**3GPP TSG RAN5#103 R5-243356**

**Fukuoka, Japan, May 20-24, 2024**

**3GPP TSG RAN Meeting #104 RP-24xxxx**

**Shanghai, China, June 17-20, 2024**

**Source: Qualcomm Inc**

**Title: New WID on UE Conformance - Requirement for NR frequency range 2 (FR2) multi-Rx chain DL reception**

**Document for: Endorsement**

**Agenda Item: 4.1**

3GPP™ Work Item Description

Information on Work Items can be found at <http://www.3gpp.org/Work-Items>
See also the [3GPP Working Procedures](http://www.3gpp.org/specifications-groups/working-procedures), article 39 and the TSG Working Methods in [3GPP TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm)

Title: UE Conformance - Requirementfor NR frequency range 2 (FR2) multi-Rx chain DL reception

Acronym: NR\_FR2\_multiRX\_DL-UEConTest

Unique identifier:

|  |  |
| --- | --- |
| **This WID includes a Testing part** | **X** |
| **and it addresses the following 3GPP work area:** | **Radio Access** | **X** |
| **Core Network** |  |
| **Services** |  |

Potential target Release: Rel-18

# 1 Impacts

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

# 2 Classification of the Work Item and linked work items

## 2.1 Primary classification

### This work item is a …

|  |  |
| --- | --- |
|  | Normative work item |
|  | Stage 1 |
|  | Stage 2 |
|  | Stage 3 |
| X | Testing |

## 2.2 Parent Work Item

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| --- |
| Parent Work / Study Items  |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
| NR\_FR2\_multiRX\_DL |  | 950077 | Requirement for NR frequency range 2 (FR2) multi-Rx chain DL reception |
| NR\_FR2\_multiRX\_DL-Core | RAN4 | 950177 | Core part: Requirement for NR frequency range 2 (FR2) multi-Rx chain DL reception |
| NR\_FR2\_multiRX\_DL-Perf | RAN4 | 950277 | Perf. part: Requirement for NR frequency range 2 (FR2) multi-Rx chain DL reception |

### 2.3 Other related Work Items and dependencies

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| --- |
| Other related Work /Study Items (if any) |
| Unique ID | Title | Nature of relationship |
|  |  |  |

# 3 Justification

The existing Rel-15 NR FR2 minimum UE requirements are defined with an assumption that UE is equipped with a single antenna panel and capable to perform DL reception using a single RX beam/chain reception. Furthermore, the UE performance requirements are limited to DL MIMO rank 1 and 2. In FR2, 4-layer MIMO reception requires beam reception from at least two directions. Although this is supported by the MIMO features since Rel-15, no performance requirements have yet been specified. This is important for high-rate MIMO in FR2, as well as for FR2 HST scenarios.

During Rel-16 and Rel-17, the support of NR FR2 CA with IBM (Independent Beam Management) with simultaneous DL reception on different component carriers from the co-located and non-co-located TRPs was defined. The IBM concept implies a UE is capable of DL simultaneous reception on different UE panels/chains using separate beams on different component carriers and requires improved UE baseband and RF capabilities (multiple baseband chains and support of multiple antenna panels).

Several enhancements to enable efficient and robust DL multi-TRP/panel operation were introduced in the Rel-16 NR eMIMO WI. For instance, DL transmission schemes with simultaneous and non-simultaneous multi-beam reception from multiple TRPs/panels were introduced. The simultaneous reception may require support of simultaneous multi-panel operation with several independent RX beams/chains at the UE side. As part of this item, a new FR2 UE capability for simultaneous multi-beam reception was introduced (simultaneousReceptionDiffTypeD-r16). However, no RF, RRM or performance requirements were defined in Rel-16 and Rel-17 for FR2 UEs with simultaneousReceptionDiffTypeD-r16 capability.

Enhanced NR FR2 UEs with multi-beam simultaneous reception and multiple RX chains can provide a meaningful performance improvement in FR2 improving both demodulation performance (4-layer DL MIMO), RRM performance and improve RF spherical coverage.

The parent work item aims to introduce the requirements for UEs capable of multi-beam/chain simultaneous DL reception on a single component carrier to achieve improved RF, RRM and UE demodulation performance.

Different implementation scenarios could be considered at the UE. Single-TCI reception on different beams has been supported by the RAN1 specifications since Rel-15 via the Type I codebook, which could be achieved at the UE with either a single panel or multiple panels. Alternatively, dual TCI operation can be combined with the Rel-17 mTRP framework even if the base station is actually deployed as a single TRP.

The parent WI therefore provides the requirements for both single and dual TCI assumptions to specify requirements for reception of 4-layer downlink MIMO with simultaneous reception at the UE from two different directions.

# 4 Objective

The objective of this work item is to enable UE conformance testing for the Rel-18 FR2 Multi-Rx WI which includes analysing the requirements, creation of corresponding test cases by defining the test environment, special conformance testing function, test procedure, message contents, MU/TT analysis, associated PICS, applicability and updating the relevant conformance specifications.

The conformance testing aspects for this WI would consist of RF, Demodulation and RRM area

# 5 Expected Output and Time scale

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| --- |
| New specifications {One line per specification. Create/delete lines as needed} |
| Type  | TS/TR number | Title | For info at TSG#  | For approval at TSG# | Rapporteur |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

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| --- |
| Impacted existing TS/TR {*One line per specification. Create/delete lines as needed*} |
| TS/TR No. | Description of change  | Target completion plenary# | Remarks |
| TS 38.508-1 | Definition of common environment for FR2 Multi-Rx | TSG RAN#110(Dec-25) |  |
| TS 38.508-2 | Introduction of physical implementation capabilities for FR2 Multi-Rx. | TSG RAN#110(Dec-25) |  |
| TS 38.509 | Introduction of special conformance testing function for FR2 Multi-Rx | TSG RAN#110(Dec-25) |  |
| TS 38.521-2 | Introduction of UE RF requirements for FR2 Multi-Rx | TSG RAN#110(Dec-25) |  |
| TS 38.521-4 | Introduction of UE Demodulation requirements for FR2 Multi-Rx | TSG RAN#110(Dec-25) |  |
| TS 38.533 | Introduction of UE RRM requirements for FR2 Multi-Rx | TSG RAN#110(Dec-25) |  |
| TS 38.522 | Introduction of test applicability for FR2 Multi-Rx | TSG RAN#110(Dec-25) |  |
| TR 38.903 | Derivation of test tolerances and measurement uncertainty for User Equipment (UE) conformance test cases | TSG RAN#110(Dec-25) |  |
| TR 38.905 | Derivation of test points for NR performance enhancement in radio transmission and reception User Equipment (UE) conformance test cases. | TSG RAN#110(Dec-25) |  |

# 6 Work item Rapporteur(s)

Balasubramanian Vijay, Qualcomm Inc, vijayb@qti.qualcomm.com

# 7 Work item leadership

RAN5

# 8 Aspects that involve other WGs

None

# 9 Supporting Individual Members

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| Supporting IM name |
| Qualcomm Inc |
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