3GPP TSG RAN WG1 #103-e R1-20xxxxx

e-Meeting, October 26th – November 13th, 2020

**Agenda item: 5.1**

**Source: Moderator (China Telecom)**

**Title: [103-e-NR-LS-TxSwitching-01] Email discussion/approval on maintenance of uplink Tx switching thread #1**

**Document for: Discussion and Decision**

# Introduction

In [1], maintenance issues are summarized for uplink Tx switching. As per the guidance of Chairman, following issues are identified for email discussion/approval during RAN1 #103 e-meeting:

[103-e-NR-LS-TxSwitching-01] Email discussion/approval a potential CR till 10/30 – Jianchi (CT)

* Clarification on T^mux\_{proc,CSI} (R1-2007603, R1-2007725, R1-2008564)
* Clarification on the ambiguity issue on SCS and align the description on carrier1 and carrier2 with TS 38.331 (R1-2007725, R1-2008229)

[103-e-NR-LS-TxSwitching-02] Email discussion/approval a potential CR till 10/30 – Jianchi (CT)

* Back to back switching caused by SRS transmission (R1-2008596)
  + Note 1: no discussion on location of switching period.
  + Note 2: the previous agreements should not be overturned.
* Maximum data rate (R1-2008596)

This contribution is the summary of email discussion/approval on maintenance of uplink Tx switching thread #1.

# Discussion

## Issue #1: Clarification on (R1-2007603, R1-2007725, R1-2008564)

During the RAN1#101-e meeting, following agreement related to the additional time due to triggered UL switching for has been achieved:

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| **Agreement:** Confirm the following work assumption:  Working assumption:   * If uplink Tx switching is triggered, the additional time is needed and it equals to the length of UL switching period for the followings cases:   + Aperiodic SRS transmission   + PDCCH order triggered PRACH transmission   + in case of CSI triggered with Z1 of Table 5.4-1 of TS 38.214 |

Based on the above agreement, the additional time due to triggered UL switching for has been captured in TS 38.213. R1-2007603 mentioned the current description in TS 38.213 is ambiguous and proposed two alternatives to revise the TS 38.213:

**Alt. 1:** Delete the from the definition of in TS 38.213 so that always equals to zero for all the cases of the determination of .

* **Proposed TP to TS 38.213**

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| 9.2.5 UE procedure for reporting multiple UCI types  **< unchanged text omitted>**  If there is at least one PUSCH in the group of overlapping PUCCHs and PUSCHs, is given by maximum of where for the i-th PUSCH which is in the group of overlapping PUCCHs and PUSCHs, , , are selected for the i-th PUSCH following [6, TS 38.214], is selected based on the UE PUSCH processing capability of the i-th PUSCH and SCS configuration , where corresponds to the smallest SCS configuration among the SCS configurations used for the PDCCH scheduling the i-th PUSCH, the PDCCHs scheduling the PDSCHs or providing the SPS PDSCH releases with corresponding HARQ-ACK transmission on a PUCCH which is in the group of overlapping PUCCHs/PUSCHs, and all PUSCHs in the group of overlapping PUCCHs and PUSCHs.  **< unchanged text omitted>** |

**Alt. 2:** Clarify the non-zero should be applied for the determination of only if of table 5.4-1 in TS 38.214 is applied for the determination of .

* **Proposed TP to TS 38.213**

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| 9.2.5 UE procedure for reporting multiple UCI types  **< unchanged text omitted>**  - , , , , , and are defined in [6, TS 38.214], is applied only if of table 5.4-1 in [6, TS 38.214] is applied to the determination of , and and are defined in [4, TS 38.211].  **< unchanged text omitted>** |

Companies are invited to provide views on the above two TPs.

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| **Companies** | **Comments** |
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R1-2008564 mentioned the PUSCH processing time for inter-band UL CA Option 2 with UL Tx switching based on *µUL* = min (*µUL, CC1*, *µUL, CC2*) is not reflected for case of computation when UCI is multiplexed on PUSCH.

* **Proposed TP to TS 38.213**

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| 9.2.5 UE procedure for reporting multiple UCI types  **< unchanged text omitted>**  If there is at least one PUSCH in the group of overlapping PUCCHs and PUSCHs, is given by maximum of where for the i-th PUSCH which is in the group of overlapping PUCCHs and PUSCHs, , , and are selected for the i-th PUSCH following [6, TS 38.214], is selected based on the UE PUSCH processing capability of the i-th PUSCH and SCS configuration , where  corresponds to the smallest SCS configuration among the SCS configurations used for the PDCCH scheduling the i-th PUSCH, the PDCCHs scheduling the PDSCHs or providing the SPS PDSCH releases with corresponding HARQ-ACK transmission on a PUCCH which is in the group of overlapping PUCCHs/PUSCHs, and all PUSCHs in the group of overlapping PUCCHs and PUSCHs, and where if UE is configured with *dualUL* by the parameter *uplinkTxSwitchingOption-r16* for uplink carrier aggregation and if a PUSCH in the group of overlapping PUCCHs and PUSCHs is on one of the two uplink carriers described in subclause 6.1.6.2 of [6, TS38.214], the SCS configuration min(*µUL,carrier1, µUL,carrier2*) is used instead of SCS configuration for the PUSCH, where *µUL,carrier1* and *µUL,carrier2* are defined in [6, TS38.214].  **< unchanged text omitted>** |

Companies are invited to provide views on the above proposed TP.

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| **Companies** | **Comments** |
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## Issue #2: Clarification on the ambiguity issue on SCS and align the description on carrier1 and carrier2 with TS 38.331 (R1-2007725, R1-2008229)

During RAN1#101e, the following agreements were reached.

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| **Agreements:**   * + For inter-band UL CA, SUL and EN-DC, a UE does not expect to perform more than one UL Tx switching in a slot with larger SCS between two uplink carriers. |

R1-2007725 mentioned the current description in TS 38.214 is not clear due to the following two reasons.

(1) The “subcarrier spacing of the uplink transmitted before the switching gap” and “subcarrier spacing of the uplink transmitted after the switching gap” are ambiguous in case when there are UL transmissions in both carriers, especially when the subcarrier spacings of the uplink transmitted in these two carriers are different.

(2) The SCS of the uplink carrier should be determined by the SCS of the active UL BWP, instead of the uplink transmission. If the uplink transmission is PRACH, the SCS of the uplink transmission (i.e., PRACH) may be different from the SCS of the active UL BWP.

* **Proposed TP to TS 38.214**

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| 6.1.6 Uplink switching  **< unchanged text omitted>**  The UE does not expect to perform more than one uplink switching in a slot with *µUL* = max(*µUL,carrier1, µUL,carrier2*), where the *µUL,carrier1* corresponds to the subcarrier spacing of the active UL BWP of one uplink carrier and the *µUL,carrier2* corresponds to the subcarrier spacing of the active UL BWP of the other uplink carrier.  **< unchanged text omitted>** |

Companies are invited to provide views on the above proposed TP.

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| **Companies** | **Comments** |
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R1-2008229 mentioned there is misalignment between TS 38.214 and TS 38.331 regarding *carrier1* and *carrier2*.

* **Proposed TP to TS 38.214**

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| 6.1.6 Uplink switching  **< unchanged text omitted>**  The UE does not expect to perform more than one uplink switching in a slot with *µUL* = max(*µUL,carrier1, µUL,carrier2*), where the *µUL,carrier1* corresponds to the subcarrier spacing of ~~the~~ one uplink carrier ~~transmitted before the switching gap~~ and the *µUL,carrier2* corresponds to the subcarrier spacing of ~~the~~ another uplink carrier ~~transmitted after the switching gap~~.  **< unchanged text omitted>** |

Companies are invited to provide views on the above proposed TP.

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| **Companies** | **Comments** |
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# References

1. R1-2008814, Summary of uplink Tx switching, Moderator (China Telecom), RAN1#103e, October 26th – November 13th, 2020.
2. R1-2007603, Discussion on the remaining problems of supporting Tx switching between two uplink carriers, Huawei, HiSilicon, October 26th – November 13th, 2020.
3. R1-2007725, Remaining Maintenance Issues of UL Tx Switching, ZTE, October 26th – November 13th, 2020.
4. R1-2008229, Text Proposals for Tx Switching between Two Uplink Carriers, OPPO, October 26th – November 13th, 2020.
5. R1-2008564, Draft CR to 38.213 on corrections for UL Tx switching, Ericsson, October 26th – November 13th, 2020.
6. R1-2008596, Remaining issues for 1Tx-2Tx switching, Qualcomm Incorporated, October 26th – November 13th, 2020.

# Appendix

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| **Companies** | **Views** |
| **Huawei**  **(R1-2007603)** | ***Proposal****:* *Adopt the TP1 or TP2 for in Appendix for the following two alternatives, respectively:*   * *Alt. 1: Delete the from the definition of in TS 38.213 so that always equals to zero for all the cases of the determination of , and*   + *Adopt TP1 in Appendix.* * *Alt. 2: Clarify the non-zero should be applied for the determination of only if of table 5.4-1 in TS 38.214 is applied for the determination of , and*   + *Adopt TP2 in Appendix.* |
| **ZTE**  **(R1-2007725)** | ***Proposal 1****: Adopt the following TP1 for 38.214 UL Tx switching.*  ***TP1****: {38.214, 6.1.6 Uplink switching}*   |  | | --- | | <---------------------------- Other parts omitted ---------------------------->  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 subclause 5.3, subclause 5.4, subclause 6.2.1, subclause 6.4 and in subclause 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,carrier1, µUL,carrier2*), where the *µUL,carrier1* corresponds to the subcarrier spacing of the active UL BWP of one uplink carrier and the *µUL,carrier2* corresponds to the subcarrier spacing of the active UL BWP of the other uplink carrier.  <---------------------------- Other parts omitted ----------------------------> |   ***Proposal 2****: Consider the following two alternatives to address the back-to-back switching issue.*  *Alternative#1: The UE does not expect to perform an uplink switching if the gap between the start of this uplink switching and the end of the previous uplink switching is smaller than 1 symbol based on numerology µUL*  *Alternative#2: The switching gap can only be placed at the slot boundary or the switching point for S slot.*  ***Proposal 3****: Tswitch is not needed for the case of SR+Aperioidc CSI multiplexing on PUSCH.* |
| **OPPO**  **(R1-2008229)** | |  | | --- | | 6.1.6 Uplink switching  **< unchanged text omitted>**  The UE does not expect to perform more than one uplink switching in a slot with *µUL* = max(*µUL,carrier1, µUL,carrier2*), where the *µUL,carrier1* corresponds to the subcarrier spacing of ~~the~~ one uplink carrier ~~transmitted before the switching gap~~ and the *µUL,carrier2* corresponds to the subcarrier spacing of ~~the~~ another uplink carrier ~~transmitted after the switching gap~~.  **< unchanged text omitted>** | |
| **Ericsson**  **(R1-2008564)** | 9.2.5 UE procedure for reporting multiple UCI types  **< unchanged text omitted>**  If there is at least one PUSCH in the group of overlapping PUCCHs and PUSCHs, is given by maximum of where for the i-th PUSCH which is in the group of overlapping PUCCHs and PUSCHs, , , and are selected for the i-th PUSCH following [6, TS 38.214], is selected based on the UE PUSCH processing capability of the i-th PUSCH and SCS configuration , where corresponds to the smallest SCS configuration among the SCS configurations used for the PDCCH scheduling the i-th PUSCH, the PDCCHs scheduling the PDSCHs or providing the SPS PDSCH releases with corresponding HARQ-ACK transmission on a PUCCH which is in the group of overlapping PUCCHs/PUSCHs, and all PUSCHs in the group of overlapping PUCCHs and PUSCHs, and where if UE is configured with *dualUL* by the parameter *uplinkTxSwitchingOption-r16* for uplink carrier aggregation and if a PUSCH in the group of overlapping PUCCHs and PUSCHs is on one of the two uplink carriers described in subclause 6.1.6.2 of [6, TS38.214], the SCS configuration min(*µUL,carrier1, µUL,carrier2*) is used instead of SCS configuration for the PUSCH, where *µUL,carrier1* and *µUL,carrier2* are defined in [6, TS38.214].  **< unchanged text omitted>** |