3GPP TSG RAN Release 18 Workshop

28th June – 2nd July 2021

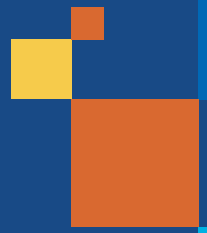
RWS-210370

Rel-18 NR MIMO

Agenda Item: 4.1

Source: Intel Corporation

Document for: Discussion



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Multi-TRP enhancements

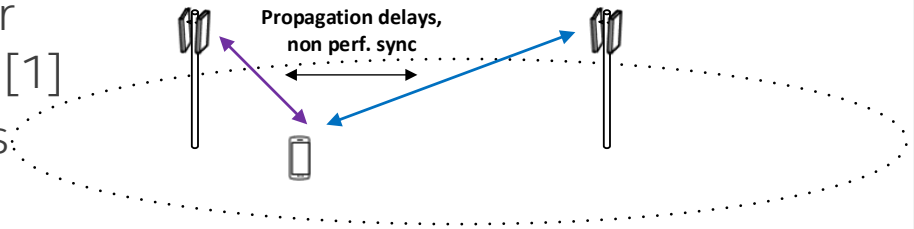
Motivation:

- Rel-15/16/17 Rx timing assumption (within a CP) is not realistic for practical multi-TRP deployment scenario, esp., for inter-cell cases [1]
- Repetitions across CCs is not yet enabled for URLLC transmissions

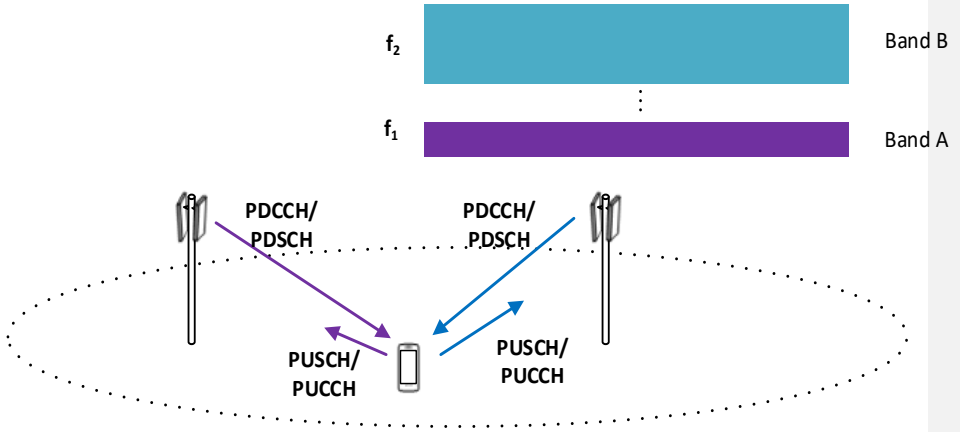
Objectives:

- Study measurements and reporting to assist inter-cell multi-TRP operation with “noticeable” (>CP) propagation delay difference and non-perfect sync TRPs
  - Single FFT with isolation for FR2, multiple FFT for FR1, etc.
  - Single DCI and multiple DCIs
  - Multiple TAs for uplink transmission
- Study multi-CC repetition schemes for URLLC (can be part of URLLC/IIOT)
  - DL and UL (including carrier switching)
  - Including mTRP aspects

Inter-cell multi-TRP



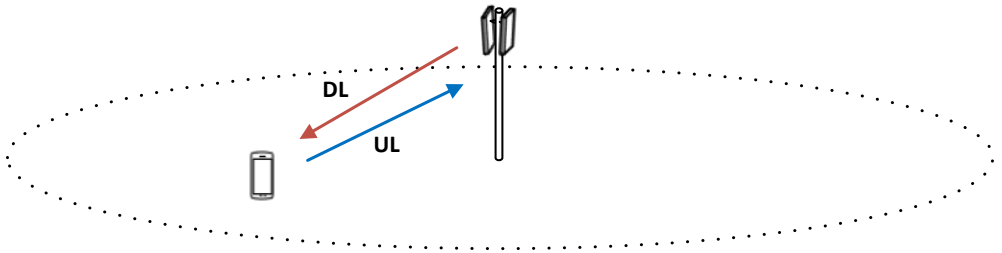
Multi-CC repetition for URLLC



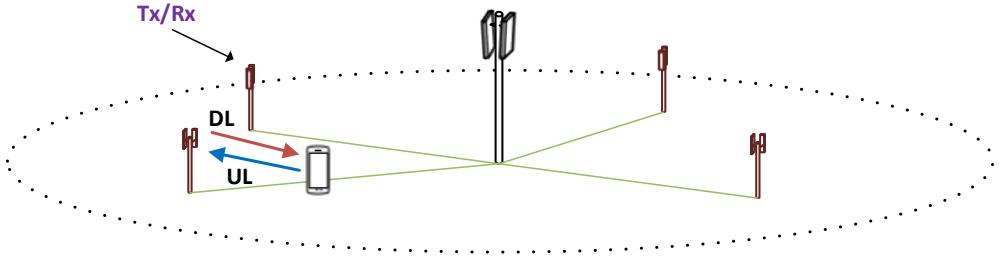
[1] R1-1908653, On multi-TRP/multi-panel transmission, Intel Corporation, Prague, CZ, RAN1#97, August 26th – 30th, 2019

Enhancement to FR2 deployment scenarios

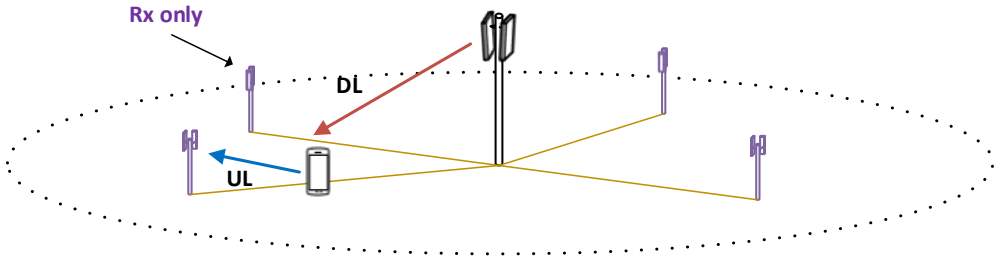
Conventional deployment



High density deployment with lower power TRP



High density deployment with Rx only capable TRPs



Motivation:

- NR coverage in FR2 (esp UL) is limited due to higher propagation losses
- Conventional way to address the coverage issue is to increase the density of the deployment
  - More cost-efficient approach to improve coverage is to deploy low-power TRPs with smaller number of the antenna elements
  - Further cost reduction can be achieved by reducing TRP functionality to Rx only, i.e., DL and UL transmission links could be different

Objectives:

- Study support of a new FR2 deployment scenarios (e.g., HetNets including TRPs with Rx capability only) in Rel-18 and specify enhancements, if needed
  - E.g., separate beam reporting for DL/UL, beam management for UL, power control, etc.

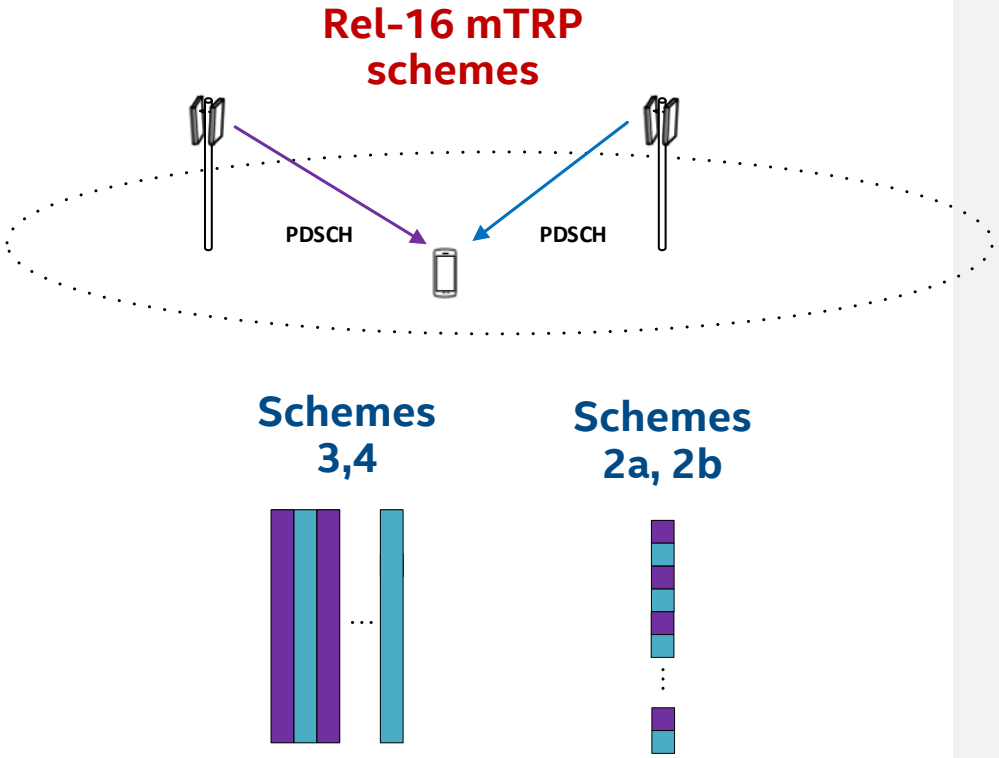
Multi-TRP CSI enhancements for URLLC

Motivation:

- Rel-16 NR supports multi-TRP repetition schemes for URLLC:
  - Scheme 2a, 2b (FDM)
  - Scheme 3, 4 (TDM)
- Accurate link adaptation is critical for URLLC to operate at target BLER = 0.00001 without relying on slow outer-loop link adaptation.
- Although CSI for URLLC in single-TRP scenario is specified in Rel-15, even basic CSI support for URLLC in multi-TRP scenarios is still missing for 5G NR.

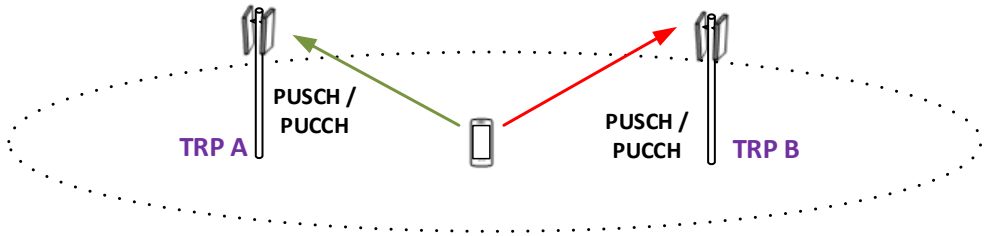
Objectives:

- Enhance CSI reporting in Rel-18 by matching CSI with the actual multi-TRP transmission schemes for URLLC
  - e.g., alignment of RI reports across TRPs to facilitate more accurate MCS selection for mTRP repetition schemes

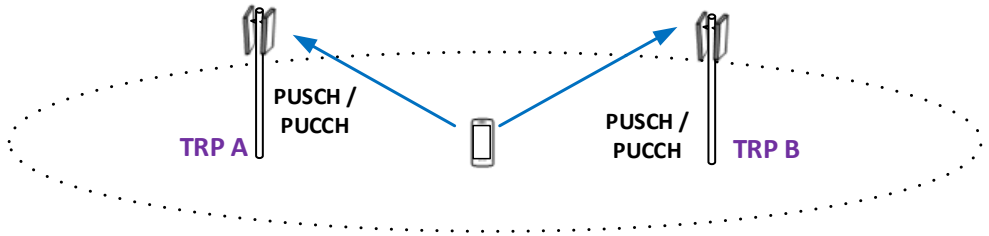


Uplink enhancements in FR2

Multi-panel spatial multiplexing (eMBB)



Multi-panel repetition (URLLC)



Motivation:

- Rel-16 NR supports simultaneous DL multi-panel reception in FR2.
- Rel-17 NR further enhances multi-panel operation for URLLC applications to support TDM-based UL transmission with repetition across multiple panels of the UE.
- Support of simultaneous uplink transmission from multiple panels of the UE is not yet supported, while feasible for certain types of UE (e.g., CPE).

Objectives:

- Introduce support of simultaneous multi-panel UL transmission:
  - Consider both eMBB (peak throughput enhancements) and URLLC (reliability enhancements) scenarios
  - Target uplink physical channels for enhancements are PUSCH and PUCCH.

Further multi-beam enhancements

Motivation:

- Several beam management enhancements were introduced in Rel-16/Rel-17 NR primarily focusing on latency and overhead reduction for *beam indication* procedures (e.g., DCI-based beam indication using unified TCI framework)
- The performance bottleneck due to *beam acquisition* latency is still not addressed resulting in highly sub-optimal beam management performance in mobility scenarios

Objectives:

- Study beam acquisition latency reduction solutions, e.g., for scenarios with large number of beams
  - e.g., additional QCL assistance to reduce beam acquisition latency, enhancement to hierarchical beam management, etc.

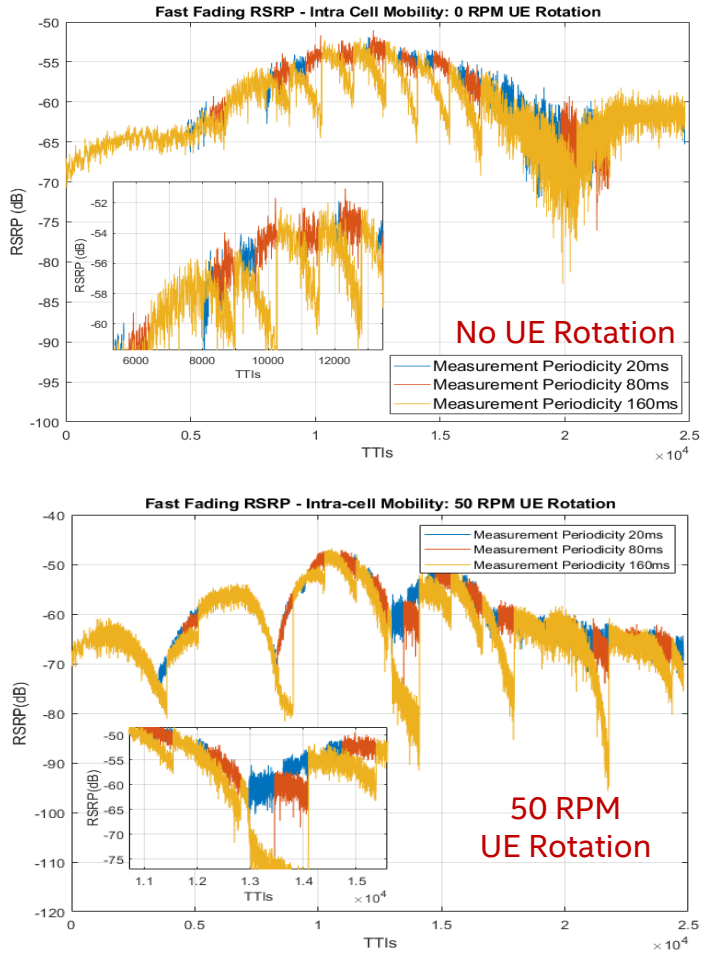


Illustration of the RSRP degradation due to beam acquisition latency

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