

# Rel.18 RAN4 Projects Proposals

Qualcomm Incorporated

# Requirements for 8Rx in FR1

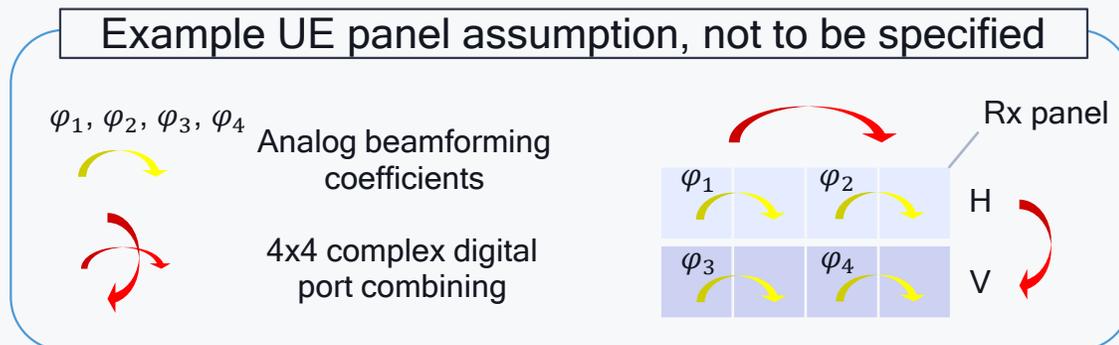
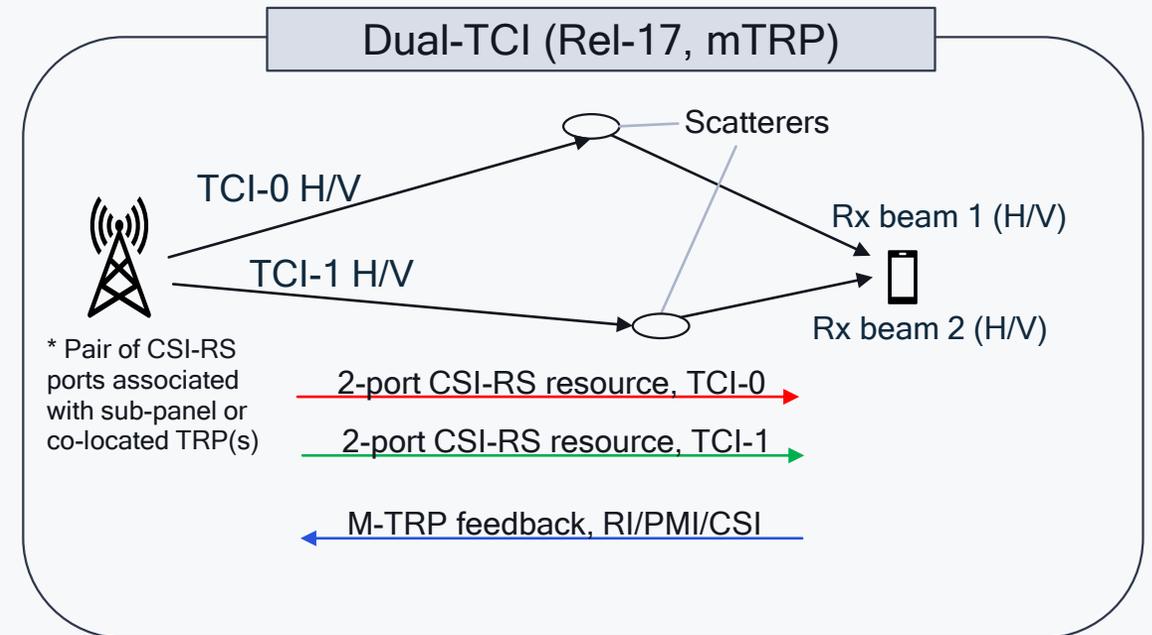
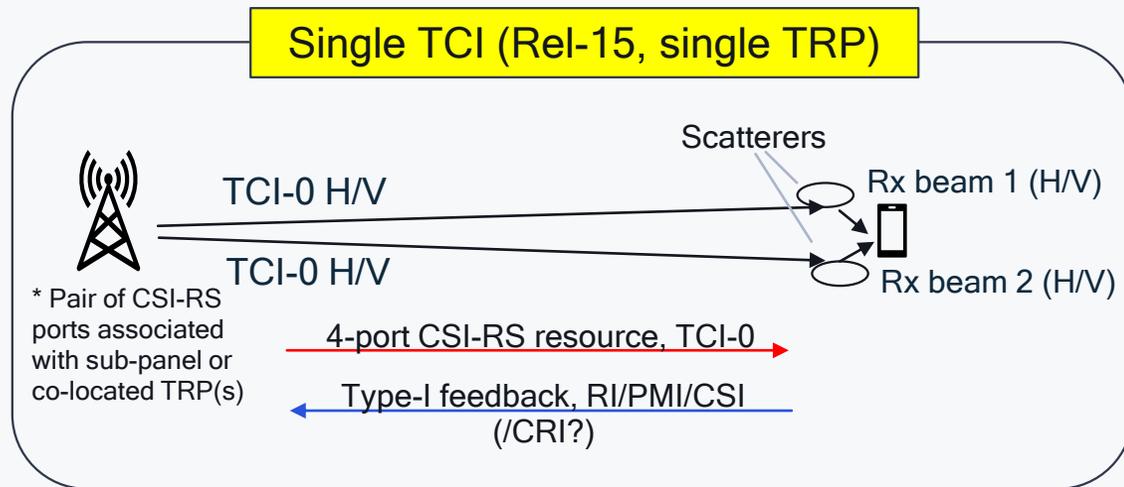
## Expanding high-end device capabilities in FR1

- We see **market demand for 8Rx** performance requirements for different form factors (including FWA)
- Proposal to introduce requirements for 8Rx
  - define support for bands **n41, n77, n78 and n79**
    - Other bands can be added any time based on proposals from operators
- Proposed objectives are in-line with the 8Rx work for LTE (see RP-202630)
  - UE RF requirements – Definition of REFSENS (based on LTE methodology)
  - Demod and CSI requirements
    - Maximum rank, from the set {4, 6, 8}, to be determined in the WID definition phase
  - No impact to RRM requirements
    - If needed, changes to RLM testing methodology to allow RLM based on 8Rx can be introduced

# Requirements for 4-Layer DL in FR2

## Expanding high-end device capabilities in FR2

- Define requirements at least for the single-TCI option shown below



Identify minimum m-TRP feature subset to enable 4L MIMO

# Requirements for 4-Layer DL in FR2

- **Introduce RAN4 requirements for multi TRP Dual TCI**
  - Feature was introduced in Rel.17 FeMIMO
  - Currently under discussion in RAN4, however, it is unlikely that RAN4 will finalize the requirements in Rel.17 timeframe due to lack of time
- **Work will span RF, RRM and demod**
  - RF requirements for 2AoAs and 4 layers
  - RRM requirements/tests for beam management with dual TCI
  - Demod tests with 2AoAs and 4 layers
- **Besides new requirements, a new test setup with 2AoAs will be needed**
  - We are proposing to start studying OTA testing for multi panel UEs in the dynamic OTA testing study

# Application Layer Throughput Requirements

Continuation of the RAN5 led SI

- RAN5 led SI on Application Layer Throughput Requirements was just concluded
  - RAN4 part also finished and it was found feasible to introduce tests with “link adaptation”(variable rate channel)
- We are proposing to introduce performance tests inline with the conclusions of the SI
  - Simulation results in RAN4 were relatively well aligned between companies, straightforward to define requirements
- RAN4 led WI with a RAN5 component
  - RAN4 to define the physical layer test (parameters and throughput requirement)
  - RAN5 to define the full test by adding the higher layer aspects to the tests

# MSD Improvements for CA/EN-DC

WI to handle the current RAN4 task

- RAN4 was tasked to check the feasibility of introducing an improved MSD capability for some band combinations
- Depending on the outcome, this should be handled in Rel.18 if not finalized in Rel.17
- A WI to introduce the improved MSD for some band combinations might be needed

# Dynamic OTA and 4L OTA testing for FR2/FR2x

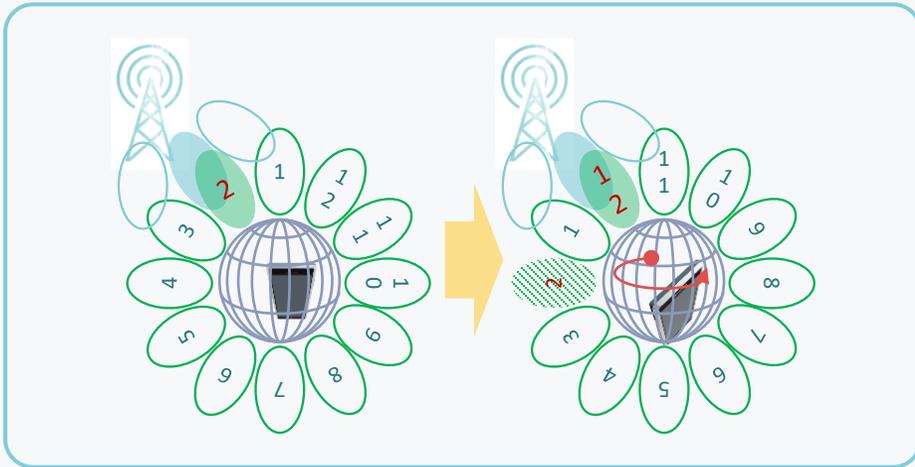
## Advanced testing for beam management

- This item is very important to address the industry need for more advanced UE testing in environments that are closer to field operation
  - Fast changes in signal directions and/or fast channel variation
  - Current tests for RRM/beam management are very simplistic, with most 2 signals coming from different directions and long dwell time(time for UE to acquire signals)
  - We believe such tests are needed during device development even if there are no 3GPP conformance tests
- The most important part of this item is to develop a standardized test environment and test methodology that benefits everyone
  - Testing solutions are very expensive without having a standardized test setup that TE vendors can build
    - Only custom test solutions would be available, these are very expensive
- Multi panel UEs should be considered for forward compatibility (see FR2 4-layer proposal)
  - Multi panel enhancements are part of Rel-17 eMIMO work, currently there is no ongoing work test setup
  - Even if RF requirements are defined, these cannot be verified until a test solution is available

# Dynamic OTA testing for FR2

## Scenarios for Dynamic-geometry based FR2 OTA Test

- UE orientation rotation-based Scenario



The following can be further considered

- Multi-cell
  - Multi-panel gNB/UE
  - Travel-based dynamic environment scenario → The beam(s) from gNB(s) are dynamic on the basis of UE orientation-based scenario
- Examples of potential Figure of Merit
    - Whether UE can maintain the established link without or with very infrequent triggering of “Beam failure detection and Link recovery” procedure
    - Averaged RSRP/RSRQ and/or Throughput
    - Performance deviation in terms of
      - SSB and/or CSI-RS based RSRP/RSRQ
      - PDSCH Throughput

# OTA Testing for FR2 FWA (PC1/PC5)

Expand FR2 OTA testing to other for factors

- FR2 PC1 (FWA) requirements were introduced from Rel.15, PC5 introduced in Rel.17 but release independent from Rel.15
  - There is increased market traction for these devices in recent years
- 3GPP does not have any testing methodology for such devices
  - Current OTA testing setup/methodology is only applicable to smartphones form factors
  - Consequently no RAN5/GCF tests available for FWA (CPE) devices
- New RAN4 SI to enable testing of such devices is needed
- SI to follow the framework of previous OTA testing SIs
  - Study test setup, methodology and coarse MU
  - Enable RF, RRM and demod testing



# Thank you

Follow us on:    

For more information, visit us at:

[www.qualcomm.com](http://www.qualcomm.com) & [www.qualcomm.com/blog](http://www.qualcomm.com/blog)

All data and information contained in or disclosed by this document is confidential and proprietary information of Qualcomm Technologies, Inc. and/or its affiliated companies and all rights therein are expressly reserved. By accepting this material the recipient agrees that this material and the information contained therein will not be used, copied, reproduced in whole or in part, nor its contents revealed in any manner to others without the express written permission of Qualcomm Technologies, Inc. Nothing in these materials is an offer to sell any of the components or devices referenced herein.

©2018-2020 Qualcomm Technologies, Inc. and/or its affiliated companies. All Rights Reserved.

Qualcomm is a trademark of Qualcomm Incorporated, registered in the United States and other countries. Other products and brand names may be trademarks or registered trademarks of their respective owners.

References in this presentation to "Qualcomm" may mean Qualcomm Incorporated, Qualcomm Technologies, Inc., and/or other subsidiaries or business units within the Qualcomm corporate structure, as applicable. Qualcomm Incorporated includes Qualcomm's licensing business, QTL, and the vast majority of its patent portfolio. Qualcomm Technologies, Inc., a wholly-owned subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of Qualcomm's engineering, research and development functions, and substantially all of its product and services businesses, including its semiconductor business, QCT.