

**3GPP TSG RAN Rel-19 workshop  
Taipei, June 15 - June 16, 2023**

**RWS-230077**

**Agenda Item: 5**  
**Source: Spreadtrum Communications**  
**Title: Overview on Rel-19 Multi-Carrier enhancement**  
**Document for: Discussion and decision**

# Background of CA/DC

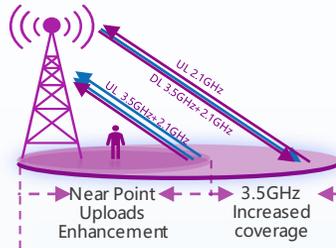
## 4G

- CA: the number of CCs is up to 32



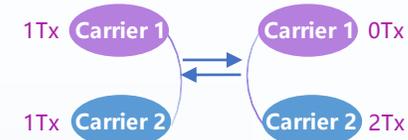
## 5G R15

- CA: the number of CCs is up to 16+16
- SUL: improve uplink coverage



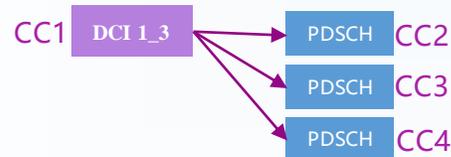
## 5G R16

- Uplink TX switching: improve uplink throughput
- Cross carrier scheduling/A-CSI-RS triggering
- Dormancy BWP, unaligned frame boundary



## 5G R18

- Multi-cell scheduling: the number of co-scheduled carrier by one DCI is up to 4
- Uplink TX switching between 4 bands



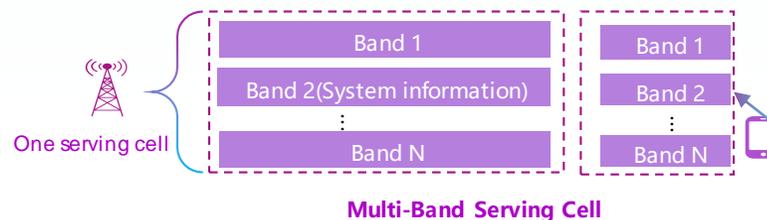
## 5G R17

- Uplink TX switching enhancement: any carrier support 2T
- Scell can cross carrier schedule Pcell: offload PCell PDCCH
- Scell fast activation

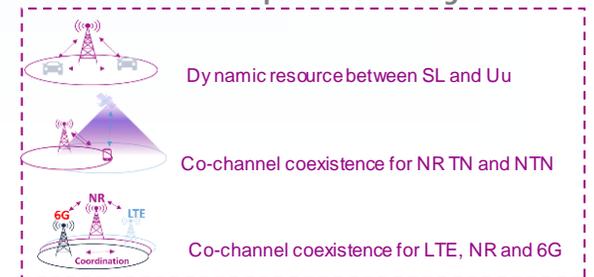


## 5G R19/6G

- R19 Multi-carrier enhancement (WI)
- R19 Multi-Band Serving Cell (SI)
- R19 Flexible Spectrum Sharing (SI)



### Flexible Spectrum Sharing



“Evergreen” Project

# Potential Objectives of R19 CA

## □ Objective 1

- Specify the leftovers for Rel-18 single DCI scheduling multiple cell PUSCH/PDSCH (RAN1, RAN2)

## □ Objective 2

- Study mechanisms for configuration a serving cell with non-contiguous carriers (RAN1, RAN2, RAN4)

## □ Objective 3

- Study mechanisms for flexible spectrum sharing (RAN1, RAN4)

# R19 Multi-carrier enhancements WI/SI

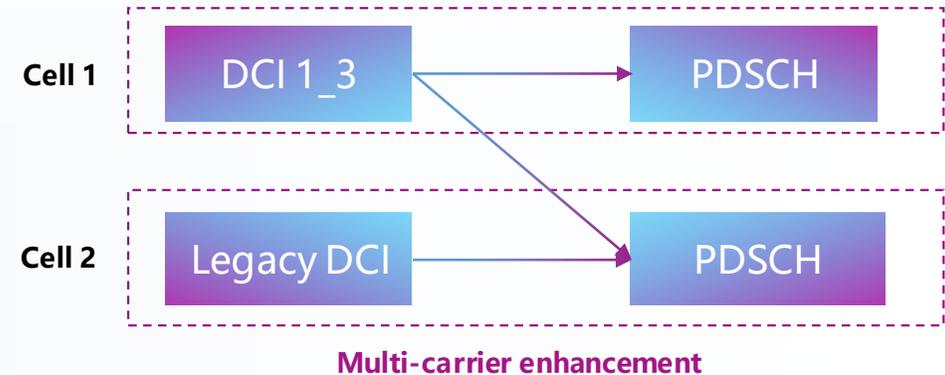
## Objective 1 : Multi-carrier enhancement

### □ Motivations

- Provide more scheduling flexibility
- Reduce the PDCCH burden on the scheduling cell for multi-cell scheduling

### □ Objectives

- Specify different SCS among co-scheduled cells
- Specify more than one scheduling cell for each scheduled cell
  - SCell schedules multiple cells including P(S)Cell
- Specify different carrier type (licensed or unlicensed, FR1 or FR2-1 or FR2-2) among co-scheduled cells



## Objective 2: Multi Band Serving Cell



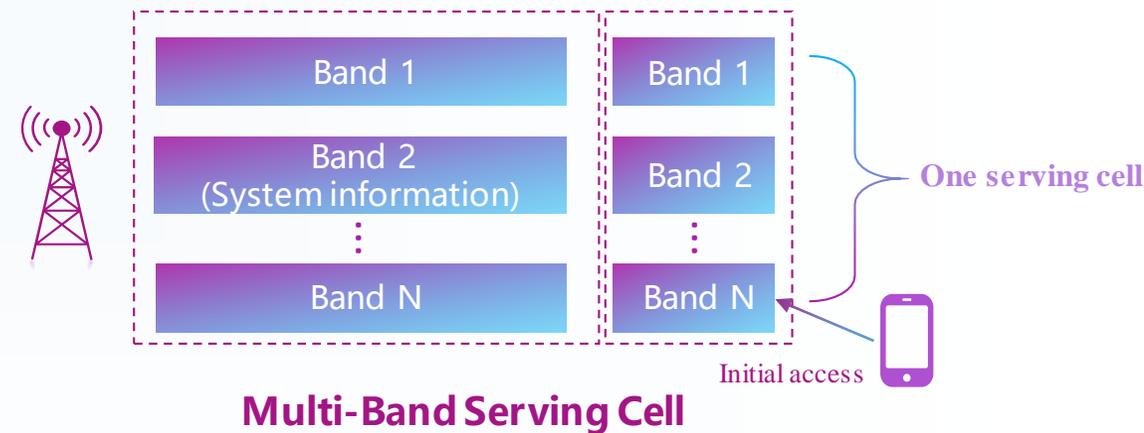
An example of discrete carriers

### □ Motivations

- Efficiently handle non-contiguous discrete carriers
- Overhead reduction of PDCCH and system information
- Prepare for 6G

### □ Objectives

- Study mechanisms for configuration a serving cell with multiple non-contiguous frequency resources
- Study enhancement of idle/inactive state and connected state for single cell with multiple carriers
- Study single PDCCH scheduling PDSCH/PUSCH across multiple carriers



## Objective 3: Flexible Spectrum Sharing

### □ Motivations

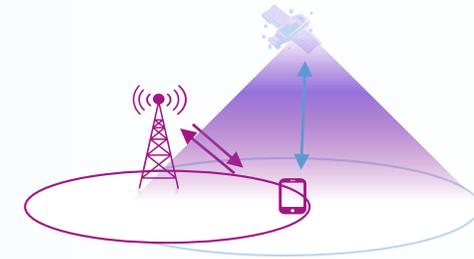
- **Static and orthogonal resources for Sidelink over Uu**
- **Dedicated NTN/TN spectrum**
  - Improve spectrum efficiency by sharing NTN spectrum between NTN and TN
  - Improve NTN data rate by sharing TN spectrum between NTN and TN
- **LTE, NR and 6G will co-existence for a long time**
  - Compatible study is essential to 6G success

### □ Objectives

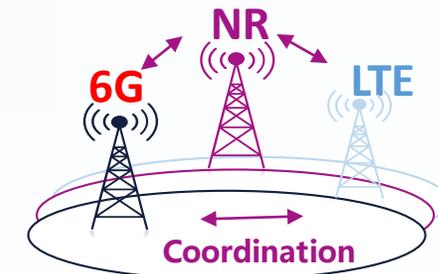
- **Study dynamic resource allocation/selection for SL and Uu**
- **Study mechanisms for co-channel coexistence between NR TN and NTN**
- **Study mechanisms for co-channel coexistence among LTE, NR and 6G**



Dynamic resource between SL and Uu



Co-channel coexistence for NR TN and NTN



Co-channel coexistence for LTE, NR and 6G

# Thanks