

# Overview of RAN4-led topics for Rel-19

Taipei, 15<sup>th</sup> – 16<sup>th</sup> June, 2023

Agenda Item 6

Source: Nokia, Nokia Shanghai Bell

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# RAN4-led topics for Rel-19: Overview

1. Robustness Enhancements for Multi-Rx UEs
2. Enhancements for NR in spectrum <5 MHz
3. Uplink coverage enhancements
4. Other RF enhancements
5. Other RRM enhancements
6. Other Demod enhancements

# Robustness Enhancements for Multi-Rx UEs

## Background

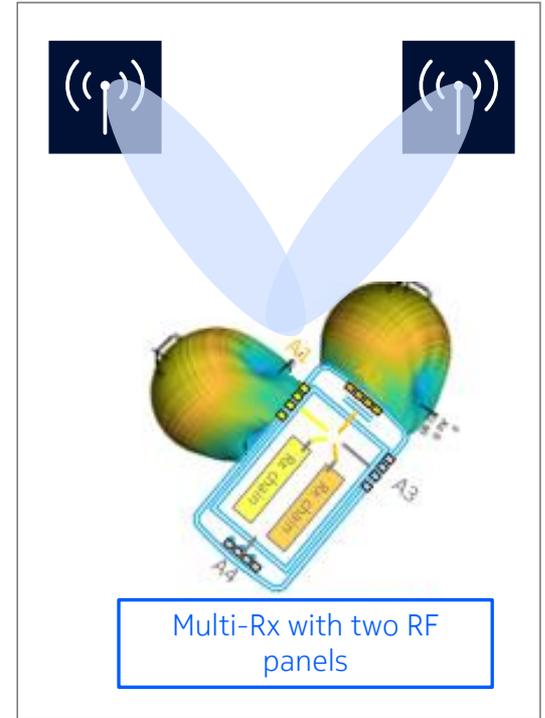
- Performance of multi-panel operation will be key to the future success of FR2, especially for TRP selection, inter-cell beam management (ICBM) and L1/L2 triggered mobility (LTM).

## Motivation

- UEs that support multi-panel Rx can perform simultaneous measurements which can be used for enhanced TRP selection, ICBM and LTM.

## Proposals

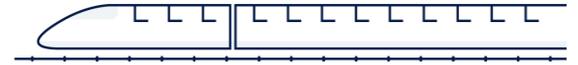
- **Introduce enhanced requirements for L1/L2 triggered mobility (LTM) and beam management for multi-panel UEs, assuming that simultaneous measurements can be made using multiple Rx chains:**
  - Study and specify reporting schemes for increased robustness against UE movement (e.g. taking the number of Rx chains on which a TRP can be received into account in the criteria for TRP measurement reporting)
  - Reduced latency of beam management, by enhancing requirements for beam alignment/refinement for multi-panel UEs to take into account the ability to make measurements with different Rx chains simultaneously.
- **Further enhancements to HST for FR2**
  - Support of enhanced Multi-Rx UE in HST FR2 scenario, including CA.



# Enhancements for NR in spectrum <5 MHz

Rel-18 introduces only basic support for 3 MHz channel bandwidth, with flexibility on actual transmission bandwidth.

CA/DC and some post-Rel-15 features will not be included.



Rel-19 should expand the use cases for NR in narrow spectrum allocations:

- Top priority is support of RRM requirements for CA and DC, e.g. for n100 + n101 (rail industry use case for 900 + 1900 MHz bands)
  - Other band combinations might be considered if need is identified.
- Handover reliability, including checking Conditional Handover (CHO) requirements for <5MHz operation and 500km/h speeds. (A target use case could be entry to and exit from tunnels.)
- Higher UE power class should be considered.
- Other post-Rel-15 features might also be considered if needs are identified.

**Continue feature specification for NR <5MHz according to identified needs**

# Uplink Coverage Enhancements

Power domain enhancements to improve uplink coverage are being undertaken in Rel-18.

Further power-domain enhancements should be considered in Rel-19, in particular:

- A-MPR values may currently be greater than 10dB, severely restricting the coverage of high-data rate services in the cell. Rel-19 should enable the gNB to know when a UE can use smaller A-MPR values, so that the scheduler can take advantage of the available extra power headroom to scheduler higher data rates.
- MPR limits the range of the cell over which CA may be configured for higher data rates. Rel-19 should also support reduced MPR.

These enhancements may be part of a wider RAN1-led Coverage Enhancement Work Item, or led by RAN4. Further details can be found in RWS-230016.

# Other RF Enhancements

We expect further RF work for new bands to continue in the Rel-19 timeframe, including, for example:

- New band for [3.1-3.45 GHz] for US, with necessary protection for incumbent radiolocation services.

# Other RRM Enhancements

As with previous releases, RRM requirements may be further enhanced in Rel-19.

Some examples include:

- **Further enhanced Early Measurement Reporting (FeEMR).**

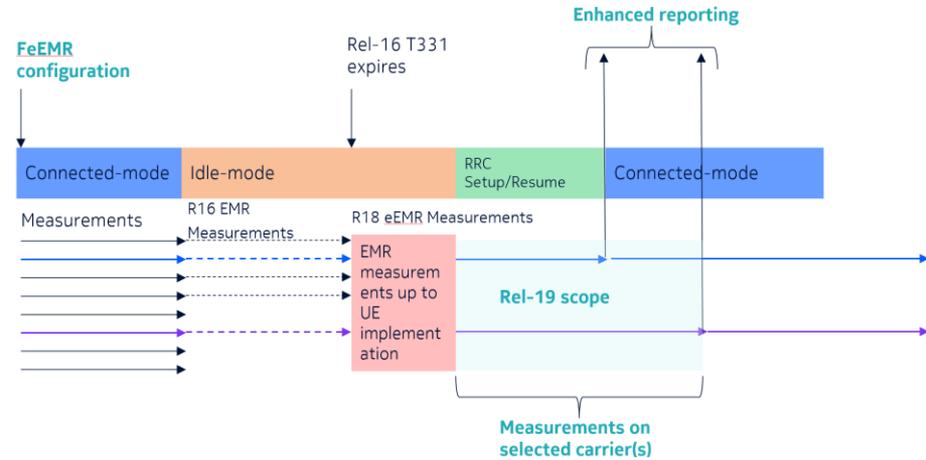
- We see benefits from further enhancements to UE reporting of measurement results for early CA/DC setup when returning to connected mode: appropriate to be led by RAN4.
- As in Rel-18, focus would be on FR2, but same solutions could be considered also for FR1 (with minor modifications if needed)
- Enhancements could include:
  - selection of a reduced set of carrier(s) to measure and report, in order to reduce measurement delay and UE power consumption;
  - improved reporting of measurement results during RRC\_CONNECTED: enable measurement reporting of the EMR results during connected mode once ready.

- **Beam Failure Detection (BFD) reconfiguration requirements**

- PSCell activation delay and recovery (FR2): introduce missing Beam Failure Detection (BFD) reconfiguration requirements for BFD on deactivated PSCell.

- **Throughput enhancement by reduction of scheduling restrictions for Multi-Rx capable UEs**

- Exploit multi-rx capability of UEs to enable scheduling restrictions to be reduced, leading to more opportunities for scheduling of data.



# Other Demod Enhancements

As with previous releases, Demod requirements may be further enhanced in Rel-19.

Some examples include:

## 1. Performance requirements with observable MIMO impact

### i. Introduce a spatial component to the MIMO fading channel model

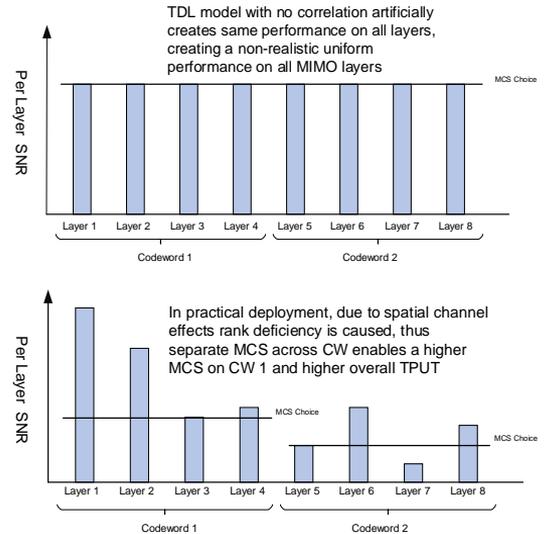
- The commonly used TDL-low MIMO fading channel model does not have a spatial component. Hence, MIMO SDMA/precoding gains are not observable in performance requirements, due to lack of rank deficiency in the channel. All layers in SU-MIMO appear to have the same performance under these artificial conditions.
- Propose to add a channel spatial component to the channel model for MIMO requirements.
- This would be important at least for 8Rx and 8Tx 2-codeword transmission.

### ii. Introduce CSI requirements for precoded MU-MIMO

- No CSI requirements exist currently for precoded MU-MIMO with co-scheduled other users.
- Requirements would create visibility for good UE PMI selection performance for MU-MIMO.

## 2. Application layer throughput (ATP) requirements with outer loop link adaptation (OLLA).

- In current ATP requirements the DUTs are seen to not adhere to the 10% BLER target in the CQI reporting. Hence the throughput shown in ATP is not representative of real deployments, where OLLA forces the BLER to 10%.
- Rel-19 should introduce requirements including OLLA in order to better reflect performance in real deployments.



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