3GPP TSG RAN WG1 #110-e R1-22abcde

e-Meeting, October 10 – 19, 2022

**Agenda item: 7.2**

**Source: Moderator (Nokia)**

**Title: [110bis-e-NR-R16-11] UE type “SwitchedUL” and simultaneous transmission on two UL bands – Moderator Summary**

**WI: NR\_RF\_FR1**

**Release: Rel-16**

**Document for: Discussion and Decision**

# 1 Introduction

This document is a summary of the discussion related to the RAN1#110bis Release-16 maintenance (agenda item 7.2) issue #11 on UL Tx Switching, handled in the following email thread:

[110bis-e-NR-R16-11] Discussion on correction to UE type “SwitchedUL” and simultaneous transmission on two UL bands by Oct 17 – Karri (Nokia)

Relevant tdocs:

* [R1-2210190](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_110b-e/Docs/R1-2210190.zip) Correction to UE type “SwitchedUL” and simultaneous transmission on two UL bands Nokia, Nokia Shanghai Bell

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# 2 Summary of the issue raised in the Tdoc

Problem description of R1-2210190

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| For CA-based UL Tx Switching with SwitchedUL (Option 1) the specifications do not correctly capture the RAN1 agreement that the UE is not supposed to be able to transmit on carrier 2 when it is transitting 1-port transmission on carrier 1.**Agreements:*** For inter-band UL CA, if UE reports via capability signaling to support uplink Tx switching, UE further reports via capability signaling which option (between Option 1 and Option 2) is supported.
	+ Option 1: If uplink Tx switching is configured, UE is not expected to be scheduled or configured with UL transmission on carrier 2 for case 1.

|  |  |  |
| --- | --- | --- |
|  | Number of **Tx chains** in WID (carrier 1 + carrier 2) | Number of **antenna ports** for UL transmission (carrier 1 + carrier 2) |
| Case 1 | 1T+1T | 1P+0P |
| Case 2 | 0T+2T | 0P+2P, 0P+1P  |

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Proposed specification change in R1-22010190 to TS38.214 subclause 6.1.6.2 *Uplink switching for carrier aggregation*

- The UE configured with *uplinkTxSwitchingOption* set to 'switchedUL' is not expected to simultaneously transmit on the two uplink carriers.

# 3 Discussion

# 3.1 Round 1

### Question 1

* **Do you agree with the problem statement, yes/no? If no, please explain.**
* *For CA-based UL Tx Switching with SwitchedUL (Option 1) the specifications do not correctly capture the RAN1 agreement that the UE is not supposed to be able to transmit on carrier 2 when it is transmitting 1-port transmission on carrier 1.*

**Please provide company comments to the table below**

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| **Company**  | **Comment** |
| Nokia | As the proponent, we agree with the problem statement. We haven’t identified the specification restriction limiting the “SwitchedUL” UE type transmissions to one UL carrier only at a time. |
| NTT DOCOMO | We agree with the problem statement. |
| Qualcomm | We understand the motivation, even though we don’t see any ambiguity on understanding current specification. We are ok to update the spec if majority prefers. |
| Huawei, HiSilicon | OK to capture the definition of Option 1 into specification if it has not been captured in RAN2 or RAN4 specification. However, we prefer to stick to the exact wording in the agreement as much as possible rather than the one from the proponent so that we don’t have to spend time in debating it again. |
| Apple | Although we think that there is no ambiguity that switchedUL doesn’t support simultaneous transmission on multiple carriers, but we are okay to update the specifications if preferred by majority of the companies |
|  |  |

### Question 2

* **Please provide your comments on the specification change proposal**
* The UE configured with *uplinkTxSwitchingOption* set to 'switchedUL' is not expected to simultaneously transmit on the two uplink carriers.

**Please provide company comments to the table below**

|  |  |
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| **Company**  | **Comment** |
| NTT DOCOMO | We are fine with the proposed change for Rel-16.On the other hand, if same change will be applied to Rel-17, “not expected to simultaneously transmit on the two uplink carriers” would not be correct since intra-band contiguous aggregated two carriers can be simultaneously used for UL transmission even with ‘switchedUL’ according to the following agreements. So, some wording modification may be necessary for Rel-17 if same change will be applied.Agreements:For Rel-17 1Tx-2Tx switching between 1 carrier on Band A and 2 contiguous carriers on Band B, the mapping between UL transmission ports and Tx chain for SUL and UL CA Option 1 is defined as follows.

|  |  |  |
| --- | --- | --- |
|   | Number of **Tx chains** in WID (band A + band B) | Number of **antenna ports** for UL transmission (band A (carrier 1) + band B (carrier 2 + carrier 3)) |
| Case 1 | 1T+1T | 1P+(0P+0P) |
| Case 2 | 0T+2T | 0P+(2P+0P), 0P+(0P+2P), 0P+(2P+2P), 0P+(1P+0P), 0P+(0P+1P), 0P+(1P+1P), 0P+(1P+2P), 0P+(2P+1P)  |

Agreements:For Rel-17 2Tx-2Tx switching between 1 carrier on Band A and 2 contiguous carriers on Band B, the mapping between UL transmission ports and Tx chain for SUL and UL CA Option 1 is defined as follows.

|  |  |  |
| --- | --- | --- |
|   | Number of **Tx chains** in WID (band A + band B) | Number of **antenna ports** for UL transmission (band A (carrier 1) + band B (carrier 2 + carrier 3)) |
| Case 2 | 0T+2T | 0P+(2P+0P), 0P+(0P+2P), 0P+(2P+2P), 0P+(1P+0P), 0P+(0P+1P), 0P+(1P+1P), 0P+(1P+2P), 0P+(2P+1P) |
| Case 3 | 2T+0T | 2P+(0P+0P), 1P+(0P+0P) |

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| Qualcomm | if majority prefers to update the spec to explicitly reveal the agreement, we are open to discuss.However, we are not ok with the above proposal as it’s not aligned with agreement ”If uplink Tx switching is configured, UE is not expected to be scheduled or configured with UL transmission on carrier 2 for case 1.” We propose following wording * The UE configured with *uplinkTxSwitchingOption* set to 'switchedUL' is not expected to be scheduled or configured with simultaneously transmission on the two uplink carriers.
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| Huawei, HiSilicon | As commented before, the wording in the agreement is better. So we propose,”*If a UE is configured with uplinkTxSwitchingOption set to 'switchedUL', the UE is not expected to be scheduled or configured with simultaneous UL transmissions on both the uplink carriers*.” Regarding the intra-band cases introduced in Rel-17, the wording ”carriers” should be kept in Rel-16 CR, while it can be replaced by bands in Rel-17 mirror CR. |
| Apple | We support the updated wording by Qualcomm, if CR is to be agreed |
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