**3GPP TSG RAN 4 Meeting #102-e R4-2206483**

**Electronic Meeting, Feb 21- Mar 03, 2022** (revision of RP-213136)

**Source: Huawei, HiSilicon**

**Title: WID revision: Additional NR bands for UL-MIMO in Rel-17**

**Document for: Approval**

**Agenda Item: 9.37.1**

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: Additional NR bands for UL-MIMO in Rel-17

## Acronym: NR\_bands\_UL\_MIMO\_PC3

## Unique identifier: 900064

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-17}.

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 |  |  |  |
| **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 basket WI on additional NR bands for UL-MIMO in Rel-17.

|  |  |
| --- | --- |
| X | Feature |
|  | 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

In Rel-16, many requests from operators and vendors in specifications of bands with UL-MIMO PC3 UE support were seen. Many NR operating bands with UL-MIMO PC3 UE support were introduced in TS 38.101-1 but without a proper placeholder work item. According to the agreements in RAN4 in Rel-16 [cf. R4-2005654, R4-2008895], RAN4 also studies on the MRP/A-MPR impacts to the NR bands for UL MIMO with certain assumptions.

Meanwhile, more NR bands supporting PC2 and PC1.5 are introduced from Rel-16. There are also demands from operators to support UL MIMO for these HPUE bands.

In Rel-17, this basket work item is greatly in need to serve as a placeholder for introduction of NR bands with UL-MIMO for PC5, PC3, PC2 and PC1.5 UE power class.

NOTE 1: the band supporting transmit diversity will be added after the common requirement is in place.

NOTE 2: only TDD bands supporting PC2 and PC1.5 are specified for the current release.

## 4 Objective

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

### 4.1.1 Objective and scope

* Specify PC3, PC2 UE for SUL bands, and specify PC5, PC3, PC2 and PC1.5 UE for NR bands with UL MIMO configuration in FR1
	+ The bands specified are according to operators’ requests
		- Consider UE form factors and whether it has external vehicle-mounted antennas
	+ Study if needed, MPR/A-MPR impacts to the NR bands (according to requests) for UL MIMO/TxD with following assumptions
		- Focus on OOBE, spurious emissions, and ACLR
		- MIMO mode: 2x2 UL MIMO
		- Antenna isolation: 10dB for all band >1GHz
	+ Specify the specific MPR/A-MPR requirements for the proposed bands, if identified in the above study

 NOTE 1: This basket WI is not subject to block approval procedure

NOTE 2: only TDD bands supporting PC2 and PC1.5 are specified for the current release.

NOTE 3: same A-MPR is applicable for both UL MIMO and TxD for the same band with same power class and same PA configuration.

### 4.1.2 Way of working

The new request adding support for NR SUL band with UL MIMO for PC3, PC2 and NR band with UL-MIMO for PC5, PC3, PC2 and PC1.5 UE should be submitted on RAN4 reflector before tdoc submission deadline to the next RAN4 meeting (1 week before the meeting). The basket WI will then be updated with the new requests (section 4.1.3, Table 4.1.3-1) and submitted to next RAN4 meeting for endorsement, before submission to RAN meeting for approval.

When the work is completed, all draft CRs related to one request will be submitted in the same RAN4 meeting to check consistency. If they are endorsed, the basket WI Rapporteur will merge all draft CRs from all requests in big CRs (one per TS specification). After the RAN4 meeting preceding a RAN meeting, those big CRs will be sent on RAN4 reflector for email approval (1 week) and, if agreed, they will be submitted to following RAN meeting.

### 4.1.3 Requests overview

Table 4.1.3-1: Requests tracking for NR bands supporting UL MIMO

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Band** | **Power Class** | **Contact name, company** | **Contact email** | **Other supporting companies** | **Justification** | **Additional information** | **status** |
|  |  |  |  | *Note: minimum 3* | *Note: Whether study is needed on MPR/A-MPR impacts to the NR band requested* | *Note: if this requested band with UL MIMO applies to all UE form factor* |  |
| n95 | PC3 | Zhang, Meng,Huawei | Zhangmeng62@huawei.com | CMCC, Spreadtrum Communications, HiSilicon | Not needed. Corresponding TDD band n34 has already been introduced. |  | Completed |
| n97 | PC3 | Zhang, Meng,Huawei | Zhangmeng62@huawei.com | CMCC, Spreadtrum Communications, HiSilicon | Not needed. Corresponding TDD band n40 has already been introduced. |  | Completed |
| n98 | PC3 | Zhang, Meng,Huawei | Zhangmeng62@huawei.com | CMCC, Spreadtrum Communications, HiSilicon | Not needed. Corresponding TDD band n39 has already been introduced. |  | Completed |
| n84 | PC3 | Zhang, Meng,Huawei | Zhangmeng62@huawei.com | CKH IoD UK, KDDI, HiSilicon | Not needed. Corresponding FDD band n1 has already been introduced. |  | Completed |
| n40 | PC2 | Zhang, Peng,Huawei | zhangpeng169@huawei.com | Reliance JIO, CMCC, CATT, HiSilicon | Not needed. Corresponding TDD band n40 supporting PC2 has already been introduced. |  | Completed |
| n24 | PC3 | Serge Nguyen,Ligado Networks | Serge@Ligado.com | Nokia, Saankhya, Mavenir, Federated Wireless, Globalstar | Not needed: FDD band n24 has been approved |  | Completed |
| n99 | PC3 | Serge Nguyen,Ligado Networks | Serge@Ligado.com | Saankhya, Mavenir, Federated Wireless, Globalstar | Not needed: SUL band n99 has been approved |  | Completed |
| n77 | PC1.5 | Zheng Zhao, Verizon | zheng.zhao@verizonwireless.com | Qualcomm, Ericsson, Nokia, Samsung, AT&T |  |  | Completed |
| n78 | PC1.5 | Zheng Zhao, Verizon | zheng.zhao@verizonwireless.com | Qualcomm, Ericsson, Nokia, Samsung |  |  | Completed |
| n95 | PC2 | Zhang Xiaoran, CMCC | zhangxiaoran@chinamobile.com | CATT, Huawei, HiSilicon | Not needed. Corresponding TDD band n34 has already been introduced. |  | New |
| n97 | PC2 | Zhang Xiaoran, CMCC | zhangxiaoran@chinamobile.com | CATT, Huawei, HiSilicon | Not needed. Corresponding TDD band n40 has already been introduced. |  | New |
| n98 | PC2 | Zhang Xiaoran, CMCC | zhangxiaoran@chinamobile.com | CATT, Huawei, HiSilicon | Not needed. Corresponding TDD band n39 has already been introduced. |  | New |
| n28 | PC3 | Zhang Xiaoran, CMCC | zhangxiaoran@chinamobile.com | CATT, Huawei, HiSilicon | Not needed. The FDD band n28 has already been introduced. |  | New |
| n46 | PC5 | Dominique Brunel, Skyworks | Dominique.Brunel@SKYWORKSINC.COM | Charter Communications, Inc, Qualcomm Incorporated, BT plc | Not needed. The unlicensed band has already been introduced. |  | New |
| n96 | PC5 | Dominique Brunel, Skyworks | Dominique.Brunel@SKYWORKSINC.COM | Charter Communications, Inc, Qualcomm Incorporated, BT plc | Not needed. The unlicensed band has already been introduced. |  | New |
| n102 | PC5 | Dominique Brunel, Skyworks | Dominique.Brunel@SKYWORKSINC.COM | Charter Communications, Inc, Qualcomm Incorporated, BT plc | Not needed. The unlicensed band has already been introduced. |  | New |

Note: For SUL bands, consider only the case of co-located and synchronized network deployment for the SUL and NUL carriers. The requirements for UL-MIMO for SUL bands apply when the UE is configured with UL Tx switching between SUL and NUL carrier(s).

### 4.2 Objective of Performance part WI

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

Specify if needed, release independent aspects of the PC3, PC2 and PC1.5 UE support to requested NR UL MIMO bands.

### 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 |
|  |  |  |  |  |  |

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 |
| 38.101-1 | Add in the band list of NR operating UL MIMO bands for PC3, PC2 and PC1.5 UE | #95 | Core part |
| 38.307 | Add release independent requirements for NR operating UL MIMO bands for PC3, PC2 and PC1.5 UE | #95 | Perf. 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)

*LIU, Ye*

*Huawei,*

*leo.liuye@huawei.com*

## 7 Work item leadership

*R4*

## 8 Aspects that involve other WGs

*None*

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

## 9 Supporting Individual Members

|  |
| --- |
| Supporting IM name |
| Huawei |
| HiSilicon |
| CMCC |
| CKH IoD UK |
| KDDI |
| CHTTL |
| Spreadtrum Communications |
| AT&T |
|  |
|  |
|  |
|  |
|  |
|  |
|  |
|  |