**3GPP TSG RAN WG1 #101 R1-200xxxx**

**e-Meeting, May 25th – June 5th, 2020**

Source: moderator (vivo)

Title: Feature lead summary on [101-e-NR-eMIMO-ULFPTx-02]

Agenda Item: 7.2.6.4

Document for: Discussion and Decision

1. Introduction

Per guidance from Mr. Chairman, this is to kick-off following email discussion, please provide your views below..

[101-e-NR-eMIMO-ULFPTx-02] TPs for correction on power scaling by 5/29 – Rakesh (vivo)

* TP 1, 2, 8 under Issues 2 of the FL summary
1. Remaining issues
	1. Issue 2 : TPs for correction on power scaling

TP#1

if *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 *ul-FullPowerTransmission* in *PUSCH-Config* is set to *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 *ul-FullPowerTransmission* in *PUSCH-Config* is set to *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 a SRI field in a DCI format scheduling the PUSCH transmission 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',

- if *ul-FullPowerTransmission* in PUSCH-Config is set to *fullpower*, $s=1$

- if a SRS resource with a single port is indicated by a SRI field in a DCI format scheduling the PUSCH transmission when more than one SRS resource is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', or if only one SRS resource with a single port is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', $s=1$

TP#2

if *ul-FullPowerTransmission* in *PUSCH-Config* is set to *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 a SRI field in a DCI format scheduling the PUSCH transmission 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',

- $s=1$, if a SRS resource with a single port is indicated by a SRI field in a DCI format scheduling the PUSCH transmission when more than one SRS resource is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', or if only one SRS resource with a single port is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', ~~and~~

- $s=1$, if the SRS resource with 2 ports is indicated by SRI when *codebookSubset* in *PUSCH-Config* is set to 'partialAndNonCoherent' and one SRS resource with 4 ports and one SRS resource with 2 ports are configured in the *SRS-ResourceSet* with *usage* set to 'codebook', and

- if *ul-FullPowerTransmission* in PUSCH-Config is set to *fullpower*, $s=1$

TP#8

if *ul-FullPowerTransmission* in *PUSCH-Config* is set to *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 a SRI field in a DCI format scheduling the PUSCH transmission if more than one SRS resource is configured in the *SRS-ResourceSet* with *usage* set to 'codebook', or indicated by Type 1 configured grant, 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',

- $s=1$, if a SRS resource with a single port is indicated by a SRI field in a DCI format scheduling the PUSCH transmission when more than one SRS resource is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', or indicated by Type 1 configured grant, or if only one SRS resource with a single port is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', and

- if *ul-FullPowerTransmission* in PUSCH-Config is set to *fullpower*, $s=1$

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| Company | Comment |
| Intel | TP #1The modification is not necessary. For Mode 1, there is no single port operation.TP #2The TP is not necessary. In Mode 2, for antenna virtualization to 2-port, the UE needs to report which 2-port TPMI could support full power transmission so that the gNB knows for which TPMI, power scaling factor of 1 should be applied.TP #8Fine with the proposal |
| Apple | TP #1: Not necessary. But we think this TP is also correct. Just different ways of specifying the same UE behaviour.TP #2: Not needed. Isn’t this TP in conflict with the first sub-bullet in which s = #NZP ports/#ports indicated by SRI TP #8: Fine with the proposal |
| QC | TP #1: This TP is not needed. Agree with Intel’s comment that mode 1 has no single port operation. TP #2: This TP is not needed. For 4 Tx UE, our understanding is that UE needs to report which TPMIs can support full power for 4 Tx precoders, as well as 2 Tx precoders. With that, when SRI point to SRS resource with 2 ports, current spec is clear on how to set power scaling factor for 2 Tx precoders. TP #8: OK with this TP.  |
| LG | TP #1: Not needed. Agree with Intel’s comment that mode 1 has no single port operation. TP #2: Not needed. Agree with QC that current spec is clear.TP #8: Fine with this TP.  |
| OPPO | TP#1: Not necessary, but we are fine with the TPTP2: Not support. Agree with other companies TP#8: Support |
| ZTE | TP#1From the perspective of specifications, we think this TP is needed. Although the single-port SRS resource may NOT be an essential case for mode 1, this case should not be precluded, which is up to gNB configuration. Under a certain circumstance, when the RRC parameter *ul-FullPowerTransmission* is configured to '*fullpowerMode1*', single-port SRS resource based also may be configured for a subsequent PUSCH transmission. Except that we have an conclusion that single port SRS transmission can not be configured for mode 1, we need to fix this hole and complete the current specification.TP#2We think this TP is not needed, because this case is covered by the wording “$s=1$ for full power TPMIs reported by the UE” in the current specification.TP#8We are fine in this TP. However, out of an abundance of caution, the case of Type 2 configured grant also should be covered/ reflected in the specification and keep alignment with the description in TS 38.214. Therefore, on the top of TP#8, we propose to adopt one of the following two TPs.

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| <-Omitted->if *ul-FullPowerTransmission* in *PUSCH-Config* is set to *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 a SRI field in a DCI format scheduling or activing the PUSCH transmission if more than one SRS resource is configured in the *SRS-ResourceSet* with *usage* set to 'codebook', or indicated by Type 1 configured grant, 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', - $s=1$, if a SRS resource with a single port is indicated by a SRI field in a DCI format scheduling or activing the PUSCH transmission when more than one SRS resource is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', or indicated by Type 1 configured grant, or if only one SRS resource with a single port is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', and - if *ul-FullPowerTransmission* in PUSCH-Config is set to *fullpower*, $s=1$<-Omitted-> |

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| <-Omitted->if *ul-FullPowerTransmission* in *PUSCH-Config* is set to *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 a SRI field in a DCI format scheduling the PUSCH transmission or activing the PUSCH transmission corresponding to Type 2 configured grant if more than one SRS resource is configured in the *SRS-ResourceSet* with *usage* set to 'codebook', or indicated by Type 1 configured grant, 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', - $s=1$, if a SRS resource with a single port is indicated by a SRI field in a DCI format scheduling the PUSCH transmission or activing the PUSCH transmission corresponding to Type 2 configured grant when more than one SRS resource is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', or indicated by Type 1 configured grant, or if only one SRS resource with a single port is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', and - if *ul-FullPowerTransmission* in PUSCH-Config is set to *fullpower*, $s=1$<-Omitted-> |

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| CATT | TP#1: We are fine with the TP. If the common understanding is that mode 1 does not support single port SRS configuration, it is suggested to capture this as a conclusion. TP#2: Not necessary. The current spec is clear. TP#3: Fine. |
| Huawei, HiSilicon | The same understanding with Majority companies that TP#1 and TP#2 are not necessary, and support TP#8.For ZTE’s comment for TP#8, in my thinking, Type-2 is with DCI, so it is already captured in SRI field. The missing one is only for Type-1 without DCI. So, it seems the TP#8 is sufficient. |
| Spreadtrum | TP#1: Fine with the TP. In Rel-15, all UEs could support single port SRS transmission to enable full power transmission without power scaling. If R16 UEs supporting mode 1 are not allowed to transmit single port SRS for full power transmission, it seems to be ‘degradation’ not ‘enhancement’.TP#2: Not needed.TP#3: Support. |
| InterDigital | TP#1: Do not support. As Intel has pointed out, single port has not relevance to Mode 1 operation.TP#2: Do not support. The TP is already covered by the first sub-bullet.TP#8: Support. Agree with Huawei comment that the proposed version by ZTE is not needed. According to the current spec, “*The configured grant Type 2 PUSCH transmission is semi-persistently scheduled by an UL grant in a valid activation DCI according to Clause 10.2 of [6, TS 38.213] after the reception of higher layer parameter configuredGrantConfig not including rrc-ConfiguredUplinkGrant.*”, hence the SRI info is still carried by DCI. |
| vivo | TP #1 and TP #2 are not needed. Generally fine with the principle of TP#8, but the wording can be revised to align with related descriptions in TS 38.213. if *ul-FullPowerTransmission* in *PUSCH-Config* is set to *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 a SRI field in a DCI format scheduling the PUSCH transmission if more than one SRS resource is configured in the *SRS-ResourceSet* with *usage* set to 'codebook', or the number of SRS ports is configured by *srs-ResourceIndicator* in *ConfiguredGrantConfig*, 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', - $s=1$, if a SRS resource with a single port is indicated by a SRI field in a DCI format scheduling the PUSCH transmission when more than one SRS resource is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', or the number of SRS ports is configured by *srs-ResourceIndicator* in *ConfiguredGrantConfig*, or if only one SRS resource with a single port is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', and  |
| Samsung | Agree that TP1 and 2 are not needed. We are fine with TP#8, and prefer vivo’s wording since it improves the readability. |
| CMCC | TP#1: We think this TP is not essential. We understand that there might be a case caused by the configuration so that fullpowerMode1 and one-port SRS resource based PUSCH transmission are together used, but we think this is a corner case and should be avoided by network configuration.TP#2: We agree with majority view that this TP is not needed since it conflicts with the current first branch under fullpowerMode2. In our understanding, for a 4Tx UE supporting fullpowerMode2, it should report both 2-port TPMIs and 4-port TPMIs that can deliver full power transmission, and whether UE reports any 2-port TPMIs or not is up to UE, the power scaling factor determination can be covered by the current specification. With the proposed TP#2, UE will use s=1 for antenna selection TPMIs even they are not reported by UE, and this may put some restrictions on the potential PA architectures. TP#3: We think this is fine, and with the modification of vivo, it is more clear. |
| Nokia, NSB | TP#1: So far there is no specification limitation to support 1Tx for Mode 1. However, it seems that we do not have UE capability to support this 1Tx Mode 1 operation. Unless there is a clear indication that UE vendors can support this operation, there is no need for this TP.TP#2: no need.TP#8: support. |

Proposal:

* For TP#1 following conclusion is captured in chairman’s notes
	+ The UE is not expected to be configured with *SRS-ResourceSe*t with *usage* set to ‘*codebook*’ with single port SRS resource when UE is configured to operate in codebook based PUSCH operation with *ul-FullPowerTransmission* in *PUSCH-Config* set to ‘*fullpowerMode1’*
* TP#2:
	+ Do not introduce the proposed TP#2 in the spec
* TP#8
	+ Agree to introduce following TP in 38.213

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if *ul-FullPowerTransmission* in *PUSCH-Config* is set to *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 a SRI field in a DCI format scheduling the PUSCH transmission if more than one SRS resource is configured in the *SRS-ResourceSet* with *usage* set to 'codebook', or the number of SRS ports is configured by *srs-ResourceIndicator* in *ConfiguredGrantConfig*, 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',

- $s=1$, if a SRS resource with a single port is indicated by a SRI field in a DCI format scheduling the PUSCH transmission when more than one SRS resource is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', or the number of SRS ports is configured by *srs-ResourceIndicator* in *ConfiguredGrantConfig*, or if only one SRS resource with a single port is provided in the *SRS-ResourceSet* with *usage* set to 'codebook', and

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# References

[1] R1-2003402, “Feature lead summary on ULFPTx”, vivo, RAN1#101-e