**3GPP TSG-RAN WG1 Meeting #106b-e *R1-210xxxx***

**Electronic Meeting, October 11th – 19th, 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.214** | **CR** | **<CR#>** | **rev** | **-** | **Current version:** | **16.7.0** |  |
|  | | | | | | | | |
| *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 | **X** | Core Network |  |

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| ***Title:*** | UL Tx Switching enhancements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_RF\_FR1\_enh-Core | | | | |  | ***Date:*** | | | 2021-11-01 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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 can be 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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduction of UL Tx Switching enhancements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | In section 6.1.6.2.1 (new) and 6.1.6.3, introduced the specification support for inter-band UL CA, if 2Tx-2Tx UL Tx switching between 1 carrier on band A and 2 carriers on band B is configured. | | | | | | | | |
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| ***Consequences if not approved:*** | | Incomplete support of UL Tx Switching enhancements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.1.6.2.1 (new), 6.1.6.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<omitted text>

### 6.1.6 Uplink switching

The UE may omit uplink transmission during the uplink switching gap if the conditions defined in this clause are met and the UE is configured with *uplinkTxSwitching*. The switching gap is indicated by UE capability *uplinkTxSwitchingPeriod*:

- If a UE indicated a capability for uplink switching with *BandCombination-UplinkTxSwitch* for a band combination, and if it is for that band combination

- Configured with a MCG using E-UTRA radio access and with a SCG using NR radio access (EN-DC), or

- Configured with uplink carrier aggregation, or

- Configured in a serving cell with two uplink carriers with higher layer parameter *supplementaryUplink*.

the conditions under which the switching gap may be present and the location of the switching gap are defined for each of the cases in clauses 6.1.6.1, 6.1.6.2, and 6.1.6.3 respectively.

If an uplink switching is triggered for an uplink transmission starting at *T0*, after *T0-Toffset*, the UE is not expected to cancel the uplink switching, or to trigger any other new uplink switching occurring before *T0* for any other uplink transmission that is scheduled after *T0-Toffset*, where *Toffset* is the UE processing procedure time defined for the uplink transmission triggering the switch given in clause 5.3, clause 5.4, clause 6.2.1, clause 6.4 and in clause 9 of [6, TS 38.213].

The UE does not expect to perform more than one uplink switching in a slot with *µUL* = max(*µUL, 1, µUL, 2*), where the *µUL, 1* corresponds to the subcarrier spacing of the active UL BWP of one uplink carrier before the switching gap and the *µUL, 2* corresponds to the subcarrier spacing of the active UL BWP of the other uplink carrier after the switching gap.

#### 6.1.6.1 Uplink switching for EN-DC

For a UE indicating a capability for uplink switching with *BandCombination-UplinkTxSwitch* for a band combination, and if it is for that band combination configured with a MCG using E-UTRA radio access and with a SCG using NR radio access (EN-DC), if the UE is configured with uplink switching with parameter *uplinkTxSwitching*,

- for the UE configured with *switchedUL* by the parameter *uplinkTxSwitchingOption*, when the UE is to transmit in the uplink based on DCI(s) received before or based on a higher layer configuration(s):

- when the UE is to transmit an NR uplink that takes place after an E-UTRA uplink on another uplink carrier then the UE is not expected to transmit for the duration of on any of the two carriers.

- when the UE is to transmit an E-UTRA uplink that takes place after an NR uplink on another uplink carrier then the UE is not expected to transmit for the duration of on any of the two carriers.

- the UE is not expected to transmit simultaneously on the NR uplink and the E-UTRA uplink. If the UE is scheduled or configured to transmit any NR uplink transmission overlapping with an E-UTRA uplink transmission, the NR uplink transmission is dropped,

- for the UE configured with *uplinkTxSwitchingOption* set to 'dualUL'*,* when the UE is to transmit in the uplink based on DCI(s) received before or based on a higher layer configuration(s):

- when the UE is to transmit an NR two-port uplink that takes place after an E-UTRA uplink on another uplink carrier then the UE is not expected to transmit for the duration of on any of the two carriers.

- when the UE is to transmit an E-UTRA uplink that takes place after an NR two-port uplink on another uplink carrier then the UE is not expected to transmit for the duration of on any of the two carriers.

- the UE is not expected to transmit simultaneously a two- port transmission on the NR uplink and the E-UTRA uplink.

- in all other cases the UE is expected to transmit normally all uplink transmissions without interruptions.

- when the UE is configured with *tdm-PatternConfig* or by *tdm-PatternConfig2*

- for the E-UTRA subframes designated as uplink by the configuration, the UE assumes the operation state in which one-port E-UTRA uplink can be transmitted.

- for the E-UTRA subframes other than the ones designated as uplink by the configuration, the UE assumes the operation state in which two-port NR uplink can be transmitted.

#### 6.1.6.2 Uplink switching for carrier aggregation

For a UE indicating a capability for uplink switching with *BandCombination-UplinkTxSwitch* for a band combination, and if it is for that band combination configured with uplink carrier aggregation:

- If the UE is configured with uplink switching with parameter *uplinkTxSwitching*, when the UE is to transmit in the uplink based on DCI(s) received before or based on a higher layer configuration(s):

- When the UE is to transmit a 2-port transmission on one uplink carrier and if the preceding uplink transmission is a 1-port transmission on another uplink carrier, then the UE is not expected to transmit for the duration of on any of the two carriers.

- When the UE is to transmit a 1-port transmission on one uplink carrier and if the preceding uplink transmission is a 2-port transmission on another uplink carrier, then the UE is not expected to transmit for the duration of on any of the two carriers.

- For the UE configured with *uplinkTxSwitchingOption* set to 'switchedUL', when the UE is to transmit a 1-port transmission on one uplink carrier and if the preceding uplink transmission was a 1-port transmission on another uplink carrier, then the UE is not expected to transmit for the duration of on any of the two carriers.

- For the UE configured with *uplinkTxSwitchingOption* set to 'dualUL', when the UE is to transmit a 2-port transmission on one uplink carrier and if the preceding uplink transmission was a 1-port transmission on the same uplink carrier and the UE is under the operation state in which 2-port transmission cannot be supported in the same uplink carrier, then the UE is not expected to transmit for the duration of on any of the two carriers.

- For the UE configured with *uplinkTxSwitchingOption* set to 'dualUL', when the UE is to transmit a 1-port transmission on one uplink carrier and if the preceding uplink transmission was a 1-port transmission on another uplink carrier and the UE is under the operation state in which 2-port transmission can be supported on the same uplink carrier, then the UE is not expected to transmit for the duration of on any of the two carriers.

- The UE is not expected to be scheduled or configured with uplink transmissions that result in simultaneous transmission on two antenna ports on one uplink carrier, and any transmission on another uplink carrier.

- In all other cases the UE is expected to transmit normally all uplink transmissions without interruptions.

##### 6.1.6.2.1 2Tx Uplink switching for carrier aggregation

[For a UE indicating a capability for uplink switching with *BandCombination-UplinkTxSwitch2TX* for a band combination, and if it is for that band combination configured with uplink carrier aggregation:]

- If the UE is configured with uplink switching with parameter *uplinkTxSwitching*, when the UE is to transmit in the uplink based on DCI(s) received before or based on a higher layer configuration(s):

- When the UE is to transmit a 2-port transmission on one uplink carrier on one band and if the preceding uplink transmission included a 1-port or 2-port transmission on another uplink carrier on another band, then the UE is not expected to transmit for the duration of on any of the uplink carriers.

- When the UE is to transmit a 1-port or 2-port transmission on one uplink carrier on one band if the preceding uplink transmission is a 2-port transmission on another uplink carrier on one band, then the UE is not expected to transmit for the duration of on any of the uplink carriers.

- For the UE configured with *uplinkTxSwitchingOption* set to 'switchedUL', when the UE is to transmit a 1-port transmission on one uplink carrier on one band and if the preceding uplink transmission was a 1-port transmission on another uplink carrier on one band, then the UE is not expected to transmit for the duration of on any of the two carriers.

- For the UE configured with *uplinkTxSwitchingOption* set to 'dualUL',

- When the UE transmitted 1-port or 2-port transmission on one carrier on one band followed by no transmission on this carrier and 1-port transmission on the other carrier on another band, if the UE was configured with [yyy] for subsequent switching consideration the UE shall consider this as if 1-port transmission was transmitted on both uplinks, otherwise the UE shall consider this as if 2-port transmission took place on the transmitting carrier.- The UE is not expected to be scheduled or configured with uplink transmissions that results in simultaneous transmission on two antenna ports on one uplink carrier, and any transmission on another uplink carrier.

- When the UE is to transmit a 2-port transmission on one uplink carrier and if the preceding uplink transmission was a 1-port on the same uplink carrier and the UE is under the operation state in which 2-port transmission cannot be supported in either uplink carrier, then the UE is not expected to transmit for the duration of on either of the two carriers.

- In all other cases the UE is expected to transmit normally all uplink transmissions without interruptions.

#### 6.1.6.3 Uplink switching for supplementary uplink

For a UE indicating a capability for uplink switching with *BandCombination-UplinkTxSwitch* [indicating support for 1 Tx on the supplementary uplink carrier, or *BandCombination-UplinkTxSwitch2TX* indicating support for 2 Tx operation on the supplementary uplink carrier] for a band combination, and if it is for that band combination configured in a serving cell with two uplink carriers with higher layer parameter *supplementaryUplink*:

- If the UE is configured with uplink switching with parameter *uplinkTxSwitching*,

- If the UE is to transmit any uplink channel or signal on a different uplink on a different band from the preceding transmission occasion based on DCI(s) received before or based on a higher layer configuration(s), then the UE assumes that an uplink switching is triggered in a duration of switching gap , where is the start time of the first symbol of the transmission occasion of the uplink channel or signal and is the preparation procedure time of the transmission occasion of the uplink channel or signal given in clause 5.3, clause 5.4, clause 6.2.1, clause 6.4 and in clause 9 of [6, TS 38.213], respectively. During the switching gap , the UE is not expected to transmit on any of the two uplinks.

- In all other cases the UE is expected to transmit normally all uplink transmissions without interruptions.

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