**3GPP TSG RAN WG1 #104b-e R1-210xxxx**

**e-Meeting, April 12th – 20th, 2021**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.214** | **CR** | **DRAFT** | **rev** |  | **Current version:** | **16.5.0** |  |
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| *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:*** | Timelines for SRS carrier switching | | | | | | | | | |
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| ***Source to WG:*** | Qualcomm Incorporated | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI16, NR\_newRAT-Core | | | | |  | ***Date:*** | | | 2021-04-06 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***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 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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | In RAN1#104, the following was concluded (see R1-2101432):  **Conclusion**  For the dropping rules for SRS carrier switching, at least for Rel-16, the UE may only be able to take into account   * the DCI(s) received *SRS-SwitchingTime* + *N2* before the SRS transmission and N2 before the conflicting channel transmission, and * the SP-CSI and SP-SRS considered active *SRS-SwitchingTime* + *N2* before the SRS transmission and N2 before the conflicting channel transmission   N2 is the time interval corresponding to the smaller subcarrier spacing between the source and target CCs, and the corresponding scheduling cells.  Discuss in RAN1#104b-e whether and how to capture the above in the specification for Rel-16. | | | | | | | | |
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| ***Summary of change:*** | | Specify the above conclusion. | | | | | | | | |
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| ***Consequences if not approved:*** | | Timelines for SRS carrier switching are not specified, leading to unpredictable UE behavior under some conditions. | | | | | | | | |
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| ***Clauses affected:*** | | 6.2.1.3 | | | | | | | | |
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|  | | **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 ... | | |
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| ***Other comments:*** | | **Isolated impact analysis:**  This CR affects only the functionality of prioritization / dropping rules for SRS carrier switching.  If the UE is implemented according to the CR and the gNB is not, or viceversa, the UE and gNB may have different assumptions on the channels / signals that are dropped. | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

6.2.1.3 UE sounding procedure between component carriers

For an SRS transmission starting in symbol of carrier and a conflicting transmission in carrier starting in symbol, the UE shall apply the prioritization / dropping rules in the remainder of this subclause taking into account:

* DCI(s) for which the time interval between the last symbol of PDCCH and is at leastsymbols and an additional time duration , and the time interval between the last symbol of PDCCH and is at least symbols*;* and
* semi-persistent CSI reports or SRS considered active at least symbols and an additional time duration before , and considered active at least symbols before .

where , and the time interval unit of OFDM symbol is counted based on the smaller subcarrier spacing across and their corresponding scheduling cells.For a carrier of a serving cell with slot formats comprised of DL and UL symbols, not configured for PUSCH/PUCCH transmission, the UE shall not transmit SRS whenever SRS transmission (including any interruption due to uplink or downlink RF retuning time [11, TS 38.133] as defined by higher layer parameters *switchingTimeUL* and *switchingTimeDL* of *SRS-SwitchingTimeNR)* on the carrier of the serving cell and PUSCH/PUCCH transmission carrying HARQ-ACK/positive SR/RI/CRI/SSBRI and/or PRACH happen to overlap in the same symbol and that can result in uplink transmissions beyond the UE's indicated uplink carrier aggregation capability included in [13, TS 38.306].

For a carrier of a serving cell with slot formats comprised of DL and UL symbols, not configured for PUSCH/PUCCH transmission, the UE shall not transmit a periodic/semi-persistent SRS whenever periodic/semi-persistent SRS transmission (including any interruption due to uplink or downlink RF retuning time [11, TS 38.133] as defined by higher layer parameters *switchingTimeUL* and *switchingTimeDL* of *SRS-SwitchingTimeNR)* on the carrier of the serving cell and PUSCH transmission carrying aperiodic CSI happen to overlap in the same symbol and that can result in uplink transmissions beyond the UE's indicated uplink carrier aggregation capability included in [13, TS 38.306].

For a carrier of a serving cell with slot formats comprised of DL and UL symbols, not configured for PUSCH/PUCCH transmission, the UE shall drop PUCCH/PUSCH transmission carrying periodic/semi-persistent CSI comprising only CQI/PMI/L1-RSRP/L1-SINR, and/or SRS transmission on another serving cell configured for PUSCH/PUCCH transmission whenever the transmission and SRS transmission (including any interruption due to uplink or downlink RF retuning time [11, TS 38.133] as defined by higher layer parameters *switchingTimeUL* and *switchingTimeDL* of *SRS-SwitchingTimeNR)* on the serving cell happen to overlap in the same symbol and that can result in uplink transmissions beyond the UE's indicated uplink carrier aggregation capability included in [13, TS 38.306].

For a carrier of a serving cell with slot formats comprised of DL and UL symbols, not configured for PUSCH/PUCCH transmission, the UE shall drop PUSCH transmission carrying aperiodic CSI comprising only CQI/PMI/L1-RSRP/L1-SINR whenever the transmission and aperiodic SRS transmission (including any interruption due to uplink or downlink RF retuning time [11, TS 38.133]) as defined by higher layer parameters *switchingTimeUL* and *switchingTimeDL* of *SRS-SwitchingTimeNR)* on the carrier of the serving cell happen to overlap in the same symbol and that can result in uplink transmissions beyond the UE's indicated uplink carrier aggregation capability included in [13, TS 38.306].

For an aperiodic SRS triggered in DCI format 2\_3 and if the UE is configured with higher layer parameter *srs-TPC-PDCCH-Group* set to 'typeA', and given by *SRS-CarrierSwitching,* without PUSCH/PUCCH transmission, the order of the triggered SRS transmission on the serving cells follow the order of the serving cells in the indicated set of serving cells configured by higher layers, where the UE in each serving cell transmits the configured one or two SRS resource set(s) with higher layer parameter *usage* set to 'antennaSwitching' and higher layer parameter *resourceType* in *SRS-ResourceSet* set to 'aperiodic'.

For an aperiodic SRS triggered in DCI format 2\_3 and if the UE is configured with higher layer parameter *srs-TPC-PDCCH-Group* set to 'typeB' without PUSCH/PUCCH transmission, the order of the triggered SRS transmission on the serving cells follow the order of the serving cells with aperiodic SRS triggered in the DCI, and the UE in each serving cell transmits the configured one or two SRS resource set(s) with higher layer parameter *usage* set to 'antennaSwitching' and higher layer parameter *resourceType* in *SRS-ResourceSet* set to 'aperiodic'.

If the UE is not configured for PUSCH/PUCCH transmission on carrier *c1* with slot formats comprised of DL and UL symbols, and if the UE is not capable of simultaneous reception and transmission on carrier *c1*and serving cell *c2*, the UE is not expected to be configured or indicated with SRS resource(s) such that SRS transmission on carrier *c1* (including any interruption due to uplink or downlink RF retuning time [11, TS 38.133] as defined by higher layer parameters *switchingTimeUL* and *switchingTimeDL* of *SRS-SwitchingTimeNR*) would collide with the REs corresponding to the SS/PBCH blocks configured for the UE or the slots belonging to a control resource set indicated by *MIB* or *SIB1* on serving cell *c2*.

For *n*-th (*n ≥* 1) aperiodic SRS transmission on a cell *c*, upon detection of a positive SRS request on a grant, the UE shall commence this SRS transmission on the configured symbol and slot provided

- it is no earlier than the summation of

- the maximum time duration between the two durations spanned by N OFDM symbols of the numerology of cell *c* and the cell carrying the grant respectively, and

- the UL or DL RF retuning time [11, TS 38.133] as defined by higher layer parameters *switchingTimeUL* and *switchingTimeDL* of *SRS-SwitchingTimeNR,*

- it does not collide with any previous SRS transmissions, or interruption due to UL or DL RF retuning time.

otherwise, *n*-th SRS transmission is dropped, where N is the reported capability as the minimum time interval in unit of symbols, between the DCI triggering and aperiodic SRS transmission.

In case of inter-band carrier aggregation, a UE can simultaneously transmit SRS and PUCCH/PUSCH across component carriers in different bands subject to the UE's capability.

In case of inter-band carrier aggregation, a UE can simultaneously transmit PRACH and SRS across component carriers in different bands subject to UE's capability.