3GPP TSG RAN Meeting #89e **RP-201741**
Electronic Meeting, 14th Sep – 18th Sep, 2020
Agenda Item: 9.1.2
Document for: Discussion

Motivation paper of new WID on performance requirements for UE advanced receiver in Rel-17

Huawei, HiSilicon

Background

- For LTE, UE demodulation performance requirements are specified for following advanced receivers
  - Single-cell
    - Single-layer: MRC
    - Multi-layer: MMSE, RML, CWIC
  - Multi-cell
    - CRS-IC, CRS-IM
    - (E)-MMSE-IRC
    - NAICS (PDSCH-IC)：SLIC, RML
  - Multiuser superposition/MU-MIMO
    - MUST: RML, SLIC
- For NR, UE demodulation performance requirements are specified for the following advanced receivers
  - Single-cell
    - Single-layer: MRC
    - Multi-layer: MMSE, RML
- Compared to LTE, there is no demodulation performance requirement defined for advanced receiver with IC for single cell with multi-layer, advanced receiver with IRC in multi-cell scenarios, or advanced receiver for MU-MIMO, which would be beneficial to improve UE DL demodulation performance without impact on RAN1 specification.

Motivation

- To improve NR UE demodulation performance under the channel with medium correlation between antennae , introduce soft IC receiver to cancel the inter-stream interference
  - Initial simulation results for 4Rx with 4 layers which show the gain for soft IC receiver

Simulation Case 1: QPSK 0.58 Corr: 0.9/0.9				
SNR	30	31	70% relative throughput	Gain
RML	0.4315	0.2965	30.97	
SNR	27	28	70% relative throughput	
Soft IC	0.3935	0.2625	27.71	3.26

Simulation Case 2: 64QAM 0.65 Corr: 0.1/0.3				
SNR	36	37	70% relative throughput	Gain
RML	0.406	0.2345	36.62	
SNR	35	36	70% relative throughput	
Soft IC	0.3155	0.164	35.10	1.52

  - Summary: The performance could be improved around 1.5 to 3 dB by using soft IC receiver
  - Consider 2Rx and 4Rx cases
- To improve NR UE demodulation performance under the interference from the neighbour cell, introduce MMSE-IRC receiver to cancel the inter-cell interference
  - Consider 2Rx and 4Rx cases
- To improve NR UE demodulation performance for MU-MIMO, introduce the advanced receiver which can cancell or suppressing the interference from paired users
  - Consider 2Rx and 4Rx cases

Proposal

- Approve the new WID “New WID on UE performance for advanced receiver with soft IC for inter-stream interference and IRC for inter-cell interference” with the following objectives:
  - Specify performance requirements for the advanced receiver with soft IC to cancel the inter-stream interference for single-cell multi-layer scenario
    - Evaluate the performance gain for the advanced receiver with soft IC compared to Rel-15 NR receiver(s)
    - Specify PDSCH requirements for the advanced receiver with soft IC
    - Investigate the feasibility, and if feasible specify the CQI requirement for the advanced receiver with soft IC.
  - Specify performance requirements for MMSE-IRC receiver to suppress the interference from other cell(s) for multi-cell scenario
    - Evaluate the performance gain for MMSE-IRC compared to MMSE receiver
    - PDSCH requirements with MMSE-IRC receivers
    - Specify CQI requirement for MMSE-IRC
  - Specify performance requirements for advanced receiver to cancel or suppress the interference from the paired users for MU-MIMO scenario
    - Discuss and agree on the reference receivers
    - Evaluate the performance gain for advanced receiver to cancel or suppress the interference from paired users
    - Specify PDSCH requirements for the advanced receiver
    - Specify CQI requirements for the advanced receiver