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

**Shanghai, China, 17th – 20th June, 2024**

**Source: RAN4 VC (Qualcomm Incorporated)**

**Title: New WID: Rel-19 High power UE (power class 1.5 and 2) for NR FR1 TDD/FDD single band, and high power UE operation (power class 1) for fixed-wireless/vehicle-mounted use cases in a single NR band**

**Document for: Approval**

**Agenda Item: 9.1.5**

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: Rel-19 High power UE (power class 1.5 and 2) for NR FR1 TDD/FDD single band, and high power UE operation (power class 1) for fixed-wireless/vehicle-mounted use cases in a single NR band

Acronym: HPUE\_NR\_FR1\_bands\_R19

Unique identifier: TBD

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** |  |

 or:

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

Potential target Release: Rel-19

NOTE: In case of contradiction with the target dates of clause 5, clause 5 determines the target release.

# 1 Impacts

{For Normative work, identify the anticipated impacts. For a Study, identify the scope of the study}

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **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

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 an SA or CT umbrella, they are defined as work tasks. If you are in doubt, please contact MCC.

### 2.2 Parent Work Item

For a brand-new topic, use “N/A” in the table below. Otherwise indicate the 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 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/Study Items (if any) |
| **Acronym** | Unique ID | Title | Nature of relationship |
| HPUE\_NR\_FR1\_TDD\_R18 | 970085 | High power UE (power class 1.5) for NR FR1 TDD single band | Rel-19 basket WI will focus on new requests made in Rel-19. |
| NR\_PC2\_UE\_FDD | 930058 | High power UE (power class 2) for one NR FDD band | The Rel-17 930058 WI completed requirements for FDD band n1 and n3 PC2. |
| HPUE\_NR\_FR1\_FDD\_R18 | 970086 | High power UE (power class 2) for NR FR1 FDD single band | The 970086 WI is the Rel-18 basket WI focused on the requirements of FDD PC2 for requested bands from operators. The current Rel-19 basket WI focuses on uncompleted requests from Rel-18 and new requests made in Rel-19. |

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

**Dependency on non-3GPP (draft) specification**:

# 3 Justification

In Rel-18 basket WI on HPUE\_NR\_FR1\_TDD\_R18, RAN4 has completed the PC1.5 HPUE feature to improve the uplink coverage for 5G SA deployments on NR TDD bands n34, n39, n40, n41, n77, n78 and n79.

In Rel-19, there are also other TDD bands e.g. n104 that need to increase UE output power to improve the users’ experience at the edge of the cell. This Work Item is a continuation of the R18 TDD HPUE basket WID that will enable HPUE (power class 1.5) operation on other NR TDD bands.

Increasing the transmit power of UE has significant benefits on extending uplink coverage area and improving the experience of cell edge users. In Rel-16 several study/work items related to HPUE have been proposed and worked on to standardize the requirements for EN-DC (FDD 23dBm+TDD 23/26dBm) scenarios. In Rel-17, PC2 HPUE for NR CA and SUL is also specified.

However, extension of uplink coverage for lower-frequency NR SA FDD band is indeed very important for operators. The increment of UE transmit power would bring performance gain for both cell average and cell edge cases, which were verified under various power control parameters as one of conclusions in Rel-17 Study on high power UE (power class 2) for one NR FDD band[1].

In the REL-17 WI on NR\_PC2\_UE\_FDD, RF requirements including Tx power and tolerance, A-MPR and receiver sensitivity degradation requirements were specified for NR FDD band n1 and n3 under PC2 operation. And there are some further requests proposed by operators on PC2 for more NR FDD bands to fulfil the commercial deployment demands.

In the Rel-18 basket WI on HPUE\_NR\_FR1\_FDD\_R18 focused on specifying RF requirements for PC2 of NR FDD bands according to operators’ requests.

This Rel-19 basket Work Item is proposed to further specify the band-specific RF requirements for PC2 of NR FDD bands, for both uncompleted Rel-18 requests and new Rel-19 requests.

[1] 3GPP TR38.861 V17.0.0 Study on high power UE (power class 2) for one NR FDD band

# 4 Objective

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

The core objectives of the WI are to develop RF requirements that are applicable to power classes 1, 1.5, and 2 UE mobile device and FWA for FDD and TDD single band as detailed below

* Objective 1. TDD band with PC1.5/2 for the different device types and PC1 only for FWVM
* Objective 2. FDD band with PC2 for the different device types and PC1 only for FWVM

Note: The bands with the default power class shall be introduced before the high power UE is requested for this band

**Table 1: Power class 1.5 NR TDD bands within FR1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR TDD band** | **Contact name, company** | **Contact email** | **Other supporting companies****(min. 3)** | **Status****(new, ongoing, completed, stopped)** |
| n104 | Ziwei Chen, CMCC | chenziwei@chinamobile.com | Huawei, HiSilicon, ZTE Corporation | New |

Table 2: Power class 2 NR FDD bands within FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR FDD band** | **Contact****name, company** | **Contact email** | **Other supporting companies****(min. 3)** | **Status****(new, ongoing, completed, stopped)** |
| n5 | Basaier Jialade, China Unicom | basejld@chinaunicom.cn | CATT, SKT, Huawei, HiSilicon, ZTE, Sanechips, China Telecom | completed for PC3, new for PC2 |
| n26 | Frank Savaglio, Telstra | frank.savaglio@team.telstra.com | Qualcomm, Ericsson, Huawei, Hisilicon | completed for PC3, new for PC2 |

Table 3: Power class 1 NR FDD bands within FR1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **NR FDD band** | **Contact****name, company** | **Contact email** | **Other supporting companies****(min. 3)** | **Status****(new, ongoing, completed, stopped)** |
| n5 | Sebastian Thalanany, US Cellular | sebastian.thalanany@uscellular.com | Nokia, Ericsson and Samsung | New from REL18 WI |
| n13 | Zheng Zhao, Verizon | zheng.zhao@VERIZONWIRELESS.COM | Nokia,,Ericsson, Qualcomm and Samsung | New from REL18 WI |
| n26 | Bill Shvodian, T Mobile | bill.shvodian@t-mobile.com | Nokia, Ericsson, Deutsche Telekom | New from REL18 WI |
| n28 | Laura White, Telstra |  | LGE, Nokia, Ericsson | New from REL18 WI |

### 4.2 Objective of Performance part WI

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

### 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 |
| *Internal TR* | *TRxx.xxx* | *Rel-19 High power UE (power class 1.5, and 2) for NR FR1 TDD single band and high power UE operation (power class 1) for fixed-wireless/vehicle-mounted use cass in a single NR band* | *TSG#xxx* | *TSG#xxx* | *Core part**xxx* |
| *Internal TR* | *TRxx.xxx* | *Rel-19 High power UE (power class 2) for NR FR1 FDD single band and high power UE operation (power class 1) for fixed-wireless/vehicle-mounted use cass in a single NR band* | *TSG#xxx* | *TSG#xxx* | *Core part**xxx* |

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 |
| TS 38.101-1 | Add HPUE single band requirements to User Equipment (UE) radio transmission and reception | *TSG#xxx* | Core 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)

NOTE: The first listed Rapporteur has the overall responsibility for this WI (incl all secondary tasks).

# 7 Work item leadership

Lead WG: RAN4

# 8 Aspects that involve other WGs

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

# 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| CMCC |
| Huawei  |
| HiSilicon |
| ZTE Corporation |
| China Unicom |
| China Telecom |
| Sanechips |
| TELUS |
| T-Mobile USA |
| OPPO |
| vivo |
| CHTTL |
| CATT |
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|  |