**3GPP TSG RAN WG1 #102-e R1-200xxxx**

**e-Meeting, August 17th – 28th, 2020**

**Agenda item:** 5

**Source:** Moderator (Qualcomm Incorporated)

**Title:** [102-e-LS-AI5-04] Discussion on NR SRS carrier switching

**Document for:** Discussion and Decision

# Background

In LS R1-2005209, RAN1 received the following questions from RAN2:

[…]

for typeA RAN2 didn’t achieve consensus on whether the following 2 cases on NR SRS carrier switching are allowed:

* Case 1: SRS carrier switching to a SUL without PUCCH/PUSCH while PUCCH/PUSCH is configured in NUL;
* Case 2: SRS carrier switching to both NUL and SUL, neither of which are configured with PUCCH/PUSCH.

**2. Actions:**

**To RAN1 group.**

**ACTION:** RAN2 respectively asks RAN1 to provide feedback on the above

As a result of this LS, the following contributions were submitted to this meeting (7 contributions, 5 different sources):

R1-2005466 Draft reply LS on NR SRS carrier switching ZTE

R1-2005553 Discussion for NR SRS carrier switching on SUL ZTE

R1-2005652 Draft reply LS to RAN2 on NR SRS carrier switching CATT

R1-2005654 Discussion on NR SRS carrier switching on SUL carrier CATT

R1-2006078 [Draft] Reply LS on NR SRS carrier switching Samsung

R1-2006757 Discussion on SRS carrier switching Qualcomm Incorporated

R1-2006945 Discussion on NR SRS carrier switching Huawei, HiSilicon

# Summary of input contributions

In the following, we summarize the received input:

* Three sources [ZTE, Samsung, Qualcomm] indicate that the two cases from RAN2 are not supported from RAN1 specification point of view.
* One source [CATT] indicates that Case 1 is not supported, and in Case 2 switching to SUL is not supported, but switching to NUL is supported.
* One source [Huawei/HiSi] indicates that both case 1 and Case 2 are supported.
* One source [Qualcomm] further states that SRS carrier switching is not supported for a target serving cell configured with SUL.

Several reasons are included in the contributions for the support / no support of this feature.

* Four sources [ZTE, CATT, Samsung, Qualcomm] mention the following specification snippet (TS 38.214) that indicates that SRS carrier switching is only supported for a “serving cell with slot formats comprised of DL and UL symbols”:

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| --- |
| 6.2.1.3 UE sounding procedure between component carriers….A UE can be configured with SRS resource(s) on a carrier *c1* with slot formats comprised of DL and UL symbols and not configured for PUSCH/PUCCH transmission. For carrier *c1*, the UE is configured with higher layer parameter *srs-SwitchFromServCellIndex* and *srs-SwitchFromCarrier* the switching from carrier *c2* which is configured for PUSCH/PUCCH transmission. During 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*), the UE temporarily suspends the uplink transmission on carrier *c2*.…. |

* Two sources [Qualcomm, ZTE] mention that SRS carrier switching is for DL CSI acquisition (SRS resource set(s) with higher layer parameter *usage* set to *'antennaSwitching'*)and, therefore, there is no use case for SUL.
* One source [Huawei/HiSi] mentions the following two agreements (in RAN1#89 and RAN1#91) as justification for supporting both Case 1 and Case 2:

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| **Agreements:*** For NR standalone operation for a UE,
	+ NR supports that the UE is allowed to transmit on UL carriers on different frequency ranges but the UE has the capability to only transmit on one of the carriers at a given time in the following case:
		- case of SRS carrier switching with at least one of the frequency ranges agreed for LTE-NR UL sharing by RAN4 (e.g. refer to R4-1704411)
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| **Agreement:*** For a UE configured two ULs in a cell, two TPC bit(s) fields within group common DCI for SRS power control can be configured to the UE, i.e., one for UL and one for SUL;
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# Discussion points

**Q1: Is the following case supported form RAN1 point of view?**

* Case 1: SRS carrier switching to a SUL without PUCCH/PUSCH while PUCCH/PUSCH is configured in NUL;

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| --- | --- |
| **Company** | **Input** |
| ZTE | Not supported. As we mentioned in our tdoc, SRS carrier switching is for DL CSI in TDD band. However, SUL has no DL symbols.  |

**Q2: Is the following case supported form RAN1 point of view? (NOTE: Sub-case of Case 2)**

* Case 2.1: SRS carrier switching to SUL, when neither SUL nor NUL of which are configured with PUCCH/PUSCH.

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| **Company** | **Input** |
| ZTE | Not supported. |

**Q3: Is the following case supported form RAN1 point of view? (NOTE: Sub-case of Case 2)**

* Case 2.2: SRS carrier switching to NUL, when neither SUL nor NUL of which are configured with PUCCH/PUSCH.

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| **Company** | **Input** |
| ZTE | Not supportedAs we explained in our tdoc, we don’t think it is a valid usecase that SUL is configured without PUCCH/PUSCH. |

**Q4: Is SRS carrier switching supported for a target serving cell configured with SUL?**

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| **Company** | **Input** |
| ZTE | This question is not related with the LS. However, technically, we don’t think it is an appropriate usecase that SRS carrier switching to a target serving cell which is configured SUL. |

# Conclusion

<To be completed after discussion>

# Appendix: Summary of proposals in input contributions

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| --- | --- | --- |
| R1-2005466 / R1-2005553 | **ZTE** | **[…]** Thus, it is not valid that a SUL without any PUSCH and PUCCH transmission is configured with SRS carrier switching for DL CSI acquisition. Therefore, the above two cases are not allowed from RAN1 perspective.  |
| R1-2005652 / R1-2005654 | **CATT** | **[…]** that in both cases SRS carrier switching to SUL carrier shall NOT be allowed. In Case 2, SRS carrier switching to the NUL shall be allowed. |
| R1-2006078 | **Samsung** | […] Hence, the NR SRS carrier switching are not allowed for both Case 1 and Case 2. |
| R1-2006757 | **Qualcomm** | Indicate to RAN2 that Case 1 and Case 2 are not supported in RAN1 specifications.[…] Include the following conclusion in the LS to RAN2:* SRS carrier switching is not supported for a target serving cell configured with SUL.
* SRS carrier switching is supported for a source serving cell configured with SUL. The interrupted carrier is signaled by *srs-SwitchFromCarrier*.
 |
| R1-2006945 | **Huawei, HiSilicon** | Confirm that both Case 1 and Case 2 described in R1-2005209 are supported by Type A SRS carrier switching. |