**3GPP TSG RAN Meeting #102 draft RP-****232791**

**Edinburgh, Scotland, December 12 - 16, 2023** (Revision of RP-222909)

**Source: Nokia, Xiaomi**

**Title: Revised WID: NR RF requirements enhancement for frequency range 2 (FR2), Phase 3**

**Document for: Approval**

**Agenda Item: 9.3.4.3**

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: NR RF requirements enhancement for frequency range 2 (FR2), Phase 3

## Acronym: NR\_RF\_FR2\_req\_Ph3

## Unique identifier: 950076

NOTE: For new WIs/SIs leave the Unique identifier empty and make a proposal for an Acronym.

For a revised WI/SI: Take Unique identifier and acronym as shown in 3GPP workplan.

If this is a RAN WID including Core and Perf. part, then Title, Acronym and Unique identifier refer to the feature WI.

Please tick (X) the applicable box(es) in the table below:

Either:

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

or:

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

Potential target Release: Rel-18

Note that this field above indicates the proposed Release at the time of submission of the WID to TSG approval. It can later be changed without a need to revise the WID. The updated target Release is indicated in the Work Plan. NOTE: In case of contradiction with the target dates of clause 5, clause 5 determines the target release.

## 1 Impacts

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Affects:** | UICC apps | ME | AN | CN | Others (specify) |
| **Yes** |  | X | X |  |  |
| **No** | 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 … *{Tick one box. "***Feature** */* **Building Block** */ Work Task" form a hierarchical structure. E.g. no Building Block can be proposed without a corresponding parent Feature. The full structure of all existing Work Items is shown in the 3GPP Work Plan in* [*ftp://ftp.3gpp.org/Information/WORK\_PLAN*](ftp://ftp.3gpp.org/Information/WORK_PLAN) *}*

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

NOTE: Normally, Core/Perf./Testing parts in RAN WIDs are Building Blocks. Only if they are under an SA or CT umbrella, they are defined as work tasks. If you are in doubt, please contact MCC.

### 2.2 Parent Work Item

|  |  |  |  |
| --- | --- | --- | --- |
| Parent Work / Study Items | | | |
| Acronym | Working Group | Unique ID | Title (as in 3GPP Work Plan) |
|  |  |  |  |

NOTE: RAN agreed some time ago, that it describes the feature WI + Core/Perf. part WI or Testing part WI in one WID. Therefore the table above should just include the feature WI data (In case the feature covers Core and Perf. part, please list under Working Group the leading WG of the Core part).

### 2.3 Other related Work Items and dependencies

|  |  |  |
| --- | --- | --- |
| Other related Work Items (if any) | | |
| Unique ID | Title | Nature of relationship |
|  |  | *{optional free text}* |

NOTE: Also related or dependent WIs/SIs in other TSGs should be indicated.

## 3 Justification

For UL 256 QAM, the improved throughput and accompanying capacity increase achieved from UL 256QAM could be extremely useful for research and marketing purposes, especially in some industry use cases, e.g., the machine transmits the photograph with super high resolution to the cloud, which needs Gbps data rate. In scenarios with lower path loss, the possibility to use 256QAM would be higher. However, the actual performance gain and implementation aspects need to be studied.

For beam correspondence, UE beam correspondence functionality for RRC\_CONNECTED, RRC\_INACTIVE and initial access in IDLE is specified in the RAN1 and RAN2 specifications already in Release 15 but no FR2 UE beam correspondence requirements have been defined for RRC\_INACTIVE and initial access in IDLE yet. The current UE beam correspondence requirements are only defined for RRC\_CONNECTED. Without UE beam correspondence requirements for RRC\_INACTIVE and initial access it is not possible to ensure good UE RACH msg1 performance and UL coverage in FR2 deployments due to varying UE performances. Rel-15 RRC\_INACTIVE and Rel-17 small data transmission (SDT) have a large potential in UE power efficiency, latency and signalling overhead reduction. RRC\_INACTIVE allows for reduced latency and UE power saving, while SDT further enhances this for small data sessions. Considering that UE power savings are especially important for successful FR2 operations and good end-user experience, it would be important that the networks could efficiently utilize RRC\_INACTIVE and Small Data Transmissions for FR2 as well. Without well performing UE beam correspondence support, wide usage of RRC\_INACTIVE and Small Data Transmission may not be feasible in practical FR2 deployments. To enable efficient use of RRC\_INACTIVE and Small Data Transmission in FR2 deployments to save UE power with reasonable latencies we see it important to develop FR2 UE beam correspondence requirements for RRC\_INACTIVE in Rel-18.

## 4 Objective

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

**UL 256QAM**

* Investigate and enable UL 256QAM for FR2-1 [RAN4]
  + Study the gain, operating SNR, phase noise model and implementation aspects
  + Specify the UE RF requirements
  + First priority: Targeted power classes are PC1, PC2 and PC5
  + Second priority: Targeted power class is PC3

**Beam correspondence requirements for RRC\_INACTIVE and initial access**

* Specify UE beam correspondence requirements for initial access and RRC\_INACTIVE state, for SSB-based beam correspondence without UL beam sweeping [RAN4 RF]
* For RRC\_INACTIVE specify at least requirements for Random Access SDT and Configured Grant SDT
  + Requirements for other transmission within RRC\_INACTIVE state are not precluded.
* For initial access, specify requirements and verification of beam correspondence requirements based on msg1 spherical coverage (at least)
* Study the potential impact on testability aspects (i.e., test time).

### 4.2 Objective of Performance part WI

NOTE: Leave empty if the WI proposal does not contain a RAN performance part.

**UL 256QAM**

* + Specify the BS demodulation performance

### 4.3 RAN time budget request (not applicable to RAN5 WIs/Sis)

NOTE: For all new RAN related WIs/Sis which are not led by RAN WG5 the WI/SI rapporteur has to fill out the attached Excel table to request time budgets for corresponding RAN WG meetings.  
The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI.  
One time unit (TU) corresponds to ~ 2 hours in the meeting.  
If no TU is needed, then leave the field empty otherwise enter a number >0 in the field.

For revisions of already approved WI/SI descriptions: Please remove the Excel table from the WID/SID’s zip file. The time budgets are already recorded. If you want to modify them, then this has to be done via the status report and not via a revised WID/SID.

If this WID is covering Core and Performance part, then please fill out one line for each part in the attached Excel table.

**Additional comments to the time budget request in the attached Excel table:**

## 5 Expected Output and Time scale

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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 |
| Technical report | 38.891 | User Equipment (UE) Further enhancements of NR RF requirements for frequency range 2 (FR2) for Rel-18 | RAN#102 | RAN#102 | CORE part: TR  Rapporteur:  Juan Zhang zhangjuan8@xiaomi.com |

*1: Only TSs may contain normative provisions. Study Items shall create or impact only TRs.  
“Internal TR” is intended for 3GPP internal use only whereas “External TR” may be transposed by Ops.}*

NOTE: If this is a RAN WI including Core and Perf. Part, then all new Core part specs have to be listed first and then all new Perf. Part specs. Indicate “Core part” or “Perf. Part” under Remarks for each spec.  
By default a new specs can only be new for one of both parts.

|  |  |  |  |
| --- | --- | --- | --- |
| **Impacted existing TS/TR** *{One line per specification. Create/delete lines as needed}* | | | |
| TS/TR No. | Description of change | Target completion plenary# | Remarks |
| 38.101-2 | UE Tx requirements for UL 256 QAM and beam correspondence requirements in RRC\_INACTIVE and initial access | RAN#102 Dec. 2023 | Core part |
| 38.101-3 | UE beam correspondence requirement for EN-DC/NE-DC | RAN#102 Dec. 2023 | Core part |
| 38.104 | BS demodulation requirements for UL 256QAM | RAN#103 March. 2024 | Performance part |
| 38.141-2 | BS demodulation conformance testing for UL 256QAM | RAN#103 March. 2024 | Performance part |

NOTE: If this is a RAN WI including Core and Perf. Part, then all new Core part specs have to be listed first and then all new Perf. Part specs. Indicate “Core part” or “Perf. Part” under Remarks for each spec.  
If an existing spec is affected by both (Core part and Perf. Part), then it has to be listed twice with appropriate approval dates.

## 6 Work item Rapporteur(s)

Primary: Hisashi Onozawa, Nokia, [hisashi.onozawa@nokia.com](mailto:petri.j.vasenkari@nokia.com)

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## 7 Work item leadership

RAN WG4

## 8 Aspects that involve other WGs

NOTE: For RAN WIs: Section 8 applies only toWGs outside of TSG RAN because RAN WG aspects have to be covered in section 4.

## 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| Nokia |
| Nokia Shanghai Bell |
| Xiaomi |
| Verizon |
| Intel Corporation |
| Telecom Italia |
| Ericsson |
| NTT DOCOMO, INC |
| CMCC |
| China Telecom |
| OPPO |
| LG Electronics |
| Huawei |
| HiSilicon |
| Qualcomm |
| SoftBank Corp |
| KT Corp. |
| vivo |
| CHTTL |
| AT&T |
| KDDI |