**3GPP TSG RAN meeting #90-e RP-20xxxx**

**Electronic Meeting, December 7-11, 2020**

**Source: Qualcomm Incorporated**

**Title: New SID on Study on radiated metrics and test methodology for FR2 NR UEs under dynamic test environment**

**Document for: Approval**

**Agenda Item: 9.1.2**

3GPP™ Work Item Description

For guidance, see [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39; and [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm).
Information about Work Items can be found at <http://www.3gpp.org/Work-Items>

# Title: Study on radiated metrics and test methodology for FR2 NR UEs under dynamic test environment

## Acronym: [NR\_Dynamic\_OTA\_TestMethod]

## Unique identifier: TBD

|  |  |
| --- | --- |
| **This WID includes a Core part** |  |
| **This WID includes a Performance part** |  |

## 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Affects:** | UICC apps | ME | AN | CN | Others (specify) |
| **Yes** |  | X |  |  |  |
| **No** | X |  | X | X |  |
| **Don't know** |  |  |  |  |  |

## 2 Classification of the Work Item and linked work items

### 2.1 Primary classification

|  |  |
| --- | --- |
|  | Feature |
|  | Building Block |
|  | *Work Task* |
| X | Study Item |

### 2.2 Parent and child Work Items

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| --- |
| Parent and child Work Items  |
| Unique ID | Title | Nature of relationship |
|  |  |  |

### 2.3 Other related Work Items and dependencies

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| Other related Work Items (if any) |
| Unique ID | Title | Nature of relationship |
| 710062 | Study on New Radio (NR) Access Technology | Preceding SI |
| 750167 | Work Item on New Radio (NR) AccessTechnology | Preceding SI |
| 750044 | Study on test methods for New Radio | Preceding SI |
| 850071 | Study on enhanced test methods for FR2 NR UEs | Preceding SI |
| 801001 | Study on radiated metrics and test methodology for the verification of multi-antenna reception performance of NR UEs | Preceding SI |
| 880178  | New WID on Multiple Input Multiple Output (MIMO) Over-the-Air (OTA) performance requirements for NR UEs | Preceding WI |

## 3 Justification

The key enablers for high data throughput and stable link connectivity in FR2 are beamforming and beam management techniques. These should be verified by corresponding tests.

However, the current RRM test cases defined in TS38.133 are based on a static test environment, i.e. spatial relation between DUT and TE probe(s), such as (Z)AoA and (Z)AoD, doesn’t change during the test. Therefore, UE beam management behaviour is not thoroughly considered in the current RRM test cases.

The Rel-16 study item MIMO OTA SI included the objectives of MIMO throughput testing under dynamic environment and extension of Rel-15 RRM tests to dynamic geometry. The dynamic test method focusing on the UE beam management performance was discussed based on the agreed static test setup. However, due to lack of time, no conclusion was reached. Companies preferred to start a new SI to study the FR2 testing under a “real-world” dynamic environment. Therefore, two scenarios are needed to be studied for FR2 UE dynamic testing. The first one is UE rotation-based scenario which is based on the current 3D-MAPC system. The second one is UE travel-based scenario which is additionally to consider the beams changing from gNB(s) on the basis of UE rotation-based scenario.

Moreover, in RAN1 Rel-17 WI on further enhancements on MIMO for NR (Acronym: NR\_FeMIMO), the objective is to extend specification to support several aspects on NR MIMO including multi-panel UE which also has RAN4 impact. Therefore, it is necessary to study the test methodology in RAN4 which is also applicable for multi-panel devices for forward compatibility.

Therefore, a new study item to develop test methodology supporting dynamic testing and multi-panel UE is required in Rel-17.

## 4 Objective

### 4.1 Objective of SI or Core part WI or Testing part WI

The objective of this Study Item is to define performance metrics and end-to-end testing methodology for the verification of FR2 NR UEs performance in a dynamic environment. The test methodology for multi-panel UE should also be considered.

The study proceeds within the following scope:

- For the following device types:

- Smartphone is the first priority.

- Other UE types are not precluded for discussion as a second priority

- Identify test scenarios:

- Stage 1: UE rotation-based scenario

* Change UE rotation during the testing
* Study the feasibility of reusing 3D-MPAC system

 - Stage 2: UE travel-based scenario

* Change both UE rotation and beams from gNB(s) during the testing
* Study the enhancement on 3D-MPAC system
* Up to 2 beams is the first priority
* Identify each test scenario with proper justification and avoid unnecessary overlapping test cases.

Test metric should be based on the current core/performance requirements.

- The test methodology shall include both NSA and SA.

* For setups intended for measurements of UE characteristics in non-standalone (NSA) mode, an LTE link antenna setup is used to configure the NR link

- Using the channel models defined in TR38.901 as the starting point to develop dynamic environment

- Channel model framework in TR38.827 should be taken as the basis

- Study whether and which parameters for channel mode defined in TR38827 will have big impact on UE performance and could be reused for dynamic testing.

- Study the applicable test methodology verification procedures

- Study the preliminary uncertainty budget for the methodology

- The uncertainty budget in TR38827 should be the basis for developing the uncertainty.

 - Study the additional uncertainty due to the dynamic environment

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- The test methodology shall initially assume a black box approach to ensure the test of multi-panel Tx/Rx UE is covered.

- The dynamic environment tests shall take the test system complexity and test time into account to keep the whole test costs within a reasonable level.

 Note: RAN5 can start a new SI to develop the test procedure with the output of this SI.

During this study item, ongoing communication with 3GPP RAN WG5, CTIA OTA Working Group (MOSG, 5G mm-wave OTA Sub-Working group and MUSG), and CCSA TC9 WG1 shall be maintained to ensure industry coordination on this topic.

## 5 Expected Output and Time scale

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| --- |
| **New specifications**  |
| Type  | Series | Title | For info at TSG#  | For approval at TSG# | Remarks |
| Internal TR | 38.xyz | Study on radiated metrics and test methodology for FR2 NR User Equipment (UE) under dynamic testing environment | TSG#92 | TSG#93 | Rapporteur:  |

|  |
| --- |
| **Impacted existing TS/TR**  |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
|  |  |  |  |

## 6 Work item Rapporteur(s)

## 7 Work item leadership

RAN4

## 8 Aspects that involve other WGs

## 9 Supporting Individual Members

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| --- |
| Supporting IM name |
| Qualcomm Incorporated |
| Keysight |
| Vodafone |
| Verizon |
| vivo |
| Xiaomi |
| OPPO |
| CAICT |