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Joint proposal on the candidate objectives for RAN4 Rel-19 Demodulation requirement enhancement

China Telecom, Samsung, ZTE, Apple, NTT DoCoMo, Huawei, HiSilicon, OPPO, CATT, China Unicom, CAICT

General

- In the RAN Rel-19 workshop and RAN#101 meeting, companies have proposed several potential objectives for RAN4 Rel-19 demodulation requirement enhancements in [1-17].

- To verify the state-of-art UE/BS demodulation performance, also consider the interests from operators, UE and BS vendors, in this contribution, a subset of candidate objectives among the proposed objectives is proposed for further consideration/down-selection:

  UE side:

  - » UE performance requirements with inter cell and with intra-cell inter-user interference for 8Rx CPE/FWA/vehicle/industrial devices (R18 left over)
  - » CSI-RS Resource Indicator (CRI) reporting requirements with multiple CSI-RS resources configured
  - » FFS the following objective(s):
    - [Enhanced UE CSI reporting requirements with R-ML receiver for SU-MIMO]
    - ~~[UE performance requirements for PDSCH FDM'd with PDCCH]~~

  BS side:

  - » BS UL demodulation requirements with advanced receiver (MMSE-IRC)

Candidate demodulation topics (1/3)

- UE performance requirements with inter cell and with intra-cell inter-user interference for 8Rx CPE/FWA/vehicle/industrial devices
  - » Motivation:
    - Performance requirements for 8Rx UE is introduced in Rel-18 with MMSE-IRC is the assumed receiver.
    - The current 8Rx performance requirements do not cover scenarios with inter cell and with intra-cell inter-user interference, which is mandatory for 2/4Rx UEs from Rel-17.
    - Compared with 2/4Rx, larger gain of MMSE-IRC is expected for 8Rx UEs under interference scenarios, due to larger spatial domain freedom.
  - » Objectives:
    - Define the following requirements for 8Rx CPE/FWA/vehicle/industrial devices:
      - ✓ PDSCH demodulation requirements with inter cell and with intra-cell inter-user interference
      - ✓ CQI reporting requirements with inter cell interference

- UE CSI-RS Resource Indicator (CRI) reporting requirements with multiple CSI-RS resources configured
  - » Motivation:
    - Multiple NZP CSI resources are configured in deployments.
    - In Rel-15 CSI reporting requirements were introduced for NR with only 1 CSI-RS resource configured and no CRI requirements covered.
    - CRI reporting requirements were introduced in LTE FD-MIMO with the purpose to verify the reported CRI is accurate.
  - » Objectives:
    - Define UE CRI reporting requirements with multiple CSI-RS resources configured
    - The test design defined in LTE (9.10 in TS 36.101) can be considered as a starting point

Candidate demodulation topics (2/3)

- [Enhanced UE CSI reporting requirements with R-ML receiver for SU-MIMO
  - » Motivation:
    - R-ML receiver for SU-MIMO was introduced in Rel-15 and the corresponding PDSCH demodulation requirements are defined.
    - The existing UE CSI reporting requirements (introduced in Rel-15 and Rel-17) only covered the baseline MMSE-IRC receiver.
    - The mismatch between CSI and actual PDSCH scheduling will lead to lower data rate for UEs supporting R-ML.
  - » Objectives:
    - Define UE CSI reporting requirements with Rel-15 R-ML receiver for SU-MIMO]
- ~~[UE performance requirements for PDSCH FDM'd with PDCCH~~
  - ~~» Motivation:~~
    - ~~NR allows FDM between PDSCH and PDCCH in the same OFDM symbol, which is not covered in the current UE performance requirements.~~
  - ~~» Objectives:~~
    - ~~Define UE PDSCH demodulation requirements with PDSCH FDM'd with PDCCH.]~~

Candidate demodulation topics (3/3)

- BS UL demodulation requirements with advanced receiver (MMSE-IRC)
  - » Motivation:
    - The UE MMSE-IRC requirements have been defined in Rel-17. There is necessity to introduce the corresponding BS MMSE-IRC requirements for FDD and TDD.
    - HPUE makes severer UL interference in NR than that of LTE.
    - In field test with different TDD UL/DL configurations between neighboring cells, heavy gNB-to-gNB co-channel CLI is observed, which can also be mitigated by BS MMSE-IRC.
  - » Objectives:
    - Define BS PUSCH demodulation requirements with MMSE-IRC receiver

Reference

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[3] RWS-230224, Initial views on RAN4 led Rel 19 topics, 3GPP TSG RAN Rel-19 workshop, Samsung

[4] RWS-230225, RAN4 Led Items for Rel-19, 3GPP TSG RAN Rel-19 workshop, Qualcomm Incorporated

[5] RWS-230262, Initial views on Rel-19 RAN4 package, 3GPP TSG RAN Rel-19 workshop, NTT DOCOMO, INC.

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[7] RWS-230460, Overview of Rel-19 RAN4 content, 3GPP TSG RAN Rel-19 workshop, Intel Corporation.

[8] RP-231711, RAN4-led topics in Rel-19, 3GPP TSG RAN Rel-19 workshop, Nokia, Nokia Shanghai Bell

[9] RP-231732, Views on RAN4 led Rel 19 topics, 3GPP TSG RAN#101, Samsung

[10] RP-231998, T-Mobile USA’s RAN4 Priorities for Release 19, 3GPP TSG RAN#101, T-Mobile USA

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[12] RP-232087, Initial views on Rel-19 RAN4 package, 3GPP TSG RAN#101, NTT DOCOMO, INC.

[13] RP-232176, Views on Rel-19 RAN4-led topics, 3GPP TSG RAN#101, ZTE, Sanechips

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[15] RP-232441, Views on Rel-19 RAN4-led topics, 3GPP TSG RAN#101, China Telecom

[16] RP-232592, Apple’s view on RAN4-led R19 Work, 3GPP TSG RAN#101, Intel Corporation

[17] RP 232632, MediaTek Views on RAN4 Rel-19, 3GPP TSG RAN#101, MediaTek

Thanks!