**3GPP TSG-RAN WG4 Meeting #101-e R4-2119970**

**Nov 2021**

**Title: WF on PC2 TxD implementations with 26+23 and 26+26 PA’s**

**Source: Qualcomm Incorporated**

**Agenda item: 8.7.1**

**Release: Rel-17**

**Work Item: NR\_RF\_TxD**

**Responsible WG: RAN4**

**Document for: Approval**

# 1. Introduction

This paper is Way Forward on Tx Diversity implementations with 26 dBm PA, namely 26+23 and 26+26 dBm PA’s for RAN4#101e email thread [123]. It should be noted that this discussion is for single CC TxD and the mentioned PA architectures may be motivated by other features such as UL MIMO support of UL CA but for this WF, the context shall be limited to single CC and TxD.

# 2. Discussion

## 2.1 Agreements in GTW Nov 5th

### 2.1.1 Issue 2-4-1 Declaration of TxD for UE’s with at least one full power PA

Agreement:

* Leave TxD as implementation aspect and assume that UE that does not declare TxD meets 1Tx requirements and has at least one full power PA
  + Only UE supporting 23+23 for PC2 and UE supporting 26+26 for PC1.5 are allowed to report TxD
    - FFS whether 1Tx PC2 MPR requirement or 23+23 TxD MPR requirement needs be applied to 23+26 UE
  + If PC2 UE does not report TxD, then 1Tx PC2 MPR requirement will be applied at least in one Tx operation mode

### 2.1.2 Issue 2-3-1: PC2 26+23 dBm MPR

* Agreement: encourage companies to provide more evaluation and measurement data in future.

## 2.2 Way forward after GTW

### 2.2.1 Interpretation of agreements

Agreement in GTW is that in two places it is spelled that specification does not recognise 23+26 dBm PA implementation.

First

* + Only UE supporting 23+23 for PC2 and UE supporting 26+26 for PC1.5 are allowed to report TxD

Second

* + If PC2 UE does not report TxD, then 1Tx PC2 MPR requirement will be applied at least in one Tx operation mode

So depending on TxD indication, UE has to meet either MPR for TxD or then MPR for 1Tx.

Agreement also provides possibility to discuss such 23+26 dBm UE in future and in relation to other features.

### 2.2.2 Proposed Way Forward

For background, this kind of implementation exists because of other features, for example 1Tx PC2 UE needs secondary 23 dBm PA for UL MIMO.

In this WF we can check if we can recognise single CC TxD UE with 23+26 dBm PAs in requirements when that same UE supports other features such as UL MIMO or CA.

**Issue 1-1: Can 23+26 dBm UE indicate TxD for single CC if same UE also supports UL CA or UL MIMO?**

Option 1: Yes

Option 2: No

**Issue 1-2: If answer is yes to the issue 1-1, are requirements for 23+26 dBm UE with TxD indication:**

Option 1: New MPR based on future proposals

Option 2: Same as 1Tx MPR

Option 3: Same as agreed TxD MPRs (note, they are subject to change in this meeting)

Option 1 means discussion is needed under what assumptions new proposals are made.

It should also be noted that unless issued 1-1 is yes, then agreement in GTW holds i.e. new data can be provided in future.

### 2.2.3 Company comments

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| Company | Comments |
| LGE | LGE) 23+26 PA UE using TxD indication signaling shall follow the MPR of 23+23 PA. This is the same situation of PC2 intra-band UL CA with 23+26 PA UE. When the UE transmits using a single Tx without TxD indication, then can follow the MPR of 1Tx PC2 UE. The capability signaling is FFS to reuse existing TxD signaling or new capability signaling. |
| Skyworks | Skyworks: we do not see that this is the same case than ULCA which was done only for the sake of reducing the number of MPR tables for 4 different architectures. In this case the 1Tx and 2Tx requirements can be different to 23+23 for both 26+23 and 26+26 and between tham. Like for the CA and SRS antenna switching cases we think specific architecture signaling (full power PA = 0, 1, all) is needed if TxD can be signaled for all architectures. |
| Qualcomm | Can LGE give some more information? It seems you are saying that there is UE with TxD that follows TxD MPR and UE without TxD and it follows 1Tx MPR. So no new proposals are needed. Both are in specification already. |
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# References

[1] R4-2117200, 1CC 2Tx MPR for different PAs implementations and signaling for 1CC and 2CC cases Skyworks Solutions Inc.

[2] R4-2118474, MPR of Tx Diversity (TxD) PC2 for two PC3 PA architecture, LG Electronics Inc.

[3] R4-2118550, Draft CR TS 38.101-1: Move PC1.5 MPR to Clause 6.2G, Huawei, HiSilicon, Qualcomm

[3] R4-2118874, R17 FR1 UL MIMO fallback to TxD and draft LS, OPPO

[4] R4-2118875, Draft R17 CR on UL MIMO falllback to TxD, OPPO

[5] R4-2119593, On Using the Pseudo-Inverse to Define EVM for Transmit Diversity, Lenovo, Motorola Mobility

[6] R4-2119723, Email discussion summary for [101-e][123] NR\_TxD, Moderator (Qualcomm)