**3GPP TSG-RAN4 Meeting #116bis *R4-251xxxx***

**Prague, Czech Republic, 13th – 17th October, 2025**

**Agenda item:** 8.12

**Source:** Feature lead (vivo)

**Title:** WF for [116bis][110] 6G testability and OTA

**Document for:** Approval

# Introduction

This Way Forward captures the agreements of 6G OTA in RAN4.

# Topic #1: **Improved testability of Conducted Requirements**

### Sub-topic 1-1 Antenna assumption of FR1 transmitter and receiver

**Issue 1-1-1: Whether RAN4 should consider a More realistic antenna efficiency assumption for FR1**

* Proposals
  + **Proposal 1:** Discuss a more realistic assumption on antenna efficiency for FR1 band tests, e.g. -5.5 dB**.**

Agreements:

* *move this discussion to general RF/UE RF from next meeting.*

### Sub-topic 1-2 Improve traditional conducted test to OTA

**Issue 1-2-1: Whether it is valuable to improve some conducted requirements to be verified via OTA approach**

Agreements:

* + RAN4 can further study the testability limitations of some conducted test cases, consider the following aspects as starting point, e.g.,
    - FR1 conducted test cases already consider antenna-performance impacts but not verified via radiated approach in a case-by-case manner, e.g. MSD
    - FR1 test case simplification with both conducted and radiated considered, e.g., spurious emission
    - Discuss which conducted conformance testing could either yield testability issues, e.g., lack of physical Tx/Rx ports, and/or highly dynamic nature of multiple Tx/Rx operation, including antenna tuning for impedance and/or pattern.

# Topic #2: **New test methodologies for new 6GR frequencies**

### Sub-topic 2-1 Testability for new 6GR frequency

**Issue 2-1-1: Testability for New Frequencies between FR1 and FR2**

Agreements:

RAN4 study the testability including conducted testing and radiated testing for the new frequencies. The following aspects can be considered:

* The frequency range definition will be discussed under the spectrum agenda.
* For conducted test, use existing test method as a starting point
* For OTA test
  + Further study potential test methodologies including the full-package, i.e., supported frequency range, test setup, configuration, positioning, procedure, validation/calibration, quiet-zone/test zone, MU, testing time reduction

# Topic #3: **OTA test methods for Multi-Tx and CA**

### Sub-topic 3-1 OTA for 6GR multi-carrier

**Issue 3-1-1: OTA test methodology for FR1 CA**

Agreements:

* RAN4 consider the study of testability for single carrier (with single or multi-Tx/Rx) as 1st priority.

# Topic #4: **Testability for different Device types**

### Sub-topic 4-1 OTA testability for different device types

**Issue 4-1-1: OTA testability applicability for different UE types in 6GR day-1**

Agreements:

* RAN4 consider the study of OTA test system to better accommodate different UE types, new feature/functionalities, new performance metrics and test cases.
* The UE types and form factor considered in testability can be further discussed in this SI.
* RAN4 study the feasibility of developing a single system to cover above aspects.

# Topic #5: **AI/ML OTA testability**

### Sub-topic 5-1 Enhanced OTA test method for 6GR AI/ML cases

**Issue 5-1-1: RAN4 study on enhancement of AI/ML testability for 6GR**

Agreements:

* The corresponding test method including both OTA and conducted, to verify the AI/ML features (FFS details) should be studied in RAN4 in 6G SI.
  + The methodologies identified in 5G will be considered as the starting point for both conducted and OTA.

# Topic #6: **Harmonized testing for TN and NTN**

### Sub-topic 6-1 Harmonized OTA test methodologies for TN and NTN

**Issue 6-1-1: Harmonized OTA test methodologies for TN and NTN**

Way Forward

* Targeting a harmonized test system/test method for TN and NTN devices for FR1.

# Topic #7: **Improved test methods and metric for SISO OTA**

### Sub-topic 7-1 Enhanced OTA test method for TRP/TRS

**Issue 7-1-1: Enhanced OTA test method for TRP/TRS**

Agreements:

* RAN4 further study the feasibility of incorporating real-world usage scenarios more closely into the 6GR OTA testing methodology.
  + FFS on OTA configurations/parameters to reflect real-world scenarios, e.g., support antenna switching, and other aspects.

# Topic #8: **Improved test methods and metric for DL MIMO OTA**

### Sub-topic 8-1 MIMO OTA for 6GR

**Issue 8-1-1: RAN4 consider MIMO OTA for 6GR day-1**

Agreements：

RAN4 will study the dynamic MIMO OTA (at least dynamic channel model and link adaptation) for 6G. static MIMO is not precluded. The following can be considered as starting point:

* 2D or 3D channel model
* FFS phantom involved testing
* FFS multi-TRP
* FFS focus on FR1 as first priority
  + FR2 and new frequency range may also be considered

# **Efficiency improvement (Test and requirements)**

### Sub-topic 9-1 Improvement of OTA testing efficiency

**Issue 9-1-1: Improve OTA test efficiency in 6GR**

Agreements:

* 6G OTA testability study should consider system complexity and test time reduction.

# Topic #10: **Testability for BS requirements**

### Sub-topic 10-1 BS related testability

**Issue 10-1-1: Study on BS testability**

* Proposals
  + **Proposal 1:** RAN4 should study the improvement of BS OTA test methods for FR3. (vivo)
* Recommended WF
  + TBA.

**FL: check with BS session whether any issue of testability should be discussed in 6G SI.**

# Topic #11: **Others**

### Sub-topic 11-1 New requirements/metric for OTA

**Issue 11-1-1: new Energy Efficiency performance under OTA metric**

* Proposals
  + **Proposal 1:** Discuss Energy Efficiency evaluation under OTA performance metric. (Xiaomi)
* Recommended WF
  + TBA.

**FL: keep it Open for further discussion.**

**Issue 11-1-2: new OTA metric for SBFD**

* Proposals
  + **Proposal 1:** Study OTA testing for SBFD**. (E///)**
* Recommended WF
  + TBA.

**FL: keep it Open for further discussion.**

### Sub-topic 11-3 General procedure on introducing alternative test method in RAN4

**Issue 11-3-1: General procedure on introducing alternative test method in RAN4**

Agreements:

* RAN4 could work on a general principle on introducing alternative methods.

**Issue 11-3-2: General procedure on introducing new and alternative test method in RAN4**

* Proposals
  + **Proposal 1:** The official standard should be limited to one primary OTA method and a single alternative to address minority needs**. (**Nokia**)**
  + **Proposal 2:** Standardize the procedure of studying the new OTA test methods proposed in the 3GPP meetings. **(**Nokia**)**
  + **Proposal 3:** Standardize the TP structure to capture pros and cons, baseline comparisons, and use cases of new methods, so that the confusion and struggles often faced in 3GPP meetings when new methods are proposed can be transformed into a clear and transparent decision-making process. **(**Nokia**)**
* Recommended WF
  + Discuss whether some high-level guidance can be agreed in RAN4 on this issue, agreements can be captured in TR
  + From moderator perspective, introducing new methods is always contribution driven (if within WI scope), whether RAN4 will agree on that depends on many aspects, e.g., complexity, workload, test efficiency and so on.
  + Potential high-level guidance would be: new alternative method discussion should include at least the following aspects: basic full-package (i.e., test setup, procedure, MU impacts), pros and cons, baseline comparisons, and applicability of new methods.

*Ad-hoc Discussions:*

*Nokia: the proposals are from the discussions previous meeting on alternative methods. A general principle is helpful for future work on alternative method introduction. One condition is the method just for special case, another case is for new features when we introduce new different methods.*

* *One condition: baseline is agreed, alternative is for specific case*
* *Another condition: no method define, and new methods for new cases*

*Keysight: not sure this belongs to this WI scope. Might be considered in 6G.*

*WF: RAN4 could work on a general principle on introducing alternative methods at least for above two conditions. Suggest to consider this aspect discussion in 6G testability and OTA discussion.*

### Sub-topic: 11-4 General procedure on cooperation between RAN4 and RAN5

**Issue 11-4-1: Cooperation between RAN4 and RAN5**

* Proposals
  + **Proposal 1:** Record and document the study procedures and results of OTA test procedure deviations in TPs using a standardized study procedure, which facilitates final decision-making in 3GPP standardization. **(Nokia)**
* Recommended WF
  + Check whether any agreements could be reached about above two proposals.