**3GPP TSG RAN WG1 #102-e- R1-200xxxx**

**e-Meeting, August 17th – 28th, 2020**

Source: moderator (vivo)

Title: Feature lead summary on ULFPTx

Agenda Item: 7.2.6

Document for: Discussion and Decision

1. Introduction

In this contribution, following issue is discussed according to agreement of preparatory email discussion

* [102-e-NR-eMIMO-07] TPMI grouping for mode 2 – Rakesh (vivo)
1. Remaining issues
	1. Issue 1: TPMI grouping for Mode 2

Alt1. Add new TPMI group(s)

Alt2. No change in TPMI group, and UE can report >1 TPMI groups

Alt3. Revise at least one TPMI group

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| Company  | Comments  |
| ZTE | There are two questions ahead of us:* Q1: The number of PA architectures corresponds to non-coherent and partial-coherent case is different, so how to make it in equal?
* Q2: In order to enable the diversity of UE implementation with this functionality, how to support more newly typical PA architectures?

Here, we would like to provide a solution to address this issue, which consist of the following two aspects.For Q1, compared to the existing G0-G6 for partial-coherent 4-port UEs, two PA architectures have been missed for non-coherent 4-port UEs, which are {20 17 20 17} dBm and {20 20 20 20} dBm. Correspondingly, two new groups (G4’, G5’) correspond to the two missed PA architectures should be added to Table 1 in RAN1 #99 agreement.**Table 1’**

|  |  |
| --- | --- |
| 4Tx, nonCoherent | 4Tx, partialCoherent |
| G0 | G0 |
| G1 | G1 |
| G2 | G2 |
| G3 | G3 |
| G4’ | G4 |
| G5’ | G5 |
|  | G6 |

**<Precoders of G4’ and G5’ correspond to non-coherent 4-port UEs>**

|  |
| --- |
| G4’:G5’:{, , , , , }, |

**<PA architectures of Table 1>**

|  |  |  |  |
| --- | --- | --- | --- |
| 4Tx, nonCoherent | PA architecture | 4Tx, partialCoherent | PA architecture |
| G0 | [23 17 17 17] dBm | G0 | [23 17 17 17] dBm |
| G1 | [23 17 23 17] dBm | G1 | [23 17 23 17] dBm |
| G2 | [23 23 23 17] dBm | G2 | [23 23 23 17] dBm |
| G3 | [20 20 20 17] dBm | G3 | [20 20 20 17] dBm |
| G4’ | [20 17 20 17] dBm | G4 | [20 17 20 17] dBm |
| G5’ | [20 20 20 20] dBm | G5 | [20 20 20 17] dBm |
|  |  | G6 | [20 20 20 20] dBm |

For Q2, based on the newly added G4’ and G5’ for non-coherent 4-port UEs, Alt2 can be regarded as a good way to address this issue, meanwhile it retains the flexible scalability of the PA architectures. Specifically, for the partial-coherent 4-port UE, it can report up to two TPMI groups, one from {G0~G2} and one from {G3~G6}. For the non-coherent 4-port UE, it also can report up to two TPMI groups, one from {G0~G2} and one from {G3, G4’, G5’}. We echo some examples as follow to elaborate this solution.* Report G1+G4’ can enable the non-coherent 4-port UE with PA={23 17 23 17} dBm to implement full power with this functionality.
* Report G1+G4 can enable the partial-coherent 4-port UE with PA={23 17 23 17} dBm to implement full power with this functionality.
* Report G2+G5’ can enable the non-coherent 4-port UE with PA={23 23 23 17} dBm to implement full power with this functionality.
* Report G2+G5 can enable the partial-coherent 4-port UE with PA={23 23 23 17} dBm to implement full power with this functionality.
* Report G1+G5' can enable the non-coherent 4-port UE with PA={23 20 23 20} dBm to implement full power with this functionality.
* Report G1+G6 can enable the partial-coherent 4-Tx UE with PA={23 20 23 20} dBm to implement full power with this functionality.
* etc.

Due to the joint-reporting of TPMI groups, this solution can flexibly to enable many PA architectures of non-coherent & partial-coherent 4-port UEs to implement full power UL transmission. In addition, plenty of entries also have been remained to support some other PA architectures of non/ partial-coherent 4-port UEs in the future.In conclusion, the intention of our solution is to ensure the number of supported PA architectures of non-coherent and partial-coherent 4-port UEs is equal, and enable more other PA architectures for the diversity of UE implement. |
| Samsung | Thanks ZTE for the proposal. Although a solution based on Alt1+2 is not our preference, but for progress, we can be fine with it. It does provide more flexibility to non-cerement UEs by including G4’ and G5’. |
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* Answer to RAN2 LS: TPMIs for 4-port non-coherence can be deduced from the reported set of TPMIs for 4-port partial-coherence. 4-port full coherent UE follow the same way as 4-port partial coherent UE to report full power TPMIs.

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| Company  | Comments  |
| ZTE | According to our above proposed solution of TPMIs reporting issue, we draft reply LS to RAN2 as below:For a 4 port partial-coherent or full-coherent UE, the UE shall report 2-port {2-bit bitmap}, one 4-port non-coherent TPMI group from {G0~G2} in Table 1’ in Annex and/or one 4-port partial-coherent TPMI group from {G3~G6} in Table 1’ in Annex.For a 4 port non-coherent UE, the UE shall report 2-port {2-bit bitmap}, one 4-port non-coherent TPMI group from {G0~G2} in Table 1' in Annex and/or one 4-port non-coherent TPMI group from {G3, G4', G5'} in Table 1’ in Annex.For a 2 port UE, the UE shall report 2-port {2-bit bitmap}.**Annex**Table 1’

|  |  |
| --- | --- |
| 4Tx, nonCoherent | 4Tx, partialCoherent |
| G0 | G0 |
| G1 | G1 |
| G2 | G2 |
| G3 | G3 |
| G4’ | G4 |
| G5’ | G5 |
|  | G6 |

Definition of G0~G6 and G4’, G5’ can be found in the table 2’ as below.Table 2’

|  |  |
| --- | --- |
| TPMI group | Precoders |
| G0 |  |
| G1 | , |
| G2 | ,, |
| G3 | , |
| G4 | , |
| G5 | ,, |
| G6 | ,,, |
| G4’ |  |
| G5’ | {,,,,, }, |

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| Samsung | Support with the clarification that for 4 ports, the UE reports x or y or (x, y) where x is a TPMI group from {G0-G2} and y is a TPMI group from {G3-G5} for NC or {G3-G6} for PC. |
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1. Reference

[1] R1-2006979. “Summary#2 for Rel.16 NR eMIMO maintenance”, moderator (Samsung), RAN1#102-e, 17th -28th August, 2020