**3GPP TSG RAN Meeting #98-e RP-223515 RP-221884**

**Electronic Meeting, December 12-16, 2022**

**Source: CMCC, China Telecom**

**Title: New WID: NR CA band combinations with two SUL cells in Rel-18**

**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: NR CA band combinations with two SUL cells in Rel-18

## Acronym: NR\_CA\_R18\_two SUL

## Unique identifier: TBA

NOTE: For new WIs/SIs leave the Unique identifier emptyand 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 |  |  |  |
| **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 …

|  |  |
| --- | --- |
| 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 |
| 900064 | Rel-18 Band combinations for SA NR supplementary uplink (SUL), NSA NR SUL, NSA NR SUL with UL sharing from the UE perspective (ULSUP) | *{optional free text}*  |

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

## 3 Justification

NR CA band combinations with SUL band were introduced from Rel-16. In Rel-16, intra-band CA with SUL band combination was supported, and the CA configuration was extended to inter-band CA with SUL band combination in Rel-17.

With fast deployment of 5G in China, more spectrum currently utilized by GSM, UMTS and LTE will be evolved into NR deployment recently. As an example, 1.9GHz and 2GHz TDD bands are previously used by 4G and 3G, which are specified as NR TDD bands n39 and n34 in Rel-15 and also specified as SUL bands n98 and n95 in Rel-16 and Rel-17 respectively. The spectrum for these two bands themselves are not very large, thus single SUL band may not fully comply with the fast increased UL usage demanded by the operator. Therefore, NR CA configurations with two SUL band combinations, i.e. two SUL bands in two cells together with other TDD NR band(s), are emerging as a prospective solution for operators. Similarly, 700MHz, 850MHz, 900MHz, 1.8GHz and 2.1GHz bands defined as SUL bands n83, n89, n81, n80 and n84 in which 2 SUL bands in conjunction with NR TDD bands, e.g. n78, n79 are highly interested by operators holding the spectrum to boost the wide band UL performance.

It is known that SUL band combination includes one SUL band and one NR band in a single cell. Aggregating a SUL band combination with another NR band and follow CA framework to specify the band combination specific requirements was already supported in previous SUL basket WI. However, the current SUL basket WI only considers one SUL band. To address the specific spectrum demand by operators, it is preferred to have a dedicated spectrum WI for NR CA combinations with two SUL cells that follow CA framework specified by both RAN1 and RAN4 specifications.

In addition, since both SUL bands and NR TDD bands could support different power classes, the requirements for NR CA with two SUL cells should cover at least PC3 and PC2 cases in Rel-18.

## 4 Objective

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

### 4.1.1 Objective and scope

The objectives of the core part are as follows:

* Specify the PC3, PC2 band-combination specific RF requirements for the listed CA configurations with two SUL cells including at least
	+ - Applicable frequencies if necessary
		- Applicable bandwidths and bandwidth sets if necessary
* Analyse combinations that have self-desensitization due to following reasons:
	+ - TX Harmonic and/or intermodulation overlap of receive band
		- TX signal overlap of receiver harmonic frequency
		- TX frequency being in close proximity of one of the receive bands
		- Any other identified reasons such that insufficient cross band isolation, harmonic mixing
* For the combination where self-desensitization exists, specify at least needed
	+ - ∆TIB, c and ∆RIB, c
		- Reference sensitivity exceptions including MSD test cases
		- Exceptions to the out-of-band blocking requirement

The NR inter-band CA band combination configurations with two SUL cells are defined in Table 1 below:

NOTE 1: the fall back combinations/configurations should be finalized no later than the proposed NR CA configurations.

NOTE 2: No simultaneous transmission on the two SUL bands according to Table 1.

**Table 1: NR Inter-band CA with two SUL cells**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **NR CA****configuration** | **Uplink CA****configuration or SUL configuration** | **Power Class** | **contact****name, company** | **Contact email** | **other supporting companies****(min. 3)** | **status****(new, ongoing, completed, stopped)** |
| CA\_SUL\_n41A-n95A\_SUL\_n79A-n98A | SUL\_n41A-n95ASUL\_n79A-n98ACA\_n41A-n79A | PC3, PC2 | Xiaoran ZHANG, CMCC | zhangxiaoran@chinamobile.com | CBN, Huawei, HiSilicon | New |
| CA\_SUL\_n41A-n98A\_SUL\_n79A-n95A | SUL\_n41A-n98A SUL\_n79A-n95ACA\_n41A-n79A | PC3, PC2 | Xiaoran ZHANG, CMCC | zhangxiaoran@chinamobile.com | CBN, Huawei, HiSilicon | New |
| CA\_SUL\_n41A-n83A\_SUL\_n79A-n98A | SUL\_n41A-n83A SUL\_n79A-n98ACA\_n41A-n79A | PC3 applicable for n83 of SUL\_n41A-n83A;PC3 and PC2 for other uplink configurations  | Xiaoran ZHANG, CMCC | zhangxiaoran@chinamobile.com | CBN, Huawei, HiSilicon | New |
| CA\_SUL\_n41A-n83A\_SUL\_n79A-n95A | SUL\_n41A-n83A SUL\_n79A-n95ACA\_n41A-n79A | PC3 applicable for n83 of SUL\_n41A-n83A;PC3 and PC2 for other uplink configurations | Xiaoran ZHANG, CMCC | zhangxiaoran@chinamobile.com | CBN, Huawei, HiSilicon | New |
| CA\_SUL\_n78A-n81A\_SUL\_n78A-n84A | SUL\_n78A-n81A SUL\_n78A-n84ACA\_n78C | PC3 applicable for n81 of SUL\_n78A-n81A and n84 of SUL\_n78A-n84A;PC3 and PC2 for other uplink configurations  | Lei GAO, China Telecom | gaol8@chinatelecom.cn | China Unicom, Huawei, HiSilicon | New |
| CA\_SUL\_n78A-n80A\_SUL\_n78A-n84A | SUL\_n78A-n80A SUL\_n78A-n84ACA\_n78C | PC3 applicable for n80 of SUL\_n78A-n80A and n84 of SUL\_n78A-n84A;PC3 and PC2 for other uplink configurations  | Lei GAO, China Telecom | gaol8@chinatelecom.cn | China Unicom, Huawei, HiSilicon | New |

### 4.2 Objective of Performance part WI

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

Specify the necessary performance requirements such as release independence in TS 38.307.

### 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 |
| TR | 38.xxx | NR CA band combinations with two SUL cells | RAN#101 | RAN#102 |  |

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 NR CA combinations with two SUL cells | #102 | Core part |
| 38.307 | Add release independent requirements for NR CA combinations with two SUL cells | #102 | 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)

Xiaoran ZHANG, CMCC, zhangxiaoran@chinamobile.com

Lei GAO, China Telecom, gaol8@chinatelecom.cn

## 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 |
| CMCC |
| CBN |
| China Telecom |
| China Unicom |
| Huawei |
| HiSilicon |
| [Qualcomm] |
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