3GPP TSG RAN WG2 #121bis-e R2-23xxxxx

Electronic meeting, 17th – 26th April 2023

**Title:** Draft LS on report of switching periods in Rel-18 UL Tx switching

**Response to:**

**Release:** Release 18

**Work Item:** NR\_MC\_enh-Core

**Source:** NTT DOCOMO, INC.[to beRAN WG2]

**To:** RAN WG1, RAN WG4

**Cc:**

**Contact person:** Riki Okawa

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**Attachments:** none

# 1 Overall description

RAN2 has discussed introduction of UE capability for length of switching periods. RAN2 has taken following RAN4 agreement in RAN4#104-e into account.

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| **Agreement:**On the length of switching period:* For UL switching period with Tx switching across 3 or 4 bands, RAN4 agreed to reuse the same set of values as in Rel-16/17, i.e., {35 us, 140 us, 210 us} for UL CA and SUL.
* The length of switching period is applied per band pair for each band combination.
* For each band pair, the switching period can be the same or different for 1Tx-2Tx switching and 2Tx-2Tx switching based on UE reporting, which is similar as in Rel-17.
	+ Note: For UE reporting different periods for 1Tx-2Tx switching and 2Tx-2Tx switching for a band pair, similar to Rel-17, it is RAN4 understanding that the 2Tx-2Tx switching period is applied when 2Tx-2Tx switching mode is configured.
* For the same band pair, RAN4 has not concluded on whether the same or a different value can be reported for the specific band pair supporting Tx switching across 3 or 4 bands in Rel-18 compared to Tx switching across 2 bands specified in Rel-16/17.
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RAN2 could not achieve conclusion, but has agreed an intention below in RAN2#121bis-e:

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| * In support of RAN4 agreement, RAN2 intend to introduce support for two per-band-pair UE capabilities, a length of a switching period, for 1Tx-2Tx switching (like Rel-16) and that for 2Tx-2Tx switching (like Rel-17).
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**To RAN1:**

**Question. RAN2 respectfully asks RAN1 to take above agreement on RAN2 intention into account and asks for feedback if there is any issue.**

**To RAN4:**

**Question 1. RAN2 respectfully asks RAN4 to take above agreement on RAN2 intention into account and asks for feedback if there is any issue.**

RAN2 has taken following RAN4 agreement informed via LS (R4-2303507, R2-2302433):

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| **Issue 1: Exact value of Tx switching period for each band pair**RAN4 discussed the exact value of Tx switching period for each band pair in the band combination, and has agreed that:* For Rel-18 UE, for a band pair within a band combination supporting Tx switching among 3/4 bands, the switching period reported by UE for Rel-18 3/4-band Tx switching can be the same or different from the switching period for Rel-16/17 2-band switching operations.
	+ Note 1: the set of candidate values is still the same, i.e., {35 us, 140 us, 210 us}, according to the agreement in RAN4 #104e.
	+ Note 2: here the band pair is a pair of bands within which there is a switching with a switching period.
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However, RAN2 could not conclude whether the UE always report switching periods for Rel-18 3/4 bands Tx switching even when the switching period is the same value as Rel-16/17 2 bands Tx switching for the same band pair.

RAN2 could not conclude whether the UE needs to explicitly report if it supports 1T-2T switching or 2T-2T switching for every band pair used for Rel-18 UL Tx switching.

RAN2 is not sure which is the correct understanding:

* The UE always supports 2T-2T switching on a pair of bands if the UE supports 2 layers UL MIMO on the two bands
* The UE may not support 2T-2T switching on a pair of bands even if the UE supports 2 layers UL MIMO on the two bands (i.e., per-band-pair UE capability to report whether to support 2T-2T switching is needed, e.g. based on the presence/absence of 2T-2T switching period).

**Question 3. RAN2 respectfully asks RAN4 to feedback if there is any issue:**

**The UE reports whether it supports 2T-2T switching via per-band-pair UE capability.**

RAN2 also considers the signalling pattern for reporting the Rel-18 3/4 bands Tx switching capabilities and RAN2 may look into the possibility for signalling optimization.

**Question x. RAN2 respectfully asks RAN4 whether following options for information sharing between Rel-18 and Rel-16/17 Tx switching is feasible from RAN4 perspective:**

**Option 1: Band combination can be shared, but separate band pair lists for Rel-18 and Rel-16/17 Tx switching in each shared band combination;**

**Option 2: Band combination as well as the band pair list in the band combination can be shared for Rel-18 and Rel-16/17 Tx switching.**

RAN2 has discussed how the gNB knows which of the reported switching periods (for 1T-2T switching or for 2T-2T) should be applied for every switching but could not conclude.

**Question 4. RAN2 respectfully asks RAN4 which of the options below matches RAN4 understanding.**

**Option 1: Based on implicit rules, e.g., 2T-2T switching period is only applicable when performing UL switching between two bands (e.g. 2P+0P<=>0P+2P) and 1T-2T period is applied for the other switching cases (e.g. UL Tx switching that involves 3 or 4 bands, such as band A + band B<=>band C, band A+ band B <=>band C + band D)-.**

**Option 2: Based on explicit RRC configuration, i.e., gNB configures which period is applied per band pair.**

# 2 Actions

**To RAN WG4**

**ACTION:** RAN2 respectfully requests RAN4 to provide feedback to the above questions.

# 3 Dates of next TSG RAN WG2 meetings

TSG RAN WG2 Meeting #122 22nd - 26th May 2023 Incheon, KR

TSG RAN WG2 Meeting #123 21st – 25th August 2023 Toulouse, FR