**3GPP TSG-RAN5 Meeting #95-e draft\_R5-223317**

**Electronic Meeting, 9th May– 20th May 2022**

**3GPP TSG RAN Meeting #96 RP-22xxxx**

**Budapest, HU, 06 June – 09 June 2022**

**Source: Apple, Rohde & Schwarz, Vivo**

**Title: New WID on UE Conformance - Introduction of UE TRP (Total Radiated Power) and TRS (Total Radiated Sensitivity) requirements and test methodologies for FR1 (NR SA and EN-DC)**

**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 - Introduction of UE TRP (Total Radiated Power) and TRS (Total Radiated Sensitivity) requirements and test methodologies for FR1 (NR SA and EN-DC)**

## Acronym: NR\_FR1\_TRP\_TRS-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-17

## 1 Impacts

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

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

### 2.1 Primary classification

This work item is a

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

### 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\_FR1\_TRP\_TRS-Core | RAN4 | 911110 | Core part: NR\_FR1\_TRP\_TRS |
| NR\_FR1\_TRP\_TRS-Perf | RAN4 | 911210 | Perf. part: NR\_FR1\_TRP\_TRS |

### 2.3 Other related Work Items and dependencies

|  |
| --- |
| Other related Work Items (if any) |
| Unique ID | Title | Nature of relationship |
| 550022 | Study on Measurements of radio performances for LTE terminals - Total Radiated Power (TRP) and Total Radiated Sensitivity (TRS) test methodology | RAN4 TR 37.902 has been used as a baseline for NR FR1 TRP TRS  |
| 580037 | LTE UE TRP and TRS and UTRA Hand Phantom related UE TRP and TRS Requirements | RAN4 TS 37.144 has been used as a baseline for NR FR1 TRP TRS  |
| 630011 | UE Conformance Test Aspects - LTE UE TRP and TRS and UTRA Hand Phantom; | RAN5 TS 37.544 has been used as a baseline for NR FR1 TRP TRS test specification definition |
| 760087 | UE Conformance Test Aspects - 5G system with NR and LTE | Content of TS 38.521-1 and 3 will be used as reference for test configuration |

## 3 Justification

Until now, the UE FR1 transmit power and receiver sensitivity performance has been tested by using conducted methodology at the antenna ports and it remains unknown what the actual performance of the UE would be in realistic network conditions with the UE antenna accounted for. Radiated performance based on OTA testing is one of the most important characteristics to verify the entire UE performance under conditions more closely resembling the end user’s interaction with the device.

To ensure robust system performance, the requirements for NR FR1 TRP and TRS was determined to be important for consistent device OTA performance in actual NR networks. It was further determined that requirements in 3GPP would provide a good reference for FR1 OTA requirements.

RAN4 introduced a Rel17 work item for NR FR1 TRP TRS at RAN#91. As of RAN#95, the core part of this RAN4 WID has reached 100% completion with progress being made in the performance part as well. To meet the industry expectations in time, there is a need for RAN5 to start a work item to deliver conformance test cases for NR FR1 TRP and TRS requirements.

## 4 Objective

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

The objective of this RAN5 WI is to enable UE conformance testing for the corresponding R17 NR FR1 TRP TRS Work Items listed under clause 2.2. RAN5 conformance test procedures will be created to verify test requirements as per the scope being covered in RAN4 namely:

* Define conformance tests for NR FR1 SISO SA TRP and TRS requirements:

- Band n41, n28, n78, and n79 for PC3 and PC2 UEs

- Define test cases covering the selected bands based on the conclusion of core requirement definition framework

- Only specify 4Rx test requirement for n41, n78, n79

- Specifying test requirements of SA with 1 CC is the first priority

* Define conformance tests for FR1 EN-DC TRP and TRS requirements

- For EN-DC, only NR test requirements will be specified, and no additional LTE requirements will be introduced.

- Only consider EN-DC combinations of 1 CC LTE with 1 CC NR. The LTE and NR power configuration for EN-DC scenarios is agreed in RAN4 and can be aligned accordingly in RAN5 test specifications.

- Specific EN-DC combinations to test is still ongoing discussion in RAN4 and can be adopted in RAN5 test specifications once RAN4 concludes.

- Band n41, n28, n78, and n79 related EN-DC band combinations for PC3 and PC2 UEs

* Align any phantom-based testing with RAN4 core specifications once RAN4 concludes on the same. For Rel.17 scope, Hand phantom only cases will be covered
* DUT feature focus
	+ Release 17 focus is on smartphone. Test coverage for additional DUT form factors to be determined in future Release(s)
	+ Wide Grip Hand for UE with Width >72mm and ≤92mm. Additional device widths to be determined in future Release(s)
	+ Power Class: Both PC2 and PC3 with 1Tx
		- PC2 as first priority
	+ TxD and Transmit antenna switching (TAS) test methodology is ongoing discussion in RAN4 and can be adopted/aligned in RAN5 test specifications once RAN4 concludes.
* Multi-antenna-based NR FR1 test methodologies and associated requirements are still ongoing discussion in RAN4 and can be adopted/aligned in RAN5 test specifications once RAN4 concludes.
* MU/TT: RAN5 has primary responsibility for MU assessment for FR1 TRP/TRS and a preliminary/placeholder MU table has been added in Annex B of TR 38.834. This work item scope includes further optimizing and finalizing MU values and then determine TT for the defined test requirements.

## 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# | Remarks |
| *TS* | *38.5XX* | NR; User Equipment (UE) Over-the-Air (OTA) performance; Conformance testing of Range 1 Standalone and Range 1 Interworking operation with other radios | RAN#101 September2023 | RAN#102 December 2023 |  |

|  |
| --- |
| **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 test environment for R17 NR FR1 TRP TRS | TSG RAN#102(Dec-23) |  |
| TS 38.508-2 | Introduction of common implementation conformance statement (ICS) for R17 NR FR1 TRP TRS | TSG RAN#102(Dec-23) |  |

## 6 Work item Rapporteur(s)

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## 7 Work item leadership

RAN5

## 8 Aspects that involve other WGs

None

## 9 Supporting Individual Members

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| --- |
| Supporting IM name |
| Apple |
| AT&T |
| China Mobile |
| Dish Network |
| Element Materials Technology (Formerly PCTest Engineering Laboratory) |
| Huawei |
| Hisilicon |
| Nokia |
| Orange |
| Qualcomm |
| Rohde & Schwarz |
| Sporton |
| Telecom Italia |
| Verizon |
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