3GPP TSG RAN WG1 #111 R1-22abcde

Toulouse, France, November 14 – 18, 2022

**Agenda item: 7.2**

**Source: Moderator (Nokia)**

**Title: [111-R16-NR] Moderator summary on UE type “SwitchedUL” and simultaneous transmission on two UL bands**

**WI: NR\_RF\_FR1, NR\_RF\_FR1\_enh-Core**

**Release: Rel-16**

**Document for: Discussion and Decision**

# 1 Introduction

This document is a summary of the discussion related to the RAN1#111 Release-16 maintenance (agenda item 7.2) issue related to a clarification of UE type “SwitchedUL” on Rel-16 Uplink Tx Switching feature. This is a continuation of a related discussion in RAN1#110bis-e

RAN1#110bis-e discussion summary:

* [R1-2210644](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_110b-e/Docs/R1-2210644.zip) Summary of [110bis-e-NR-R16-11] UE type “SwitchedUL” and simultaneous transmission on two UL bands, Moderator (Nokia)

Relevant RAN1#111 tdocs:

|  |  |  |
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| [R1-2211282](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_111/Docs/R1-2211282.zip) | On UE type “SwitchedUL” and simultaneous transmission on two UL bands | Nokia, Nokia Shanghai Bell |
| [R1-2211283](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_111/Docs/R1-2211283.zip) | Rel-16 Correction to UE type “SwitchedUL” and simultaneous transmission on two UL carriers | Nokia, Nokia Shanghai Bell |
| [R1-2211284](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_111/Docs/R1-2211284.zip) | Rel-17 Correction to UE type “SwitchedUL” and simultaneous transmission on two UL bands | Nokia, Nokia Shanghai Bell |
| [R1-2211633](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_111/Docs/R1-2211633.zip) | Draft TP for UL Tx switching for non-simultaneous transmission on two UL bands | ZTE |
| [R1-2212490](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_111/Docs/R1-2212490.zip) | Corrections on scheduling restrictions between serving cells for UL Tx switching | Huawei, HiSilicon |
| [R1-2212491](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_111/Docs/R1-2212491.zip) | Corrections on scheduling restrictions between intra-band serving cells for UL Tx switching | Huawei, HiSilicon |

# 2 Proposals submitted to RAN1#111

## 2.1 Proposals of R1-2211282/1283/1284

**For the CA-based UL Tx Switching subclause 6.1.6.2:**

**Proposal 1:** Agree to the addition to subclause 6.1.6.2 of Rel-16 38.214 (6.1.6.2 part of R1-2211282):

* The UE configured with uplinkTxSwitchingOption set to ‘switchedUL’ is not expected to be scheduled or configured with simultaneous transmissions on the two uplink carriers.

**Proposal 2:** Agree to the addition to subclause 6.1.6.2 of Rel-17 38.214 (6.1.6.2 part of R1-2211283):

* The UE configured with *uplinkTxSwitchingOption* set to ‘switchedUL’ is not expected to be scheduled or configured with uplink transmissions that result in simultaneous transmission on one uplink carrier on one band and any transmission on another uplink carrier on another band.

**For the SUL-based UL Tx Switching sub-clause 6.1.6.3:**

**Proposal 3:** Agree to one of the two alternatives:

**Alt 1:** Agree to the addition to subclause 6.1.6.3 of Rel-16 38.214 (6.1.6.3 part on R1-2211282):

* The UE is not expected to be scheduled or configured with simultaneous transmissions on the two uplink carriers.

**Alt 2:** Conclude that no change is needed to subclause 6.1.6.3 of Rel-16 38.214

**Proposal 4:** Agree to the addition to subclause 6.1.6.3 of Rel-17 38.214 (6.1.6.3 part of R1-2211283):

* The UE configured with two UL carriers for one serving cell and with another serving cell for intra-band uplink carrier aggregation is not expected to be scheduled or configured with uplink transmissions that result in simultaneous transmission on one uplink carrier on one band and any transmission on another uplink carrier on the other band.

## 2.2 Proposals of R1-2211633

***Proposal 1****: RAN1 adopts the following TP for Rel-16 and Rel-17 UL Tx switching in TS38.214.*

* **Reason for change:**

The followings for UL Tx switching for SUL are missing in the Rel-16/17 specification.

1. For UE configured with Rel-16/Rel-17 UL Tx switching for SUL, UE is not allowed to perform “1P+1P” (i.e., simultaneous transmissions) on SUL (i.e., SUL#1 in the following table) and its corresponding NUL (i.e., NUL#2 in the following table) even if UE indicates support of simultaneousTxSUL-NonSUL.
2. For UE configured with Rel-17 UL Tx switching for SUL, UE is not allowed to perform “1P+1P” (i.e., simultaneous transmissions) on SUL (i.e., SUL#1 in the following table) and the non-corresponding NUL (i.e., UL#3 in the following table).

The details of UL Tx switching for switchedUL CA is missing in the Rel-16/17 specification

* **TP in section 6.1.6 of TS38.214:**

**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.

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 uplink carrier aggregation and configured with uplinkTxSwitchingOption set to ‘*switchedUL*’, or

- 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, the UE is not expected to be scheduled or configured with simultaneous transmissions on the two uplink bands.

## 2.3 Proposals of R1-2212490/2491

**For the CA-based UL Tx Switching subclause 6.1.6.2:**

Rel-16: Agree to the addition to subclause 6.1.6.2 of 38.214 (R1-2212490):

- The UE configured with *uplinkTxSwitchingOption* set to ‘switchedUL’ is not expected to be scheduled or configured with uplink transmissions that result in simultaneous transmission on two uplink carriers.

Rel-17: Agree to the addition to subclause 6.1.6.2 of 38.214 (R1-2212491):

- The UE configured with *uplinkTxSwitchingOption* set to ‘switchedUL’ is not expected to be scheduled or configured with uplink transmissions that result in simultaneous transmission on one uplink carrier on one band and any transmission on another uplink carrier on another band.

**For the SUL-based UL Tx Switching subclause 6.1.6.3:**

Rel-16: No change

Rel-17: Agree to the addition to subclause 6.1.6.3 of 38.214 (R1-2212491):

- The UE configured with intra-band uplink carrier aggregation is not expected to be scheduled or configured with uplink transmissions that result in simultaneous transmission on one uplink carrier on one band and any transmission on another uplink carrier on another band.

# 3 Comparison of proposals

* Nokia Alternative 2 and Huawei proposals are essentially the same with only minor wording differences in the proposed spec changes to 6.1.6.2 and 6.1.6.3
* Nokia Alternative 1 has an additional change to Rel-16 SUL-based UL Tx switching to Rel-16 6.1.6.3 compared to the Nokia Alternative 1 / Huawei proposals that did not have
* ZTE proposal avoids changes to 6.1.6.2 and 6.1.6.3 and the debate on what to say of CA-based and SUL-based UL Tx Switching and introduces the clarification to the higher-level clause 6.1.6 common to both CA-based and SUL-based UL Tx Switching
* The ZTE proposal is not in conflict with the Nokia or Huawei proposals

# 4 RAN1#111 meeting discussion

Possible alternatives identified from the proposals submitted to the RAN1#111

* Alt a): Agree to Nokia Alt.1 approach
  + Rel-16 and Rel-17 changes to 6.1.6.2 and 6.1.6.3
* Alt b): Agree on the Nokia Alt.2/Huawei approach
  + Rel-16 change to 6.1.6.2 and Rel-17 changes to 6.1.6.2 and 6.1.6.3
* Alt c): Agree on the ZTE approach
  + Rel-16 and Rel-17 changes to 6.1.6
* Alt d): Combine c) with a) or b)

## 4.1 Round 1

Please provide your views on the alternatives a) – d) and if you have a clear preference or a specific concern with a particular approach.

**Please provide your company’s comments to the table below**

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| **Company** | **Comment** |
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