

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

RP-232975

Agenda Item: 9.1.1.2
Source: Spreadtrum Communications
Title: Views on Rel-19 MIMO enhancement
Document for: Discussion and decision

Background

The list of topics and objectives for further discussion, refinement and down scoping [1]

Topics	Objectives
Topic 1: Beam management enhancements to reduce overhead/latency through UE-initiated/event-driven beam management	Objective 1. Signalling/mechanism to facilitate UE-initiated beam management procedure including UE-initiated beam reporting/switch
Topic 2: Enhancements to CSI framework to support > 32 (64/128) CSI-RS ports	Objective 1: Type I codebook enhancements to support > 32 CSI-RS ports Objective 2: Type II codebook enhancements to support > 32 CSI-RS ports Objective 3: Hybrid beamforming enhancements (CRI based reporting enhancements) Note 1: Extension of legacy codebooks and legacy CSI-RS resources Note 2: Objective 3 may require further study or clarification.
Topic 3: CJT/DL multi-TRP enhancements	Objective 1: UE-assisted calibration reporting of delay and frequency/phase offsets for CJT with non-ideal synchronization and backhaul Note: Assume legacy CSI-RS design and standalone aperiodic reporting on PUSCH.
Topic 4: UL enhancements	Objective 1: STxMP enhancements (e.g. Simultaneous TX of PUCCH and PUSCH, Asymmetric panel implementations, mDCI PUCCH + PUCCH, STxMP with up to rank 8, Coherent SFN STxMP) Objective 2: Enhancements for UL 3Tx including 3Tx for UL codebook and non-codebook based transmission
Topic 5: Enhancement for asymmetric downlink S-TRP/UL M-TRP scenario assuming intra-band intra-cell non-co-located M-TRP scenarios without changing existing cell definition or defining a new cell	Objective 1: Extension of Rel-18 2TA mDCI to sDCI assuming legacy PRACH resources Objective 2: Separate UL power control for SRS only to downlink S-TRP from SRS to UL M-TRP and introduce path loss measurement to uplink M-TRP
Topic 6: 6Rx/8Rx UE enhancements with lower complexity utilizing two segments of 3/4 Rx antenna units up to 8-layer DL Tx based on legacy codebook and legacy codeword to layer mapping	Objective 1: SRS antenna port grouping, CSI and codeword association to the segments of receive antenna.

[1] RP-232612, Moderator's summary for REL-19 RAN1 topic MIMO Evolution

Background

Based on RAN Chair's Guidance, the number of allocated TUs for R19 MIMO is only [1-2]. [2]

List of Potential RAN1-led Items for Subsequent Discussion till RAN#102

Index	Title	First-order TU Estimate (# TUs)
1	AI (Artificial Intelligence)/ML (Machine Learning) for Air interface	[4]
2	MIMO Evolution	[1-2]
3	Duplex Evolution	[2-3]
4	Ambient IoT*	[3-4]
5	Network energy savings	[2]
6	LP-WUS/WUR	[1-2]
7	ISAC & Exploring study in new spectrum (7-24 GHz) **	[2]

* Further discussion SI only or SI → WI

** May start as a RAN-level study item first. For the new spectrum, focusing on channel modeling only. For ISAC, further discuss channel modeling only or additionally techniques

- ~10% RAN1 capacity (~27TUs) is planned to be reserved
- ~1TU (in the 2nd half Rel-19) is planned to be reserved for TEI purpose
- With [2-3] TUs left, RAN1 may have room up to 2 RAN1-led **small** projects

Total: [17]

Cross-WG/TSG impact: 3-4 TUs

~4 TUs reserved

[2-3] TUs left

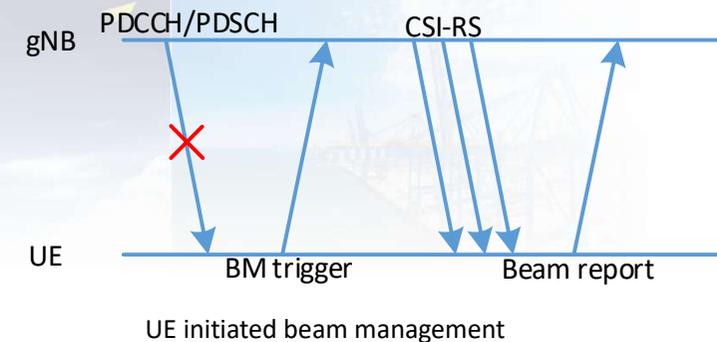
Slide 9

Preferred topics

Topic 1: Beam management enhancements to reduce overhead/latency through UE-initiated/event-driven beam management

Objective 1. Signalling/mechanism to facilitate UE-initiated beam management procedure including UE-initiated beam reporting/switch

- **Motivation:**
 - Overhead and latency of beam measurement/reporting procedure will become a critical issue when the number of beams is large or the UE moves with high speed.
- **Views and comments:**
 - At least UE-initiated beam reporting can be included.
 - UE-initiated beam switch can also be include if there's enough TU.



Preferred topics

Topic 2: Enhancements to CSI framework to support > 32 (64/128) CSI-RS ports

Objective 1: Type I codebook enhancements to support > 32 CSI-RS ports
 Objective 2: Type II codebook enhancements to support > 32 CSI-RS ports
 Objective 3: Hybrid beamforming enhancements (CRI based reporting enhancements)
 Note 1: Extension of legacy codebooks and legacy CSI-RS resources
 Note 2: Objective 3 may require further study or clarification.

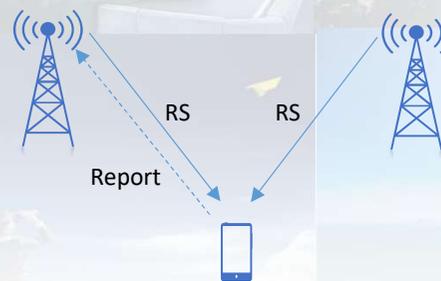
- **Motivation:**
 - Massive MIMO antenna arrays provides additional gain for coverage and throughput.
 - Increasing the number of CSI-RS ports together with codebook enhancement is a straightforward solution.
- **Views and comments:**
 - At least objective 1 should be included.
 - Objective 2 and 3 can be considered as long as the workload is well controlled.

Preferred topics

Topic 3: CJT/DL multi-TRP enhancements

Objective 1: UE-assisted calibration reporting of delay and frequency/phase offsets for CJT with non-ideal synchronization and backhaul
 Note: Assume legacy CSI-RS design and standalone aperiodic reporting on PUSCH.

- **Motivation:**
 - Ideal backhaul and synchronization can be relaxed for CJT to support more realistic assumptions and more divergent deployments.
- **Views and comments:**
 - Objective 1 is clear and can be included in WID.



UE assisted antenna calibration across TRPs

Other topics

Topic 4: UL enhancements	Objective 1: STxMP enhancements (e.g. Simultaneous TX of PUCCH and PUSCH, Asymmetric panel implementations, mDCI PUCCH + PUCCH, STxMP with up to rank 8, Coherent SFN STxMP) Objective 2: Enhancements for UL 3Tx including 3Tx for UL codebook and non-codebook based transmission
Topic 5: Enhancement for asymmetric downlink S-TRP/UL M-TRP scenario assuming intra-band intra-cell non-co-located M-TRP scenarios without changing existing cell definition or defining a new cell	Objective 1: Extension of Rel-18 2TA mDCI to sDCI assuming legacy PRACH resources Objective 2: Separate UL power control for SRS only to downlink S-TRP from SRS to UL M-TRP and introduce path loss measurement to uplink M-TRP
Topic 6: 6Rx/8Rx UE enhancements with lower complexity utilizing two segments of 3/4 Rx antenna units up to 8-layer DL Tx based on legacy codebook and legacy codeword to layer mapping	Objective 1: SRS antenna port grouping, CSI and codeword association to the segments of receive antenna.

- **Views and comments:**

- For topic 4 and 5, open to include this topic if majority operators/network vendors think it's beneficial.
- For topic 6, we fail to find this feature beneficial in terms of reducing UE receiver complexity.

Conclusion

Summary of our views

Topics	Objectives
Topic 1: Beam management enhancements to reduce overhead/latency through UE-initiated/event-driven beam management	Support
Topic 2: Enhancements to CSI framework to support > 32 (64/128) CSI-RS ports Objective 1: Type I codebook enhancements to support > 32 CSI-RS ports Objective 2: Type II codebook enhancements to support > 32 CSI-RS ports Objective 3: Hybrid beamforming enhancements (CRI based reporting enhancements)	Support objective 1 Open to objective 2 and 3
Topic 3: CJT/DL multi-TRP enhancements	Support
Topic 4: UL enhancements	Open
Topic 5: Enhancement for asymmetric downlink S-TRP/UL M-TRP scenario assuming intra-band intra-cell non-co-located M-TRP scenarios without changing existing cell definition or defining a new cell	Open
Topic 6: 6Rx/8Rx UE enhancements with lower complexity utilizing two segments of 3/4 Rx antenna units up to 8-layer DL Tx based on legacy codebook and legacy codeword to layer mapping	Not preferred

Thanks

