

RAN4 Rel-19 OTA topics

Source: CAICT
Document for: Discussion
Agenda Item: 9.1.4.3

- RAN4 Rel-19 OTA topics has been discussed in RAN#102 and summarized in RP-233918.
- In RP-240019, RAN chair provided guidance on Rel-19 Package RAN4 part, OTA related package are as follows:

<p>OTA testing enhancement WI (2 topics, ensuring reasonable load)</p> <ul style="list-style-type: none"> • TRP/TRS Enhancement • MIMO OTA Requirements and Test Enhancement 	WI
<p>OTA testing enhancements SI (1 topic, ensuring reasonable load)</p> <ul style="list-style-type: none"> • FR2 OTA Testing Enhancement 	SI

OTA: TRP/TRS Enhancement

- References: [RP-233918](#)
- Potential objectives:
 - Important to keep the load reasonable according to TU allocated to OTA testing
 - Test method
 - Enhanced test method for FR1 OTA including the following aspects
 - Study potential test metrics method to support NR NTN and IoT NTN device measurement
 - Enhanced radiated output power test method to support multi-Tx, e.g. 2Tx and 4Tx
 - Testing time reduction solutions for FR1 OTA
 - MU assessment of test methods
 - Requirements work
 - TRP/TRS requirements for operator demanded bands including UE with 1Tx and 2Tx (non-coherent UE)
 - FFS: Test method to support XR device measurement, new head phantom may be needed. 2Rx relaxation for 4Rx bands for XR UE
 - FFS: Test method to support NR NTN and IoT NTN device measurements (further clarify the UE type whether it is smartphone or other devices)
 - FFS: CA MSD test method enhancement for more UL/DL combination, e.g. 2DL/2UL, with MSD issue being considered, e.g., MSD reporting enhancement
 - FFS: Study UE antenna correlation for multiple antennas
 - FFS: TRP/TRS requirements for operator demanded CA band combinations depending on operators' demand

OTA: MIMO OTA Requirements and Test Enhancement

- References: [RP-233918](#)
- Potential objectives:
 - Important to keep the load reasonable according to the overall TU allocated to OTA testing
 - Test Method focusing on FR1
 - Test methods to allow more realistic use cases, including the following aspects
 - MIMO OTA Test method under dynamic channel model (study phase is needed for dynamic environment)
 - » Further clarification on dynamic channel model is needed
 - MU assessment for test methods
 - Performance requirements
 - FR1/FR2 MIMO OTA requirements for operator demanded bands
 - FFS: MIMO OTA Test method to support testing using phantoms, e.g. hand phantom
 - FFS: Multiple TRP test scenarios for FR1 MIMO OTA
 - FFS: FR2 MIMO OTA requirements for operator demanded bands

OTA: FR2 OTA Testing Enhancement

- References: [RP-233918](#)
- Potential objectives:
 - Important to keep the load reasonable according to the overall TU allocated to OTA testing
 - Testability issue for STXMP for non-handheld UE
 - FFS: RC (Reverberation Chamber) Method
 - FFS: Testability issue of FR1+FR2 DC/CA RRM test cases
 - FFS: Study dynamic OTA testing

- In this contribution, we provide our views on RAN4 Rel-19 OTA topics.

- **Current MIMO OTA test methods are limited to fixed scenarios**
 - Radiated multi-antenna reception performance is one of the most important characteristics to verify the MIMO receiver of the UE under conditions more [closely resembling the end user's interaction](#) with the device.
 - The current MIMO OTA test plans only specified [stationary test scenarios](#), which only enable the testing under a fixed channel condition and fixed MCS.
- **Dynamic test solution enables more realistic use cases**
 - Dynamic (non-stationary) channel models, i.e., the channel model characteristics in the test zone are variable during testing, can provide much [more realistic use cases](#) and allow for a much more accurate measure of the overall link performance.
 - MIMO OTA testing based on dynamic channel models will provide solutions for “normalized virtual drive testing”, enabling MIMO OTA performance to be tested and evaluated under [different channel conditions](#).
 - Besides, the adaptivity of the UE under dynamic channel conditions can be tested by dynamic link adaptation, i.e., variable MCS/rank/MIMO precoding by the BS emulator/gNB, which would provide a UE performance closer to its behavior in real field.
- **Dynamic test solutions are important for AI/ML enabled features**
 - From the perspective of future compatibility, the techniques for reconstructing dynamic channel models are promising for supporting the testing of [AI/ML enabled features](#).

- **Objectives**

- Develop Dynamic test solution for FR1 MIMO OTA
 - define dynamic channel model characteristics based on virtual drive routes for 2x2 MIMO and 4x4 MIMO. CDL channel models defined in TR38.901 and TR38.827 can be used as the starting point.
 - specify channel model validation procedures, reference values, and pass/fail limits
 - define the figure of merit (FoM) of UEs for dynamic environment based test methodology
 - decide the environmental conditions, noise-limited and interference-limited scenarios should be considered
 - decide whether to introduce the dynamic scheduling for link adaptation
 - the 16-probe MPAC system is the baseline.
 - develop the preliminary measurement uncertainty for the test system

- **Motivation**

- Current MIMO OTA test methods are only applicable for the single transmission/reception point scenario, multi-transmission/reception point (multi-TRP) is a Rel-16/Rel-17 feature to improve cell edge performance. Rel-16 and Rel-17 features support intra- and inter- cell multi-TRP, respectively.
- Multi-TRP technology brings capacity gains and improves cell edge performance, meeting the needs of operators.

- **Objectives**

- Develop FR1 MIMO OTA Test method for Multi-transmission/reception point (multi-TRP) test scenarios

- **Motivation**

- In previous release, only a limited number of NR bands are covered, some important bands with clear operator demands have been deprioritized due to time constraints.
- More frequency bands have been deployed for FR1 and FR2.

- **Objective**

- New MIMO OTA performance requirements for smartphone at other NR bands based on operators/certification bodies demand (2Rx and 4Rx)
 - consider Rel-18 measurement campaign framework as baseline to define requirements for new bands
 - n3, n8, n77 are first priority (could be refined based on operators/certification bodies demand)

- **FR1 MIMO OTA Test method enhancement to allow more realistic use cases (core part)**
 - dynamic test solution for FR1 MIMO OTA (first priority)
 - including general aspects, e.g., channel model definition, channel model validation, Figure of Merit (FoM), MU assessment.
 - Multi-transmission/reception point (multi-TRP) test scenarios for FR1 MIMO OTA (2nd priority)
- **FR1/FR2 MIMO OTA Requirements for new bands (perf part)**
 - New requirements for smartphone at other NR bands based on operators/certification bodies demand (2Rx and 4Rx)
 - consider R18 measurement campaign framework as baseline to define requirements for new bands
 - n3, n8 and n77 are first priority.

- **Motivation**

- It is agreed to specify OTA TRS requirements per band for both 4Rx XR and 2Rx XR for the NR bands which are mandatorily to support 4Rx, therefore, it is necessary to first study the testing methods that support XR devices.
- NTN devices are being released to the market, antenna transmission/reception capability of UE is important to ensure NTN coverage and stable connectivity.
- Traditional FR1 UE adopted omni-directional antenna radiation pattern, and corresponding OTA performance metric is also based on spherical integrated method (TRP/TRS). For NTN UE, the applicable test metric may differ from traditional UE and require further study.

- **Objective:**

- Study test methodology enhancement for new device types. (Core part)
 - XR
 - IoT NTN and NR NTN
- New TRP TRS performance requirements for smartphone at other NR bands based on operators/certification bodies demand (Perf part)
 - consider Rel-18 measurement campaign framework as baseline to define requirements for new bands

- **Motivation**

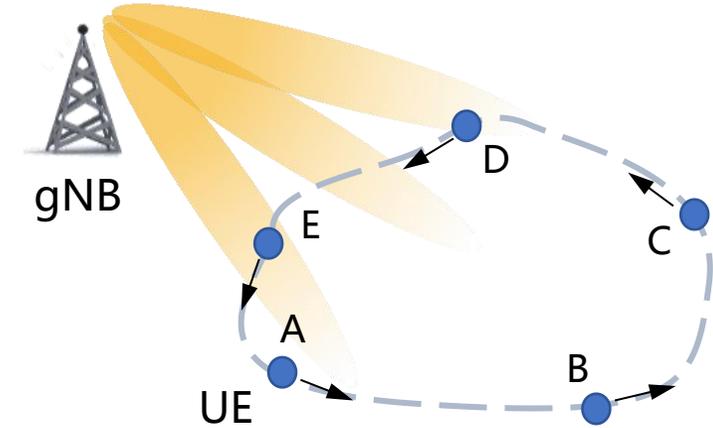
- Rel-18 FR2 OTA enhanced SI focus on FR2-1 OTA testing for UEs with multi-panel reception and 4DL layer. RAN4 has discussed the requirements for sTxMP, the corresponding test method can be considered in Rel-19.

- **Potential Rel-19 objectives:**

- Study test methodology to support simultaneous transmission with multi-panel

THANKS

- Dynamic test solution implements dynamic channel models in the test zone
 - ❑ with varying channel model parameters over the testing time
 - including Delay, Power, Angles of departure and arrival, etc
 - ❑ which emulate time-varying multi-path channel conditions in real-world scenarios with different large scale channel characteristics
 - such as Doppler power spectrum, angular power distribution, power delay profile, and LOS/NLOS condition.
 - ❑ the adaptivity of the UE under dynamic channel conditions can be tested by dynamic link adaptation,
 - i.e., variable MCS/rank/MIMO precoding by the BS emulator/gNB, which would provide a UE performance closer to its behavior in real field.



Scenarios for Dynamic test solution for MIMO OTA testing