**3GPP TSG-RAN WG4 Meeting # 102-e R4-2207201**

**Electronic Meeting, February 21 – March 3, 2022**

**Agenda item:** 11.1

**Source:** Intel Corporation

**Title:** WF on FR2-2 OTA test methods

**Document for:** Approval

# Introduction

This Way Forward covers discussion agreements for the Study on Enhanced Test Methods in FR2

# Topics

## General

### Remaining work of SI

Candidate options:

* Proposal 1: RAN4 should conclude the preliminary MU assessments for UE RF, RRM, and demodulation based on the agreed assumption on the number of UE antenna elements.
* Proposal 2: RAN4 should conclude the max achievable SNR for demodulation and for RRM in the beam peak direction.
* Proposal 3: RAN4 should conclude the applicability of Objectives 1-5 to FR2-2 based on the agreements below and capture the related agreements in TR38.884.
	+ As a starting point, the same High DL power and low UL power test cases for which NF based solutions (i.e. CFFNF, CFFDNF, and CFFdeltaNF) are applicable in FR2-1, can be considered for NF based solutions applicability in FR2-2. In case relaxations are needed for IFF/DFF methods for a given test case, it is up to RAN5 to confirm applicability of NF based solutions
	+ At least, RSRPB based Rx beam peak search, Single link polarization measurement and Fast Spherical Coverage Method can be applied to 52.6-71GHz directly

**Tentative greement:** For Proposal 1 and Proposal 2, include the content of previous agreements (captured below). Work on the wording of the proposals and any additional content (i.e., measurement grid) to be captured.

* **Agreement:** MU assessment for FR2-2 will focus on PC3 in Rel-17 timeline. This, however, does not deprioritize the general work on other UE types in the WI (i.e., FWA and vehicular).
* **Agreement:** Approve the proposal (below) and extend applicability of Objective 2 and Objective 5 solutions to FR2-2.
	+ **Proposal:** Applicability of methodology enhancements of three methods in Objective 5 can be extended to FR2-2. Objective 3 discussions should be postponed until core requirements are discussed. Lastly, we should further discuss the remaining objectives

## OTA test methods for UE RF, RRM and demodulation for 52.6~71GHz

### General aspects

#### Testing and calibration

Candidate option:

* Proposal 1: RAN4 should confirm if the testing and calibration aspects detailed in Clause 5.2.1.3 of TR 38.810 can be extended to FR2-2.

**Agreement:** Approve Proposal 1; testing and calibration aspects can be extended to FR2-2. Relevant text is already included in R4-2207202.

#### Radiating aperture

Candidate options:

* Option 1: Yes, 5cm can be reused for D
	+ Proposal: If D = 5cm is reused for FR2-2, a column for 71 GHz will be added to the minimum range length of DFF table in TR 38.810 (Table 5.2.1.2-1).
* Option 2: No, a different value is needed

*Recommendation:*

*Need to confirm 5cm can be reused. Further discuss which assumptions, if any, should be modified to justify reusing D = 5cm for FR2-2.*

**Tentative agreement:** TBD

### UE types

#### Single-element antenna assumption

Candidate options:

* Proposal 1: Feedback is requested from chipset vendors/device manufacturers which single-element antenna assumptions should be considered for PC1, PC2, and PC3 in FR2-2.
* Proposal 2: Single UE antenna element pattern parameters can be reused as Table G.1.1-1 in TR38.810, and half-power beamwidth and gain need to be further confirmed.

*Recommendation:*

*Discuss the reduction in half-power beamwidth considering the impact of integrating a design into a hand-held form factor. Additionally, discuss if a 90º/90º assumption is agreeable.*

**Tentative agreement:** TBD

#### Worst-case antenna array configuration (MxN) for PC1 and PC2

Candidate option:

* Proposal: Feedback is requested to clarify the worst-case antenna array configuration (MxN) for PC1 and PC2 UEs in FR2-2.

**Tentative agreement:** TBD

#### Beam steering assumptions of PC3, PC1 and PC2

Candidate option:

* Proposal: Feedback is requested to clarify the beam steering assumptions for PC1, PC2, and PC3 UEs in FR2-2.

**Tentative agreement:** Reuse the beam steering assumptions in TR38.810 for PC3

### Test methodology for UE RF

#### MIMO EVM measurement

Candidate options:

* Proposal 1: For two-layer uplink MIMO in FR2, define the zero-forcing receiver as the inverse of the effective channel matrix so that

$$G\_{ZF}=\tilde{H}^{-1}$$

* Proposal 2: Agree to the text proposal for Section 5.2.3.1.1.2 of TR38.884-130 in the Appendix.

**Agreement:** Approve Proposal 1 and Proposal 2. Include relevant text proposal content in R4-2207202.

### Test methodology for RRM

#### Informative assessment of testable RRM DL SNR range

**Tentative agreement:**

* Perform informative assessment of testable RRM DL SNR range for FR2-2 for the first and second scenario of RRM requirements and for both types of RRM requirements
* Assume [7] dB gain between fine and rough beams for FR2-2

### Test methodology for Demodulation and CSI

#### FR2-2 max achievable DL SNR adjustment

**Tentative agreement:**

Further discuss the following ways on test methodology change

* Acceptable ∆thermal decrease
	+ Option 1: 1 dB (similar to FR2-1)
	+ Option 2: 2dB
	+ Other options are not precluded
* Adjustment of TE
* Acceptable restriction of allocation size within CBW

#### Path delay grid

Candidate options:

* Option 1: Limit max applicable CBW and sampling frequency by 400MHz
* Option 2: Define accurate delay grid
	+ Specify validation procedure and acceptance criteria for channel model implementation tolerances.

**Tentative agreement:** TBD

# References

1. R4-2207452, “Email discussion summary for [102-e][337] FR2\_enhTestMethods,” Moderator (Intel), RAN4 #102-e, March 2022