

# 3GPP TSG RAN Rel-18 workshop

June 28 – July 02, 2021

Agenda: 4.2 Non-eMBB-driven Functional Evolution

TDOC: RWS-210199

For: discussion

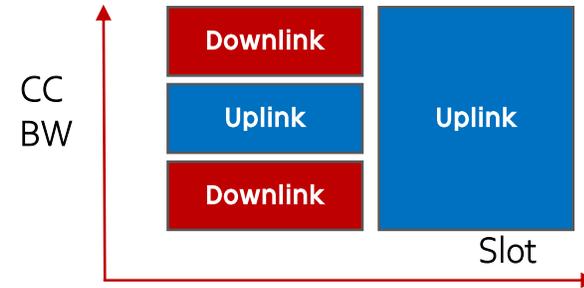
## Uplink Enhancements

Source: Rakuten Mobile



# Sub Band Full Duplex (XDD)

Sub Band Full Duplex (XDD) is a new duplexing scheme that enables simultaneous use of downlink and uplink within a TDD carrier using non-overlapping frequency resources



## Challenges:

- gNB may be required to handle self-interference to support simultaneous TX and RX

## Proposals:

### Release 18

- RAN1 should study simultaneous use of DL and UL.

### Release 19 (if study concluded as positive direction)

- Sub Band Full Duplex for gNB Only

# Multiple UE Tx Power Aggregation (through Clustering)

Proposal:

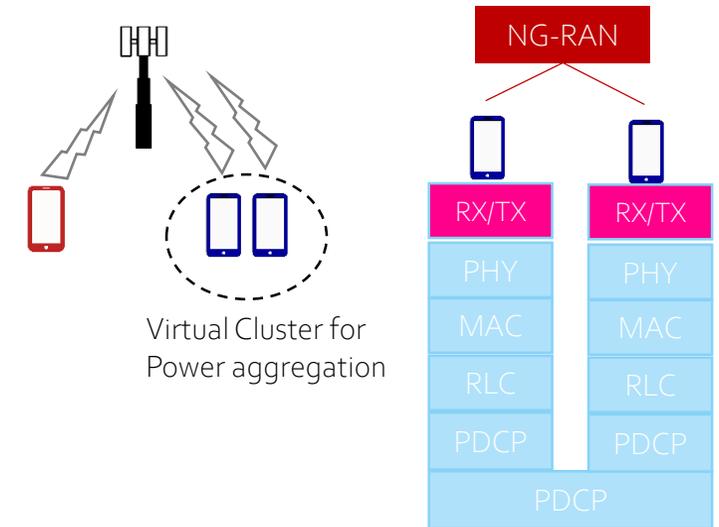
Release 18

- Study the potential UE aggregation mechanism, including the architecture that can be utilized to aggregate UE's Tx Power to improve the UL throughput.

Study Item scope:

- RAN<sub>1/2/3</sub> should study potential UE aggregation mechanisms.
  - RRC management procedures
  - Mechanisms to form UE Virtual Clusters
  - Mobility of aggregated UEs
  - Minimize data loss

## UE Clustering and Tx Aggregation



Device helps another device to transmit uplink data to effectively boost up the antenna/power capabilities i.e. increased RF Chains

# Enhanced Uplink CA and Power Aggregation Control

## Motivation

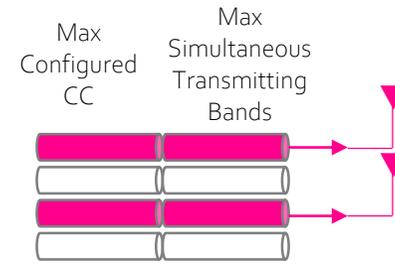
- A number of CA Improvements have been brought up in DL CA over last few 3GPP Releases.
- However, UL CA has not been picked for deployment by operators and hence, lacked the motivation for enhancements.
- With increased demands in UL data by arrival of XR/VR and high end devices, UP CA is becoming important.

## Proposals:

We recommend to have following enhancements included in Rel-18

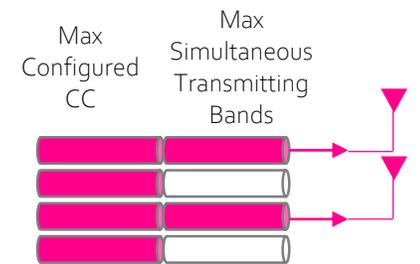
- **Multi Tx Switching:**
  - In Rel-17 Tx Switching for 2Tx UE can be configured with 2 Bands.
  - In Rel-18, it is proposed to have dynamic carrier selection and Tx Switching while UE configured with more than 2 Bands.
- **Uplink Dynamic Power Aggregation:**
  - Introduce UL dynamic power aggregation between UL CA where a Tx Chain can increase power over 26dBm for a short duty cycle.
  - UE should ensure SAR compliance.

## Current (Rel-17)

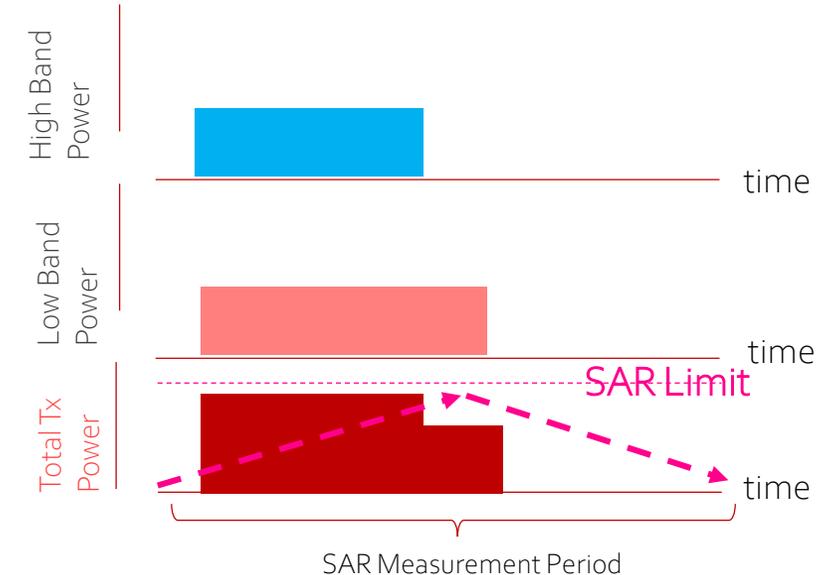


Max CC Configured /Activated = Max Transmitting

## Proposal (Rel-18)



More than 2 can be configured and Activated. UE does Tx switching dynamically. ( 1tx ...4tx)



28dBm for short burst

> Limit SAR by reducing power within SAR compliance window

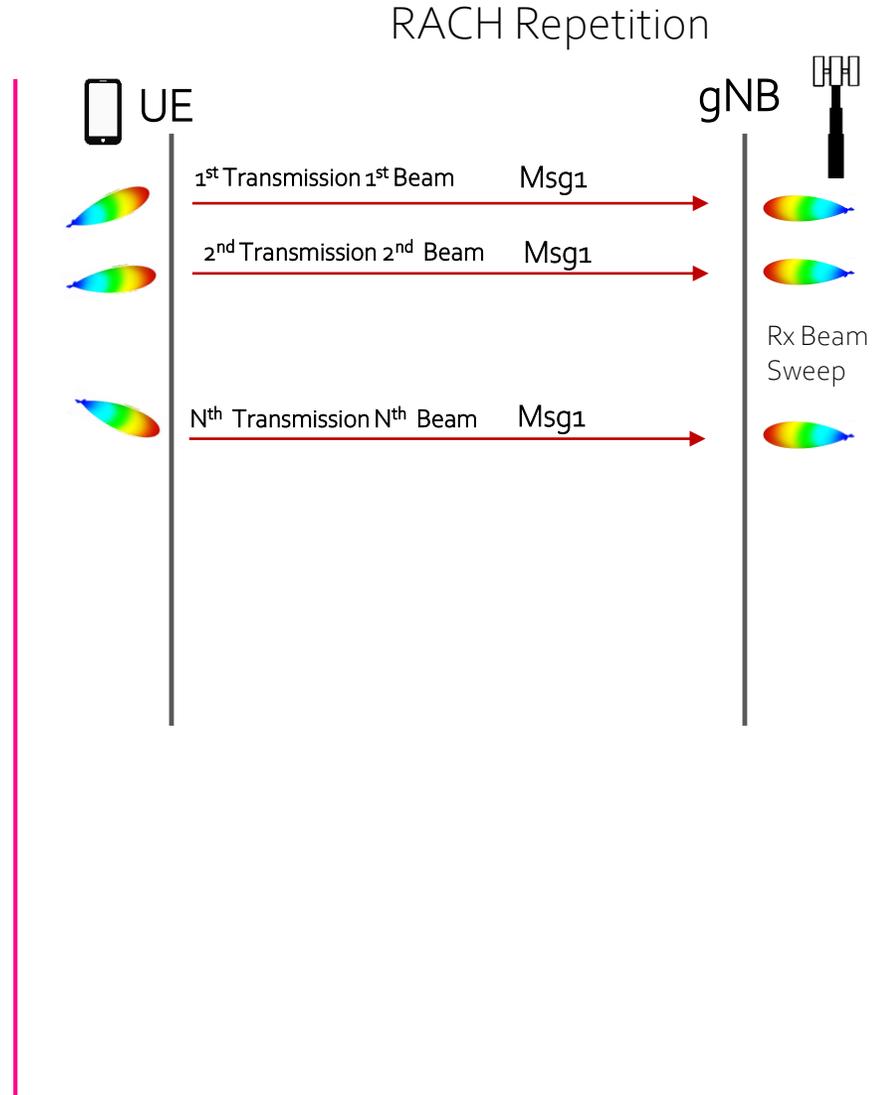
# RACH Coverage Enhancement

## Background:

RACH coverage improvement dropped from Rel-17 should be Included in Release 18.

## Proposal in Rel18:

- RACH Coverage improvement methods should be considered for both FR2 and FR1.
- Multiple PRACH transmissions for the same beam and/or Multiple Beams.



# Conclusions

We propose to work on the following topics for Uplink Enhancements in Rel18.

## 1. Full Duplex XDD

- Initiate RAN1 Study item “Full Duplex/XDD” for gNB in Rel-18. Study item can include the topics like Self interference mitigation and Receiver Saturation handling.

## 2. Multiple UEs Tx Power aggregation.

- Study the potential UE aggregation mechanism, including the architecture that can be utilized to aggregate UE’s Tx Power to improve the UL throughput.

## 3. Enhanced Uplink CA and Power Aggregation

- Study dynamic carrier selection and Tx Switching while UE configured with more than 2 Bands
- Study UL dynamic power aggregation between UL CA CC’s where a Tx Chain can increase power over 26dBm for a short duty cycle while UE ensures SAR compliance.

## 4. RACH Coverage enhancement

- Support RACH repetitions for both FR2 and FR1

## 5. Support Higher Modulation (1024QAM) and Higher number of UL layer (6/8)