**3GPP TSG-RAN4 Meeting #111 R4-240xxxx**

**Fukuoka City, Fukuoka , Japan, 20th – 24th May, 2024**

**Agenda item:** 7.13.4

**Source:** Moderator (China Telecom)

**Title:** Topic summary for [111][119] NR\_MC\_enh\_UERF\_R18

**Document for:** Information

# Introduction

This thread discusses the maintenance for UE RF requirements for Rel-18 Multi-carrier enhancements WI.

# Topic #1: Maintenance for UE RF requirements

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2408837 | NTT DOCOMO INC. | Remaining issue for Rel-18 Tx switching  **Proposal: At latest, RAN4 will check the progress in RAN2 in Friday morning, and update the UE feature list according to the agreement in last meeting.** |
| R4-2408911 | Huawei, HiSilicon | (NR\_MC\_enh-Core) CR for 38.101-1: Correction on time mask for Rel-18 Tx switching  **Summary:** The draftCR R4-2404509 with the same content was endorsed in RAN4#110bis. |
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## Open issues summary

### Sub-topic 1-1: UE feature list

* **Background:**

In RAN4#110bis meeting, the following agreement for FG 38-4 and FG 38-5 is capured in chairman note

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| **R4-2406629 WF on feature list for NR\_MC\_enh\_UERF\_R18**  *Type: other For: Approval  Source: China Telecom*  **Agreement: for FG 38-4 and FG 38-5**   * RAN4 did not reach consensus on merging FG 38-4 and FG38-5 and there is no corresponding update of the feature list. * Companies are encouraged to further discuss the capability issue in RAN2 * Check RAN2 progress during May meeting. If RAN2 keep the agreement, RAN4 will agree on Option 2 and update the feature list in May meeting.   **Decision: Noted.** |

#### Issue 1-1-1: UE capability of ***FG 38-4 and FG 38-5***

**Options based on latest discussion in WF of R4-2406629 (The WF was noted)**

* **Option 1: keep the FG 38-4 and FG 38-5 as it is and remove the square brackets.**

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| ***Features*** | ***Index*** | ***Feature group*** | ***Components*** | ***Prerequisite feature groups*** | ***Need for the gNB to know if the feature is supported*** | ***Applicable to the capability signalling exchange between UEs (V2X WI only)”.*** | ***Consequence if the feature is not supported by the UE*** | ***Type***  ***(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)*** | ***Need of FDD/TDD differentiation*** | ***Need of FR1/FR2 differentiation*** | ***Capability interpretation for mixture of FDD/TDD and/or FR1/FR2*** | ***Note*** | ***Mandatory/Optional*** |
| 38.  NR\_MC\_enh | 38-4 | [Additional switching Period for Dual UL] | [1. Indicate additionally the supported Tx switching period for switching between a band pair and another band pair or another band, when Rel-18 UL Tx switching is configured by uplinkTxSwitchingMoreBands-r18. If the capability is not reported, the switching period reported in switchingPeriodFor2T-r18 or switchingPeriodFor1T-r18 applies, as specified in TS 38.214 and TS 38.101-1.] | 38-1 | Yes | N/A | [UL Tx switching across more than 2 bands cannot be supported for the band pair in the band combination.] | Per BC | No | FR1 only | Support mixture of FDD/TDD | Component 1 candidate value: {35us, 140 us, 210us} | Optional with capability signaling |
| 38.  NR\_MC\_enh | 38-5 | preferredBandPairs for four-band switching case | 1. Support the indication of the switching period can be improved to min {max(Tswitch\_A-C, Tswitch\_B-D), max(Tswitch\_A-D, Tswitch\_B-C)} assuming UE’s preferred (switched-from, switched-to) band pairs for parallel UL transmission switching for a band combination consisting of four different bands. | 38-1 | Yes | N/A | [Network can only assume the maximum switch period] | Per BC | No | FR1 only | Support mixture of FDD/TDD | [Note: Detailed information can refer to the LS to RAN2 in R4-2317609] | Optional with capability signalling |

* **Option 2: Merge the FG 38-5 into the FG 38-4**

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| ***Features*** | ***Index*** | ***Feature group*** | ***Components*** | ***Prerequisite feature groups*** | ***Need for the gNB to know if the feature is supported*** | ***Applicable to the capability signalling exchange between UEs (V2X WI only)”.*** | ***Consequence if the feature is not supported by the UE*** | ***Type***  ***(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)*** | ***Need of FDD/TDD differentiation*** | ***Need of FR1/FR2 differentiation*** | ***Capability interpretation for mixture of FDD/TDD and/or FR1/FR2*** | ***Note*** | ***Mandatory/Optional*** |
| 38.  NR\_MC\_enh | 38-4 | Additional switching Period for switching case across three or four bands for Dual UL | 1. Indicate additionally the supported Tx switching period for switching case across three or four bands, when Rel-18 UL Tx switching is configured by uplinkTxSwitchingMoreBands-r18. If the capability is not reported, the switching period reported in switchingPeriodFor2T-r18 or switchingPeriodFor1T-r18 applies, as specified in TS 38.214 and TS 38.101-1. | 38-1 | Yes | N/A | UL Tx switching across more than 2 bands cannot be supported for the band pair in the band combination. | Per BC | No | FR1 only | Support mixture of FDD/TDD | Component 1 candidate value: {35us, 140 us, 210us} | Optional with capability signaling |
| 38.  NR\_MC\_enh | 38-5 | Void |  |  |  |  |  |  |  |  |  |  |  |

* **Recommended WF:**
  + Agreement in RAN4#110bis: Check RAN2 progress during May meeting. If RAN2 keep the agreement, RAN4 will agree on Option 2 and update the feature list in May meeting.
  + Recommended WF: Check RAN2 progress, and update the UE feature list.

### Sub-topic 1-2: CRs

#### Issue 1-2-1: CRs for correction

**Background:** There is one CR submited to maintain and correct the time mask requirements

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| R4-2408911 | Huawei, HiSilicon | **Title:** (NR\_MC\_enh-Core) CR for 38.101-1: Correction on time mask for Rel-18 Tx switching  Summary: The draftCR R4-2404509 with the same content was endorsed in RAN4#110bis. |

* **Recommended WF:**
  + Agreed?

# Topic #2: On 2CC-2CC UL Tx Switching Scenarios

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2407074 | Apple | **Title:** On 2CC-2CC UL Tx Switching Scenarios  ***Observation #1:*** *The current multi-carrier enhancement WID limits the numbers of CCs to 3 for UL Tx switching between two UL carriers.*  ***Observation #2:*** *There are 3 existing UL Tx switching capabilities in the TS38.822 specifications that are related to the number of CCs involved in the switching.*  ***Observation #3:*** *If UL Tx switching involving 4 CCs is added in Rel-18, three associated additional UE capabilities will have to be defined by RAN4 and approved by RAN2.*  ***Proposal:*** *2CC-2CC UL Tx switching is out of scope of the original Multi-carrier enhancement WID and introducing in Rel-18 will require three additional UL capabilities to be created and approved by RAN2. Due to those reasons, we propose that this UL TX switching feature be added to the list of Rel-19 work items.* |

## Open issues summary

### Sub-topic 2-1: On 2CC-2CC UL Tx Switching Scenarios

* **Background:**

Refer to R4-2407074: Through the endorsed CR R4-2406699, RAN4 has recently discussed and introduced time mask definitions for UL Tx switching between two bands with each having two contiguously aggregated carries (CCs) using the TEI process. However, as captured in the original scope of the WID RP‑202088, the current work plan limits the total numbers of CCs involved in the UL Tx switching to only 3 CCs not 4 CCs: We can clearly read “**UE requirements to enable Tx switching betweencases where 1 on band A and 2 contiguous aggregated carriers on band B…**” as one of the main objectives of the WID. Therefore, the UL Tx switching involving 4 CCs is out of scope of the current NR multicarrier enhancement WID.

* **Proposals (Apple):**
* **Proposal:** *2CC-2CC UL Tx switching is out of scope of the original Multi-carrier enhancement WID and introducing in Rel-18 will require three additional UL capabilities to be created and approved by RAN2. Due to those reasons, we propose that this UL TX switching feature be added to the list of Rel-19 work items.*
* **Recommended WF:**
  + 2CC-2CC UL Tx switching shall be added to the scope of Rel-19 work items.