3GPP TSG RAN Meeting #101
Bangalore, India, September 11-15, 2023
Agenda item: 8A.2.2
RP-232204

Discussion on Rel-19 MIMO Evolution

CMCC

Multi-UE Joint Transmission and Reception

Multi-UEs

- **Motivation:**
  - Improve the throughput, reliability, and reduce delay of services as well, that is, if the channel condition of a terminal is deteriorating, another terminal can be used to make up for the traffic performance unsteadiness caused by channel condition variation.
  - Provide applications requiring high UL bitrates on 5G terminals, in cases when normal UEs are too limited by UL UE transmission power to achieve required bitrate, especially at the edge of a cell.
  - Enable up to 8 layers UL transmission to satisfy the requirement of high UL data rate.
- **Potential Objectives:**
  - Multi-UE UL transmission enhancement:
    - ① NCJT SDM scheme to improve throughput
    - ② NCJT TDM/FDM scheme to improve reliability
    - ③ SFN scheme to improve reliability
  - Multi-UE DL reception enhancement:
    - ① NCJR SDM scheme to improve throughput
    - ② NCJR TDM/FDM scheme to improve reliability
  - Both S-DCI and M-DCI based scheduling could be considered

Multi-UE Joint Transmission and Reception

Multi-UE UL PUSCH transmission enhancement

① **NCJT SDM scheme to improve throughput**

- Anchor UE and assistant UE jointly transmit one TB with different layers

(a) NCJT SDM scheme

② **NCJT TDM/FDM scheme to improve reliability**

- Anchor UE and assistant UE transmit TB with same/different RV in TDM manner
- Anchor UE and assistant UE transmit TB with same/different RV in FDM manner

(b) NCJT TDM scheme

(c) NCJT FDM scheme

③ **SFN scheme to improve reliability**

- Anchor UE and assistant UE transmit the same TB in same resources

(d) SFN scheme

Note: Both S-DCI and M-DCI based scheduling could be considered

Multi-UE Joint Transmission and Reception

Multi-UE DL PDSCH reception enhancement

① **NCJR SDM scheme to improve throughput**

- Anchor UE and assistant UE jointly receive one TB with different layers

(a) NCJR SDM scheme

② **NCJR TDM/FDM scheme to improve reliability**

- Anchor UE and assistant UE receive TB with same/different RV in TDM manner
- Anchor UE and assistant UE receive TB with same/different RV in FDM manner

(b) NCJR TDM scheme

(c) NCJR FDM scheme

Note: Both S-DCI and M-DCI based scheduling could be considered

Outdoor-Indoor HetNet Interference Management

Motivations

- 5G indoor gNBs and outdoor gNBs are deployed at same frequency (HetNet), macro site may cause severe interference towards indoor micro site. The data rate decrease of indoor UEs has been observed in current network deployment.
- Similar techniques used in LTE eICIC can be considered in NR to improve indoor UE performance, especially for UEs with similar DL RSRP from indoor and outdoor gNB, e.g., reduce the DL transmission power of macro cell in some slots.

UE DL/UL with indoor gNB
with severe interference from outdoor gNB

Power level difference observed by indoor UE(dB)

Potential objectives

- Study and specify interference mitigation schemes for outdoor-indoor HetNet scenario, e.g.,
  - Exchange of macro gNB's slot pattern (reduced-power/normal-power) between macro gNB and indoor gNB
  - CSI report enhancement for UEs under indoor gNB to report two kinds of CSI corresponding to different IMR power levels (macro gNB transmit power levels)
  - Advanced UE receiver

Enhancement on CJT transmission

Motivations

- CJT in Rel-18 considers only ideal time/frequency synchronization among TRPs, which is not realizable for deployment. It restricts that the TRPs should be under ideal backhaul and could not enable large area cooperation.
- For CJT transmission, it is difficult to implement calibration across different TRPs with non-ideal backhaul.

Potential objectives

- Enhancements on CJT transmission
  - UE assisted calibration for non-ideal time/frequency synchronization among TRPs
  - Consider air-based antenna calibration among TRPs

CSI for reciprocity-based DL SU/MU-MIMO

Motivations

- For reciprocity based massive MIMO, the noise and interference level experienced by the UE is not available to the gNB and needs to be predicted which leads to inaccurate LA and inefficient MU-MIMO. Even if the CQI can be configured for reporting, the CSI-RS used for channel measurement is usually based on SU-MIMO assumption, which is not efficient and accurate for MU-MIMO scheduling.

Potential objectives

- Inference and noise power reporting
  - Measurement based on ZP-CSI-RS
- Inference and noise covariance matrix reporting
  - Measurement based on NZP-CSI-RS

THANK YOU !