**3GPP TSG RAN Meeting #95e RP-220xxx**

**Electronic Meeting, Mar 17-23, 2022**

 **(revison of RP-213666)**

**Source: Nokia, Nokia Shanghai Bell**

**Title: Revised WID Further enhancements of NR RF requirements for frequency range 2 (FR2)**

**Document for: Approval**

**Agenda Item: 9.5.4.8**

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: Revised WID on NR RF Enhancements for FR2

## Acronym: NR\_RF\_FR2\_req\_enh2

## Unique identifier:

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

 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** |  |

## 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

|  |  |
| --- | --- |
|  | 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 SA or CT umbrella, we define them as work tasks. If you are in doubt, please contact MCC.

### 2.2 Parent and child Work Items

|  |
| --- |
| Parent and child Work Items  |
| Unique ID | Title | Nature of relationship |
|  | NR RF requirements for FR2 | Parent WID |

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 Unique ID and title.

### 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 in other TSGs should be indicated.

## 3 Justification

RAN4 completed many FR2 NR features in Rel-16. Some of the original objectives were however down scoped during the WI phase hence it would be important to continue the work in Rel-17. There was also extensive email discussion on objectives in RAN drafts reflector RP-201609.

## 4 Objective

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

The purpose of this work item is to specify the following FR2 UE features and associated requirements:

* Inter-band DL CA enhancements [RAN4 RF/RRM]
	+ Agree a method how applicable CBM/IBM information is captured into specification for a particular CA configuration. Agree how it is decided whether a certain CA configuration is assuming CBM or IBM based requirements (for-example is applicability based on operator request or some general rule or are all CA configurations applicable for both CBM and IBM).
	+ Study and if feasible define UE requirements for CBM between different freq. groups (e.g. 28GHz + 37GHz). (Study concluded to be feasible in RAN4#100)
	+ Define requirements for CA\_n258A-n260A and CA\_n257A-n259A based on IBM (Note these CA configurations will be moved to Basket WI in RAN#90 and more combinations may be added to Basket WI later). (Completed in RAN4#99e)
	+ Define UE requirements for inter-band CA within the same freq. group (e.g. 28GHz + 28GHz) and between different freq. groups (e.g. 28GHz + 37GHz) for common beam management (CBM) based on requested band combinations. Evaluate performance impact based on deployment conditions and design constraints, including outcome of MRTD requirement if any.
	+ Study and if feasible define UE RF requirements for inter-band CA within the same freq. group (e.g. 28GHz + 28GHz) for (IBM) based on explicitly requested band combinations. (on hold until there is operator request or CBM requirements are finalized for one band combination)
	+ Both RF and RRM requirement aspects are in scope for DL interband CA.
* Inter-band UL CA [RAN4 RF/RRM]
	+ Specify requirements for inter-band UL CA for two bands between different frequency groups based on IBM.
	+ Define requirements for CA\_n257A-n259A and CA\_n260-n261 based on IBM (Note this CA configuration will be moved to Basket WI in RAN#90 and more combinations may be added to Basket WI later).
	+ Both RF and RRM requirement aspects are in scope for UL interband CA.
* UL gaps for self-calibration and monitoring. [RAN4 RF/RRM, RAN2] Study and, if feasible, introduce UE specific and NW configured gap for general self-calibration and monitoring purposes including
	+ - UE Tx power management
		- Coherent uplink MIMO
	+ **Phase 1:** Study and clearly identify the performance gain over the current baseline (Rel.16 requirements) Study of RF performance evaluation/testability related to UE self-calibration and monitoring. Study network impact of UE emissions during UL gap, if any.
	+ **Phase 2:** Specify the UL gap configuration(s), related UE capability and interruptions, if needed, based on the identified performance gain in Phase 1 and UE fall back behaviour i.e. if gaps are not available for UE requesting gaps. Discussion on release independence aspects.
	+ Note: The work of FR2 UL gaps includes (NG) EN-DC, NE-DC, NR-DC and SA. FR2 UL gap operation shall have no impacts to eNB operation or LTE RRC.
* Introduce new FR2 CA BW classes and related Rx requirements to support of contiguous downlink aggregated channel BW up to 1600 MHz [RAN4 RF]
* Specify DC location reporting schemeto cover intra-band UL CA with 2 CCs and more for FR1 and FR2, and intra-band DL CA for FR2. (RAN4, RAN2)
	+ NOTE: No impact on Rel-16 method (uplinkTxDC-TwoCarrierReport-r16)

### 4.2 Objective of Performance part WI

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

Specify the necessary UE RRM performance requirements for the specified enhancements if needed.

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

NOTE: For all new RAN related WIs/SIs which is 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 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  | Series | Title | For info at TSG#  | For approval at TSG# | Remarks |
| Technical report  | 38.851 | User Equipment (UE) Further enhancements of NR RF requirements for frequency range 2 (FR2) |  | RAN#96 | Core-part Rapporteur: Petri Vasenkaripetri.j.vasenkari@nokia.com. |

NOTE: If this is a RAN WID 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 specification.
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 | NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone | RAN#96 | Core UE part |
| 38.307 | NR; Requirements on User Equipments (UEs)  | RAN#96 | potentially impacted specification, Performance UE part |
| 38.133 | NR; Requirements for support of radio resource management | RAN#96 | Core UE part |
| 38.306 | NR; User Equipment (UE) radio access capabilities | RAN#96 | impacted RAN2 specification, Core part |
| 38.321 | NR; Medium Access Control (MAC) protocol specification | RAN#96 | impacted RAN2 specification, Core part |
| 38.331 | NR; Radio Resource Control (RRC); Protocol specification | RAN#96 | impacted RAN2 specification, Core part |
| 38.300 | NR; Overall description; Stage-2 | RAN#96 | potentially impacted RAN2 specification, Core part |
| 38.133 | NR; Requirements for support of radio resource management | RAN#97 | Performance UE part |
|  |  |  |  |
|  |  |  |  |

NOTE: If this is a RAN WID 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)

Nokia

Petri Vasenkari (petri.j.vasenkari@nokia.com)

## 7 Work item leadership

Primary WG: RAN4

Secondary WGs: RAN2

## 8 Aspects that involve other WGs

None

NOTE: For RAN WIDs: 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 |
| Verizon |
| AT&T |
| T-Mobile USA |
| Softbank |
| Samsung |
| Apple Inc. |
| Mediatek |
| Huawei |
| LG Electronics |
| Xiaomi |
| vivo |
| OPPO |
| HiSilicon |
| Intel Corporation |