**3GPP TSG-RAN WG4 Meeting # 109 R4-2321138
Chicago, US, November 13 – 17, 2023**

**Agenda item: 8.16.1**

**Source:** **CAICT**

**Title:** **Updated Framework and time plan for** **FR2 MIMO OTA performance requirements development (Nov 2023)**

**Document for: Approval**

# 1 Introduction

This contribution provides an updated framework and time plan based on the approved version in [1] and new agreements achieved in recent RAN4 meetings as below [2-3].

At the last meeting, it was agreed to adopt the pure measurement approach [2]:

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| --- |
| **Issue 2-1-1: Simulation activities for FR2 MIMO OTA****<Agreement>**: * Down-selection can be made that the pure measurement approach is adopted for FR2 measurement campaign.

**Issue 2-1-2: How to process the PAD measurement results to be included into FR2 MIMO OTA data pool****<Agreement>**: * + FFS how to process the PAD measurement results to be included into FR2 MIMO OTA data pool.
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Thus, the simulation related work is removed in the updated framework.

At this meeting, the time plan for FR2 MIMO OTA lab alignment is further adjusted based on real progress [3]:

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| **Issue 2-1: FR2 PAD delivery scheme and time plan****Agreement:*** Postpone the deadline of FR2 lab alignment activity to Apr. RAN4 110-bis meeting.
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# 2 Updated Framework for FR2 MIMO OTA performance requirements development (for approval)

**2.1 Overall work flow**

The overall work flow of FR2 MIMO OTA performance requirements development is illustrated in Fig. 1.



Fig. 1. Work flow of FR2 MIMO OTA performance requirements development

In general, FR2 MIMO OTA performance requirements will be derived based on a measurement data pool of commercial devices per band.

To establish valid and trustable measurement data pool for defining FR2 MIMO OTA requirements, the following activities are required before measurement campaign:

1. Channel model validation activity: Companies shall complete channel model validation before submitting measurement results, validation results should be submitted to RAN4 for review. Details of the channel model validation is specified in 2.2.1.
2. Lab alignment activity: An FR2 MIMO OTA lab alignment should be done. Only aligned labs can share measurement results into the data pool for defining FR2 MIMO OTA requirements. Details of the lab alignment activity is specified in 2.2.2.
* At least 3 participating labs and 2~4 Performance Alignment Devices (PADs) per band are required.

The detailed working procedures for specifying FR2 MIMO OTA performance requirements are described in Section 2.2.

**2.2 Detailed working procedures**

**2.2.1 Channel Model Validation**

1. The purpose of Channel Model Validation is to ensure that the channel models are correctly implemented and hence capable of generating the propagation environment, as described by the model, within the test zone of the 3D-MPAC system.
2. The channel model validation measurements shall be performed as described in Annex D.3 of TS 38.151, including:
	1. Power delay profile (PDP)
	2. Doppler/Temporal correlation
	3. PAS similarity percentage (PSP)
	4. Cross-polarization
	5. Power validation
3. Channel model: FR2 UMi CDL-C, as specified in Annex D.1 of TS 38.151
4. Test band: n261
5. Pass/fail limits: as defined in Annex D.2 of TS 38.151

**2.2.****2 Lab Alignment Activity**

1. The purpose of Lab Alignment Activity is to ensure there is no unexpected lab deviation and establish full trust and confidence on the measurement results. At least 3 participating labs and 2~4 PADs for each band are required.
2. Test labs are invited to participate in the lab alignment activity, the following conditions should be fulfilled:
	1. Participating labs shall complete channel model validation.
	2. Participating labs should have sufficient test resource to provide on-time measurement results without delay.
	3. Each lab should finalize PAD measurement within 10 workdays, and deliver to the next lab in the same country ASAP with PAD In/Out information shared via email-reflector; otherwise, labs in the same country should equally share the period for testing the PADs.
3. Test methodology:
	1. Test plan: 3GPP TS 38.151
4. Test cases for Lab Alignment Activity:
	1. Test band: n261 (for PADs that support n261), n257 (for the PAD that does not support n261)
	2. Number of test cases: 2~4 PADs per-band
	3. Operation mode: NR Non-Standalone (NSA) is preferred and SA is not precluded, and should be mapped with the measurement results submission.
	4. Power class: PC3
5. Test results submission:
	1. Use the same worksheet template in R4-2308740 to submit the measurement results
	2. The measurement results should be submitted to RAN4 by anonymous approach (the UE model shall not be disclosed publicly)
	3. Results shall not be shared between labs before submitting to RAN4 meetings or sharing in the RAN4 reflector. Comparison and lab alignment analysis should only be done in RAN4 meetings/discussions
6. Lab alignment criteria:
	1. The pass/fail criteria are defined as the maximum deviation between the MASC measurement result and the reference value
	2. The reference value is derived based on the per-band averaging approach of lab alignment data pool from ≥ 3 labs, whether apparent outliers will be considered in averaging process, or not, is FFS
	3. Pass/fail limit for lab alignment should be derived from the preliminary MU value. Adopt [0.5-1]\*preliminary MU as starting point and further check after the FR2 MU is decided and some PAD measurement results are available.

**2.2.3 Measurement Campaign**

1. The purpose of Measurement Campaign is to collect measurement results of commercial devices from permitted labs after the Lab Alignment Activity for specifying FR2 MIMO OTA performance requirements.
2. Test cases for FR2 MIMO OTA Measurement Campaign:
	1. Test band: n261 (first stage)
	2. Operation mode: NR Non-Standalone (NSA) (first stage)
	3. Powe class: PC3 (first stage)
3. Commercial Device (Smartphone) selection criteria:
	1. DUT capability: at least support n261 (for the first stage)
	2. The following selection criteria can also be considered:
		1. Year of production: 2019-2024
		2. Brand variety
		3. Popularity
		4. Number of bands supported
	3. Power Class: PC3
4. Commercial devices provision:
	1. Test labs can collect commercial devices by themselves based on the above selection criteria
	2. Any 3GPP member can work with the selected test labs to provide devices
		1. A test lab shall measure only one UE model in case different samples of the same model are provided
	3. The 3GPP member providing the DUTs should contact one of the selected labs to check their availability to receive the DUTs and define together the related provisioning aspects
		1. Any issue should be reported to the rapporteur in a timely manner to discuss for an alternative solution
		2. To plan properly the measurement campaign, the following actions are requested for the RAN4 Nov meeting:
			1. The rapporteur checks with the volunteer labs the number of DUTs (minimum 3) they expect to be able to measure AND how many DUTs they can accommodate from 3GPP members
			2. The 3GPP member providing the DUTs checks how many samples they intend to provide (in terms of maximum number)
			3. Planning of the measurement campaign could be reviewed based on the above points
5. Measurement results submission:
	1. Use the same worksheet template to submit the measurement results (a template will be submitted to RAN4 meetings for approval)
	2. The measurement results should be submitted to RAN4 by anonymous approach (the UE model should not be disclosed). The following information should be provided:
		1. All FR2 bands supported by each UE
		2. Production year of each UE
		3. Other information that should be disclosed is FFS
	3. The plan and progress of each lab are encouraged to be shared via the RAN4 reflector (e.g., how many devices are planned to be/ have been measured)

**2.2.6 Specifying Performance Requirements**

1. Only the results from aligned labs will be considered for specifying requirements
2. Minimum number of commercial devices for defining requirements: [8-15]
	* + FFS after receiving some feedback from volunteer labs on the estimated amount of measurement data can be provided. More measurement data is preferred.
		+ To increase the number of measurement data, include the PAD measurement results from aligned labs into the data pool for specifying FR2 MIMO OTA performance requirements, if allowed by PAD providers. FFS how to process the PAD measurement results from aligned labs.
3. Method: Derive the requirements based on per-band Data driven approach. The value at [TBD] percentile of the CDF curve can be selected as the starting point for requirement discussion.
4. Performance part of the work will proceed in a contribution-driven manner.

**2.2.7 UE antenna panel assumption impact on performance requirements**

1. RAN4 needs to study the impact of different UE implementation assumptions on the number of panels on MIMO OTA requirements
2. FFS how to accommodate different UE assumptions of number of panels for deriving MIMO OTA requirements

**2.3 Time plan**

1. Finalize the framework and time plan for FR2 Lab Alignment Activity in RAN4 #106 (Feb 2023).

2. Lab volunteers and PADs announced in RAN4#106 or via email-reflector before the starting of RAN4#106-bis-e (17 Apr 2023) are considered.

3. Conclude lab volunteers, PADs’ information, and delivery scheme in RAN4#106-bis-e. PAD providers should make sure the PADs are ready by the end of RAN4#106-bis-e (26 Apr 2023). Lab Alignment Activity can start with the labs that have completed channel model validation, after RAN4#106-bis-e immediately, if ≥ 3 lab volunteers and [2-3] PADs are confirmed.

4. Lab volunteers shall complete channel model validation before the starting of RAN4#108 (21 Aug 2023). The results shall be submitted to RAN4 by formal T-docs. Lab volunteer can share the validation results via email-reflector before submitting to RAN4 meetings, and then ask for PADs to participate in the Lab Alignment Activity.

5. Collect all lab alignment measurement results from lab volunteers based on contribution-driven manner in RAN4#110 (Feb 2024) and RAN4#110-bis (Apr 2024). Conclude the lab alignment outcome in RAN4#110-bis. Measurement data collection can start before RAN4#110 by volunteer labs.

6. Companies are encouraged to prepare and purchase commercial devices for the Measurement Campaign as early as possible. Count the number of the commercial devices no later than RAN4 #109 (Nov 2023) to estimate how much measurement data can be collected. Providers should make sure the commercial devices are ready by the end of RAN4#110 (Feb 2024). .

7. Collect measurement results of commercial devices from aligned labs based on contribution-driven manner in RAN4#110-bis (Apr 2024) and RAN4#111 (May 2024).

8. Conclude FR2 MIMO OTA performance requirements at or before RAN4#111 (May 2024).

**Proposal 1: Approve the updated framework and time plan in Section 2 of this contribution for FR2 MIMO OTA performance requirements development.**

# 3 Conclusion

In this contribution, we propose an updated framework and time plan for FR2 MIMO OTA performance requirements development.

**Proposal 1: Approve the updated framework and time plan in Section 2 of this contribution for FR2 MIMO OTA performance requirements development.**

# References

1. R4-2309816, “Updated Framework for FR2 MIMO OTA performance requirements development (May 2023)”, CAICT, 3GPP RAN4#107, May 2023.
2. R4-2313900, “WF on Rel-18 MIMO OTA”, CAICT, 3GPP RAN4#108, Aug. 2023.
3. R4-2321085, “WF on [109][336] NR\_MIMO\_OTA\_enh”, CAICT, 3GPP RAN4#109, Nov. 2023