**3GPP TSG RAN#102**
**Edinburgh, Scotland, December 11-15, 2023**

**RP-233670**

**Agenda Item:** 9.1.4.2
**Source:** Xiaomi
**Document for:** Discussion

# Xiaomi's views on RAN4 RF/OTA topics for Rel-19

Xiaomi

# Summary of potential RF/OTA Topics

## RAN4 UE RF

- **UE RF FR1 enhancement**
  - High power UE
    - PC1.5 for intra-band CA
    - PC1.5 for inter-band CA
  - 6Rx for UE on high bands
  - Power boosting
- **UE RF FR2 enhancement**
  - Inter-band CA enhancements in FR 2-1
- **NTN high power UE**
  - PC2 (+26dBm) for handheld UE
  - PC1.5 (+29dBm) for handheld UE

## OTA TEST

- **MIMO OTA**
  - FR1
    - New bands requirements
    - Phantom based MIMO OTA test method
    - UL MIMO with new test method and new FoM

标准与新技术部
COPY RIGHT 2022，ALL RIGHTS RESERVED

# UE RF FR1 enhancement

## Justification

- From UE side, higher power and multi-Rx play an important role increasingly in improving cell coverage range or performance and improving the experience of cell edge users. For example:
  - In Rel-16, PC 1.5 is enable in NR n41 with single component carrier UL operation, at the same time, PC 1.5 is utilized for LTE-NR Dual Connectivity between band 41 and Band n41.
  - In Rel-17, PC 1.5 was introduced for band n77 and n78 to enhance both UE mobile and FWA uplink efficiency and coverage.
  - In Rel-18, 8Rx for non-handheld UE has been introduced.
- To further help network improve cell coverage or performance, in Rel-19:
  - Develop higher power class for band combination, i.e., the potential PC1.5 intra-band UL CA and inter-band UL CA in TDD bands could be considered.
  - 6Rx for UE could be studied since it had been discussed as one of candidates for Rel-18 scope.
  - Power boosting under current PA ability with relaxing RF requirements.

## Objective

- High power UE
- PC1.5 for intra-band both contiguous and non-contiguous CA with 2Tx in TDD bands
  - Example band combinations could be n77C/n78C, n77(2A)/n78(2A).
  - Develop UE RF requirements:
    - Specify MOP, Tx power tolerance, MPR, A-MPR, ACLR and the configured transmitted power, etc.
    - Research the SAR issue.


COPY RIGHT 2022, ALL RIGHTS RESERVED

# UE RF FR1 enhancement

## Objective

- PC1.5 for inter-band CA with 2Tx in TDD bands
  - Example band combination could be n41+n79
  - Develop UE RF requirements:
    - Specify the UE RF requirements for PC2+PC2, e.g. MOP, Tx power tolerance, the configured transmitted power and MSD if needed, etc.
    - Research the SAR issue.

### 6Rx UE

- Investigate the feasibility to support 6Rx with 4 layer DL MIMO for handheld UE on high bands
  - Example bands can be n41/n77/n78/n79
- Study and specify the necessary Rx requirements, e.g. $\Delta R_{IB,6R}$
- Study and specify the requirements to support SRS antenna switching
- Specify UE demodulation performance and CSI requirements

### Power boosting

- Study the feasibility of power boosting for PC2/PC3 UE by relaxing the main limit factors including ACLR or EVM requirements for different modulation orders.
- Specify the boosting power and the corresponding requirements.

标准与新技术部
COPY RIGHT 2022, ALL RIGHTS RESERVED

# UE RF FR2 enhancement

## Justification

- In Rel-17, the inter-band UL/DL CA with IBM type including PC1/2/3/5 in FR 2-1 has been introduced . However, due to limited timeline, the inter-band UL/DL CA with CBM type in FR 2-1 were removed from the WID.
- From the signaling perspective, UE can selectively support the inter-band CA with IBM type or CBM type or both from Rel-17.
- To ensure the flexibility of inter-band UL/DL CA applications, the inter-band UL/DL CA with CBM type at least within the same frequency group can be considered in Rel-19.

## Objective

- Inter-band CA enhancements in FR 2-1
  - Develop the Tx and Rx RF requirements for inter-band UL/DL CA with CBM type in FR 2-1
    - The example band combination can be limited to 28GHz + 28GHz and/or 39GHz + 39GHz.
  - Develop the Tx and Rx RF requirements for inter-band and intra-band UL/DL CA/DC enhancement with IBM type and CBM type in FR 2-1
    - The example band combination could reuse the defined band combinations for inter-band CA with IBM type and CBM type.

标准与新技术部
COPY RIGHT 2022，ALL RIGHTS RESERVED

# NTN high power UE

## Justification

- In Rel-17, Handheld NTN UE is limited to PC3 (+23dBm) operating on FDD bands.
- In Rel-17, PC2 (+26dBm) operating on FDD bands for general NR UE had already been introduced.
- In future, higher power NTN UE are quite essential to further improve UL coverage, availability and throughput performance.

## Objective

- PC2 (+26dBm) with single component carrier UL operation for handheld UE
  - Considering all the existing NTN FR1 bands.
  - Develop PC2 NTN UE RF requirements, e.g. MOP, Tx power tolerance, A-MPR, REFSENS, etc.
- PC1.5 (+29dBm) with single component carrier UL operation for handheld UE
  - Considering all the existing NTN FR1 bands.
  - Investigate the feasibility, if feasible, develop PC1.5 NTN UE RF requirements, e.g. MOP, Tx power tolerance, A-MPR, REFSENS, etc.

标准与新技术部
COPY RIGHT 2022, ALL RIGHTS RESERVED

# MIMO OTA potential enhancement

## Motivation

- The MIMO OTA WID of Rel-18 is on-going and mainly focus on the FR2 performance requirement definition with hybrid method including simulation and measurement method.
- The FR1 MIMO OTA enhancement to reflect the UE UL MIMO throughput has not been considered yet while the UL enhancement with higher throughput and better UL coverage is under discussion in Rel-18 WID.

## Objectives

- FR1 MIMO OTA enhancement
  - New bands requirements
  - Phantom based MIMO OTA test method
  - UL MIMO with new test method and new FoM can be studied
    - Study on dynamic channel model

标准与新技术部
COPY RIGHT 2022，ALL RIGHTS RESERVED

Thanks！