement**  For 2 ports, number of bits to indicate TPMI(s) which can deliver UL full power:   * 2 bits (bitmap) * Whether is this capability reporting is optional or not will be discussed as part of UE capability discussions   **Agreement**  For 4 ports, number of bits to indicate TPMI(s) which can deliver UL full power:   * + Non Coherent 2 bits   + Partial coherent 4 bits     - Additional entries on top of existing entries may be added to table 1 and table 2   + Whether is this capability reporting is optional or not will be discussed as part of UE capability discussions |
| Samsung | Not needed.  In our view, a UE reports only one TPMI group (not multiple) depending on number of ports and its capability (non-coherent or partial-coherent). Based on this understanding, we also think this TP is not needed. |
| CATT | Not needed. Non-coherent TPMIs are included in the full power TPMI groups for 4Tx partial-coherent. It is not necessary for a 4Tx partial-coherent UE to report full power TPMI groups for *codebookSubset* = nonCoherent and *codebookSubset* = partialAndNonCoherent respectively. |
| Apple | Not needed |
| ZTE | We think TP1 is not needed with the following reason.  The UE reports full power TPMIs according to its UE capability, and each TPMI should be supported full power transmission for the UE. Besides, UE with partial-coherent ports can use both of partial-coherent and non-coherent TPMIs to enable full power transmission. Therefore, we think TP1 is redundant and not needed. |
| LG | Not needed |
| Intel | We are open for discussion and slightly prefer with the text proposal. For partial coherent UE with 4 Tx, the UE may report full power TPMIs of partial coherent codebook subset with 4 ports and also report full power TPMIs of noncoherent codebook subset with 2 ports if it supports antenna virtualization. |

* + 1. TP2

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- if ULFPTxModes in PUSCH-Config is set to Mode1, and each SRS resource in the SRS-ResourceSet with usage set to 'codebook' has more than one SRS port', 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, or

- if ULFPTxModes in PUSCH-Config is set to Mode2, when for full power TPMIs reported by the UE [16, TS 38.306], and 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 resources are 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', or when full power TPMIs are not reported by the UE, is the ratio of the number of antenna ports with a non-zero PUSCH transmission power to the number of SRS ports is associated with a SRS resource indicated by SRI if more than one SRS resources are configured in the *SRS-ResourceSet* with usage set to ‘codebook’ and the indicated SRS resource has more than one SRS port, or

- if ULFPTxModes in PUSCH-Config is not provided,

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| Company/organization | comments |
| OPPO | Not needed as there is no issue. The wording “for remaining TPMIs” is very clear. |
| CMCC | We also think the part added can be covered by the remaining TPMIs case. |
| Samsung | Not needed, same view as OPPO, since the text “the remaining TPMIs” is equivalent to “TPMIs are not reported by the UE” |
| CATT | Not needed. How to determine for non-reported TPMIs is clear in current specification. When there is no full power TPMI reported, all the TPMIs are “remaining TPMIs”. |
| Apple | Not needed |
| ZTE | We think TP2 is not needed.  As some companies hold the same view, this TP is redundant with the text “remaining TPMIs”. |
| LG | Not needed |
| Intel | We think in the current spec, the power scaling for one port SRS is missing for Mode 2 operation. In this case, there is no TPMI at all. We suggest the following text change.  - if ULFPTxModes in PUSCH-Config is set to Mode1, and each SRS resource in the SRS-ResourceSet with usage set to 'codebook' has more than one SRS port', 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 in PUSCH-Config is set to Mode2,   * for full power TPMIs reported by the UE [16, TS 38.306], and 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 resources are 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', * , if the SRS resource with single port is indicated by SRI when more than one SRS resources are configured in the SRS-ResourceSet with usage set to 'codebook' or if only one SRS resource is configured in the SRS-ResourceSet with usage set to 'codebook' which has single port   - if ULFPTxModes in PUSCH-Config is not provided, |

* + 1. TP3

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if ULFPTxModes in PUSCH-Config is set to Mode2, for full power TPMIs reported by the UE [16, TS 38.306] corresponding to the value of *codebookSubset*, and is the ratio of a number of antenna ports with non-zero PUSCH transmission power over a number of SRS ports for remaining TPMIs corresponding to the value of *codebookSubset*, where the number of SRS ports is associated with a SRS resource indicated by SRI or *srs-ResourceIndicator* for type 1 configured grant if more than one SRS resources are 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

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| Company/organization | comments |
| OPPO | There are two part for this TP   1. The first part “corresponding to the value of codebookSubset” is similar to TP1. Thus we suggest to split TP3, the first part should be merged to TP1 and only discuss the second part in TP3 2. The second part “or *srs-ResourceIndicator* for type 1 configured grant”. We support it. |
| CMCC | We support this TP. For ease of discussion, we also think this TP could be split into two parts. The first part could be discussed together with TP1. |
| Samsung | Agree with OPPO, the first part is included in TP1 and hence not needed. We are also with the second part. |
| CATT | 1. The first revision that is the same as in TP 1 is not needed.  2. The second revision is not needed. In TS38.214, it has been explicitly clarified that SRI can be given by DCI fields of SRS resource indicator or given by *srs-ResourceIndicator* in *rrc-ConfiguredUplinkGrant*. |
| Apple | We are fine with the second part “or srs-ResourceIndicator for type 1 configured grant”. |
| ZTE | We think TP3 is not needed.  Hold the same view as CATT, this TP is redundant with the text in TS 38.214 section 6.1.1.1. |
| LG | Agree with CATT. TP3 is not needed. |
| Intel | Generally, we are fine with the proposal. |

# References

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