**3GPP TSG RAN Meeting #88e *draft* RP-201338**

**Electronic Meeting, June 29 - July 3, 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **38.101-1** | **CR** | **0293** | **rev** | **4** | **Current version:** | **16.3.0** |  |
|  |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  |
| ***Title:***  | CR to TS 38.101-1: Switching time mask between two uplink carriers in UL CA and SUL |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** | China Telecom, CMCC, China Unicom, KDDI, Spreadtrum, CATT, CHTTL, MediaTek, OPPO, Huawei, HiSilicon, vivo, Xiaomi, Orange, Apple, Nokia, Nokia Shanghai Bell |
|  |  |
| ***Work item code:*** | NR\_RF\_FR1-Core |  | ***Date:*** | 2020-07-02 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | For UE supporting maximum two concurrent transmission, Tx switching between two uplink carriers can enable 1 Tx on one carier and 2 Tx on the other carrier.  |
|  |  |
| ***Summary of change:*** | Introduce UE time mask requirements to allow switching between two uplink carriers for inter-band UL CA and SUL.Note: this is the revision of the CR in R4-2009143 at RAN4 #95e. |
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| ***Consequences if not approved:*** | UE is not allowed to support Tx switching between two uplink carriers. |
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| ***Clauses affected:*** | 3.3, New section 6.3A.3.3 and 6.3C |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS 38.521-1 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*< Start of first change >*

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

*< Unchanged part omitted >*

TAE Time Alignment Error

TAG Timing Advance Group

Tx Transmitter

UL MIMO Uplink Multiple Antenna transmission

*< End of first change >*

*< Start of second change >*

### 6.3A.3 Transmit ON/OFF time mask for CA

#### 6.3A.3.1 Void

#### 6.3A.3.2 Void

#### 6.3A.3.3 Transmit ON/OFF time mask for inter-band CA

##### 6.3A.3.3.1 General

For inter-band carrier aggregation with uplink assigned to two NR bands, the general output power ON/OFF time mask specified in clause 6.3.3.1 is applicable for each component carrier during the ON power period and the transient periods. The OFF period as specified in clause 6.3.3.1 shall only be applicable for each component carrier when all the component carriers are OFF.

##### 6.3A.3.3.2 Time mask for switching between two uplink carriers

In addition to the requirements in 6.3A.3.3.1 and the maximum output power requirement specified in Table 6.2A.1.3-1 with uplink assigned to two NR bands, the switching time mask specified in this sub-clause is applicable for an uplink band pair of a inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanisms specified in sub-clause 6.1.0 of TS 38.214 [10], where NR UL carrier 1 is capable of one transmit antenna connector and NR UL carrier 2 is capable of two transmit antenna connectors with 3dB boosting on the maximum output power when the capability *uplinkTxSwitchingPowerBoosting* is present and the IE *powerboostingTxSwitching* is set to 1, and the two uplink carriers are in different bands with different carrier frequencies. The UE shall support the switch between single layer transmission with one antenna port and two-layer transmission with two antenna ports on the two uplink carriers following the scheduling commands and rank adaptation, i.e., both single layer and two-layer transmission with 2 antenna ports, and single layer transmission with 1 antenna port shall be supported on NR UL carrier 2.

The switching periods described in Figure 6.3A.3.3.2-1a and Figure 6.3A.3.3.2-1b are located in either NR carrier 1 or carrier 2 as indicated in RRC signalling *uplinkTxSwitchingPeriodLocation* [7], and the length of uplink switching period *X* is less than the value indicated by UE capability *uplinkTxSwitchingPeriod*.



Figure 6.3A.3.3.2-1a: Time mask for switching between UL carrier 1 and UL Carrier 2, where the switching period is located in carrier 1



Figure 6.3A.3.3.2-1b: Time mask for switching between UL carrier 1 and UL Carrier 2, where the switching period is located in carrier 2

The requirements apply for the case of co-located and synchronized network deployment for the two uplink carriers.

The requirements apply for the case of single TAG for the two uplink carriers, i.e., the same uplink timing for the two carriers as described in sub-clause 4.2 of TS 38.213 [8].

*< End of second change >*

*< Start of third change >*

## 6.3C Output power dynamics for SUL

### 6.3C.1 Void

### 6.3C.2 Void

### 6.3C.3 Transmit ON/OFF time mask for SUL

#### 6.3C.3.1 Time mask for switching between two uplink carriers

The switching time mask specified in this sub-clause is applicable for an uplink band pair of a SUL configuration when the capability *uplinkTxSwitchingPeriod* is present, is only applicable for uplink switching mechanisms specified in sub-clause 6.1.0 of TS 38.214 [10], where NR SUL carrier 1 is capable of one transmit antenna connector and NR UL carrier 2 is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies. The UE shall support the switch between single layer transmission with one antenna port and two-layer transmission with two antenna ports on the two uplink carriers following the scheduling commands and rank adaptation, i.e., both single layer and two-layer transmission with 2 antenna ports, and single layer transmission with 1 antenna port shall be supported on NR UL carrier 2.

The switching periods described in Figure 6.3C.3.1-1a and Figure 6.3C.3.1-1b are located in either NR carrier 1 or carrier 2 as indicated in RRC signalling *uplinkTxSwitchingPeriodLocation* [7], and the length of uplink switching period *X* is less than the value indicated by UE capability *uplinkTxSwitchingPeriod*.



Figure 6.3C.3.1-1a: Time mask for switching between SUL carrier 1 and UL Carrier 2, where the switching period is located in carrier 1



Figure 6.3C.3.1-1b: Time mask for switching between SUL carrier 1 and UL Carrier 2, where the switching period is located in carrier 2

The requirements apply for the case of co-located and synchronized network deployment for the two uplink carriers.

The requirements apply for the case of single TAG for the two uplink carriers, i.e., the same uplink timing for the two carriers as described in sub-clause 4.2 of TS 38.213 [8].

*< End of third change >*