3GPP TSG-RAN WG4 Meeting # 111
Fukuoka City, Fukuoka, Japan, 20th - 24th May 2024

R4-2407701
Agenda Item 13

Evolution path of 3Tx UEs

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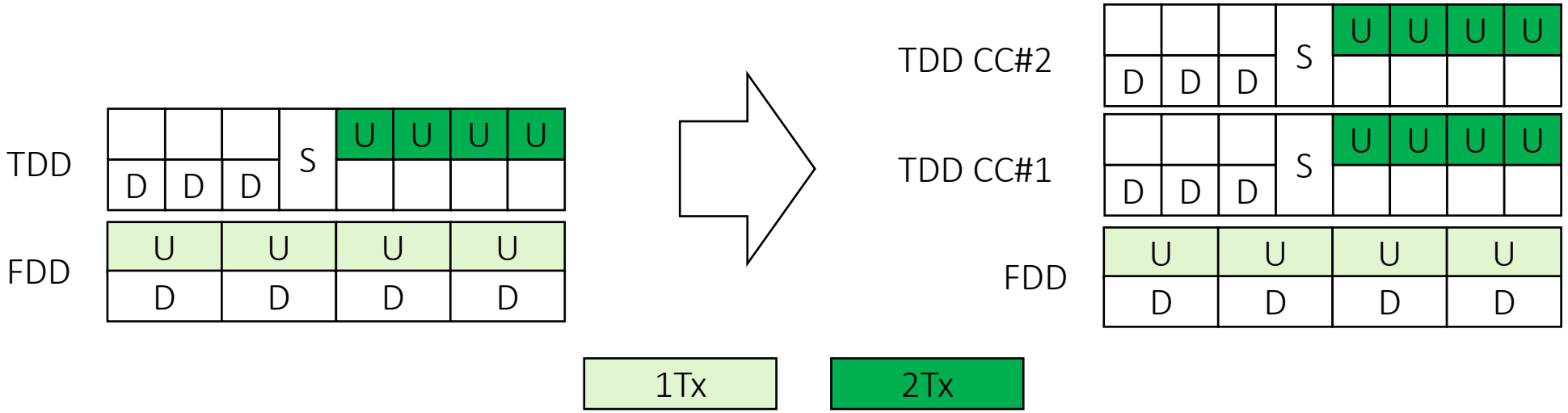
Introduction

- In Rel-18, one first step toward 3Tx was introduced via the following the non-spectrum WI *4Rx_low_NR_band_handheld_3Tx_NR_CA_ENDC* and the spectrum WI *R18_3Tx_NR_CA_ENDC*. Allowing 3Tx chains on top of PC2 and PC1.5 framework provides configuration flexibility for UL-MIMO when UE is operating with UL CA, leading to further UL throughput improvement.
  - As the first step for 3Tx requirements in 3GPP, some reasonable limitations were considered to build the solid fundation as well as control the workload, such as 1 CC per band and 1 Tx only for FDD band
- In Rel-19, it is important to consider the evolution path to further utilize the 3Tx architecture to achieve even better performance. In the newly approved Rel-19 WI *NR_ENDC_RF_Ph4*, one objective for HPUE with CA was introduced to discuss the general requirements for 3Tx UE. There is no further limitations on the detail configurations and power classes (e.g., FDD 2T or intra-band CA). In other words, the detail scenario should be reflected in the corresponding spectrum WI.
- Therefore, in this contribution, we provide our views on the next step for 3Tx evolution for the spectrum WI.

Discussions [1/2]

- One very straightforward enhancement is to consider more than 1 CC in a band. For operators with >100MHz spectrum holding in a band, it is a very beneficial to fully utilize this spectrum for UL throughput enhancement.
  - It is reasonable to focus on TDD band, since typically >100MHz BW is only in TDD
  - Contiguous intra-band CA can be considered as a starting point.

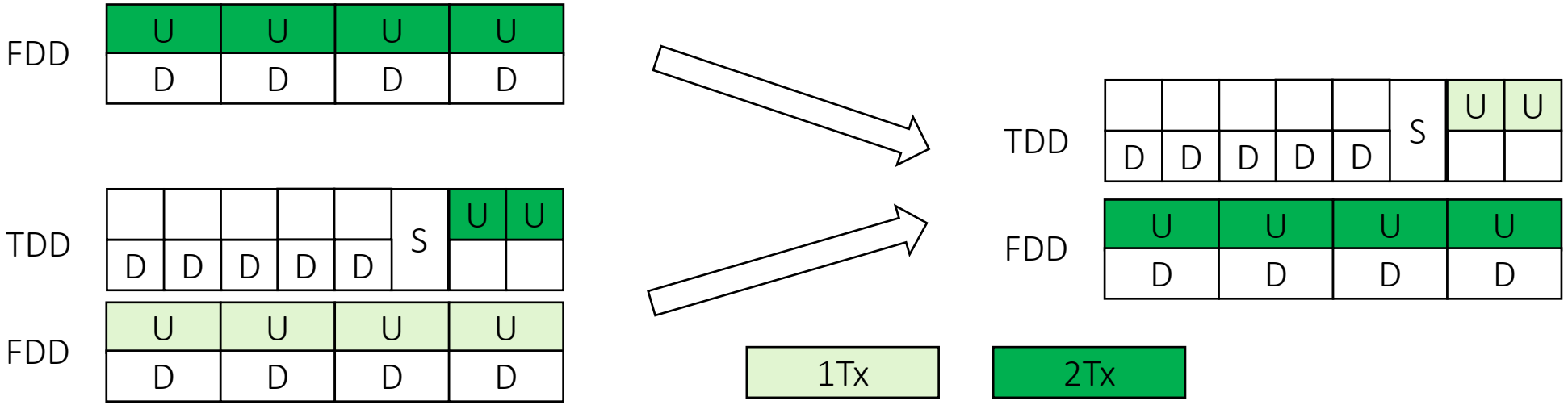
Proposal 1: Extend the 3Tx spectrum WI for intra-band contiguous UL CA in TDD band



Discussions [2/3]

- The single carrier FDD HPUE has been considered in Rel-17 non-spectrum WI NR_PC2_UE_FDD and Rel-18 spectrum WI HPUE_NR_FR1_FDD_R18 as an important technique for improve UL performance of cell edge users.
- To further enhance the user experience in UL, it is desirable to consider UL CA with 2Tx in FDD for FDD-TDD UL CA. This can further increase the UL throughput when FDD UL-MIMO is deployed.

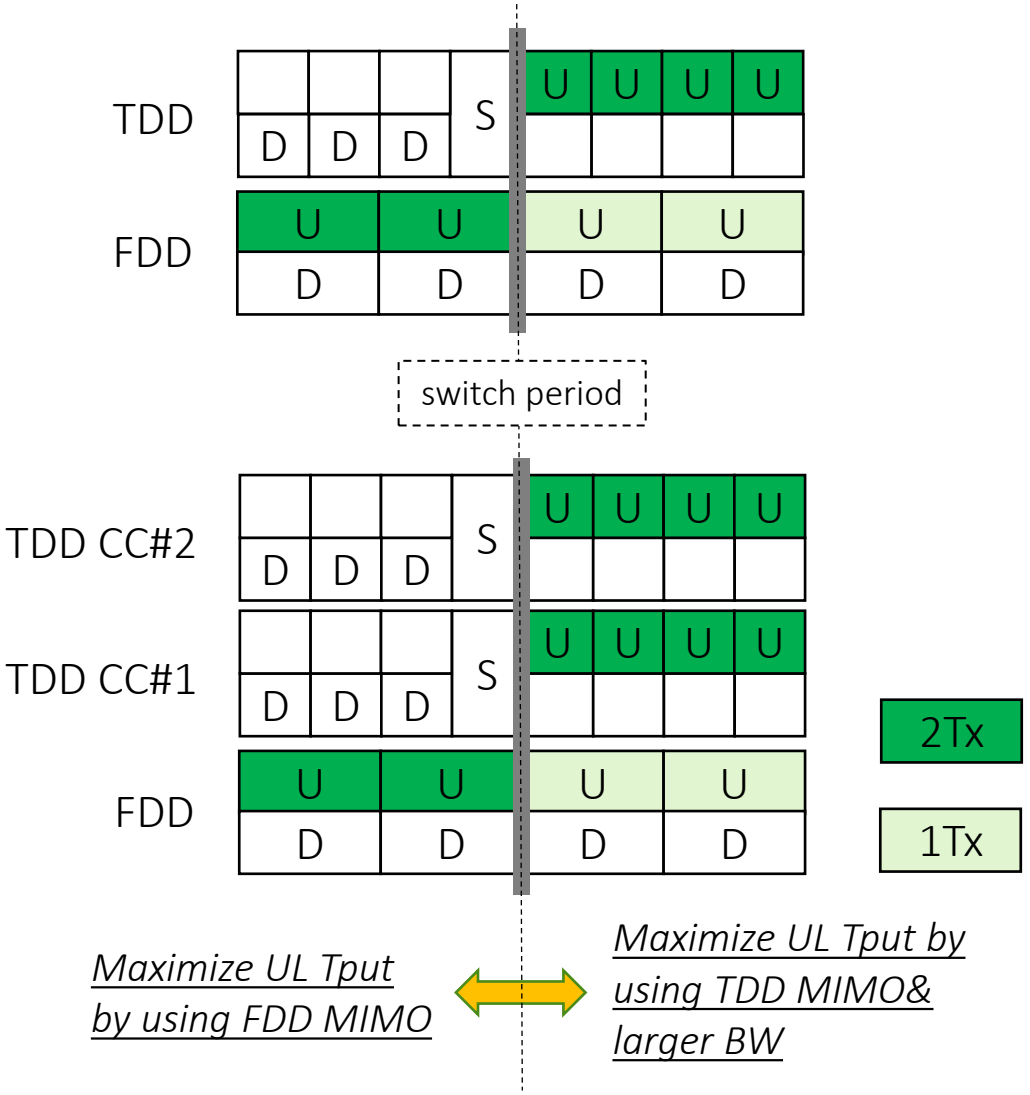
Proposal 2: Extend the 3Tx spectrum WI to include FDD 2Tx + TDD 1Tx



Discussions [3/3]

- Once both FDD 1Tx + TDD 2Tx and FDD 2Tx + TDD 1Tx are ready in the 3GPP spec, we can further consider a Tx switching between above 2 scenarios. E.g., by default, 2Tx in TDD to enjoy the larger BW, and switching to 2Tx in FDD when UE moves to cell edge or during the TDD DL slots.

Proposal 3: Consider Tx switching between FDD 1Tx + TDD 2Tx and FDD 2Tx + TDD 1Tx in Dec'24.



Summary

- ***Proposal 1: Extend the 3Tx spectrum WI for intra-band contiguous UL CA in TDD band for PC2 and PC1.5 3Tx UE***
- ***Proposal 2: Extend the 3Tx spectrum WI to include FDD 2Tx + TDD 1Tx for PC2 and PC1.5 3Tx UE***
- ***Proposal 3: Consider Tx switching between FDD 1Tx + TDD 2Tx and FDD 2Tx + TDD 1Tx in Dec'24.***

Thank you!