**3GPP TSG-RAN WG4 Meeting #111 R4-2410317**

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

**Title:** WF on RRM requirements for NR\_MIMO\_evo\_DL\_UL

**Agenda Item:** 7.19.4

**Source:** Samsung

**Document for:** Approval

# <Topic 1 RRM core requirements maintenance >

**Issue 1-1-2: Applicability of timing requirements for 2 TAs.**

**< Agreement>**

* Timing requirements for two TAs are applicable for PUCCH/PUSCH/SRS, intra-cell PDCCH ordered RACH CFRA.
* FFS on inter-cell PDCCH ordered RACH CFRA.
* FFS on other uplink transmission

**Issue 1-1-3: For PDCCH order RACH, uplink timing and DL timings association.**

**< Agreement>**

* For intra-cell, confirm the association in RAN1 LS R4-2407007.
* For inter-cell, FFS on:
	+ If the PRACH is triggered towards serving cell PCI, the uplink transmission takes place $N\_{TA offset}×T\_{c}$ before the reception of the first detected path (in time) of [one of] the corresponding downlink reference signal(s) of the reference cell associated with the *coresetPoolIndex* having the same TAG as that serving cell, where $N\_{TA offset}$ is the first n-TimingAdvanceOffset value,
	+ If the PRACH is triggered towards active additional cell PCI, the uplink transmission takes place $N\_{TA offset}×T\_{c}$ before the reception of the first detected path (in time) of [one of] the corresponding downlink reference signal(s) of the reference cell associated with the *coresetPoolIndex* having the same TAG as that active additional PCI, where $N\_{TA offset}$ is the second n-TimingAdvanceOffset value.

**Issue 1-2-1: For mDCI mTRP, OL definition?**

**< Agreement>**

* OL = 1 if the SSB overlaps or is adjacent to the SSB from the other TRP in FR2 and the SSB is associated to the TRP with the lowest corestPoolIndex, 0, otherwise.

**Issue 1-2-2: For mDCI mTRP, how to specify UL TCI state switching requirements for eUTCI if UE supporting two TAs (RTD<CP and RTD>CP)?**

**< Way forward >**

* Option 1 (Apple, Samsung)
	+ For joint TCI state, no additional DL RS tracking time for UL TCI state switching.
	+ For separate UL TCI state, If the DL beams are changed as well and DL TCI is not in the active list, the previous DL timing cannot be used. Additional DL RS tracking time for UL TCI state switching is needed as:
		- Known case: THARQ + $3N\_{slot}^{subframe,µ}$ + TOk-ref (Tfirst-SSB-DLRef + OL\*T SSB-DLRef + 2ms)+NM\*( Tfirst-PL-RS + 4\*Ttarget\_PL-RS + 2ms)
		- Unknown case: THARQ + $3N\_{slot}^{subframe,µ}$ + TL1-RSRP + TOuk-ref (Tfirst-SSB-DLRef + OL\*T SSB-DLRef + 2ms)+ Tfirst-PL-RS + 4\*Ttarget\_PL-RS + 2ms
		- TOk-ref = 1 if there is no active DL TCI-State for DL timing reference associated with the same coresetPoolIndex
	+ For other cases of separate UL TCI state, no additional DL tracking is needed.
* Option 2: (Huawei, MediaTek, Ericsson)
	+ No additional DL RS tracking time for UL TCI state switching

**Issue 1-2-3: Whether to add scheduling restriction of DL and UL TCI state switch for mDCI?**

**< Way forward >**

* Option 1 (Xiaomi)
	+ Define scheduling restriction for DL and UL TCI state switch, i.e. The UE is not expected to transmit or receive data on the SSB or CSI-RS symbols used for T/F measurement or pathloss measurement for FR1 with different SCS and FR2.

**Issue 1-2-4: RLM/BFD/CBD requirements for mTRP?**

**< Way forward >**

* Option 1 (MediaTek)
	+ The legacy evaluation delay of RLM/BFD/CBD is applicable to RTD>CP case in FR1. The legacy RLM, BFD and CBD requirements are not applicable to RTD>CP case in FR2.

# <Topic 2 RRM performance requirement for TDCP >

**Issue 2-1-1: Test metric of TDCP test cases:**

**< Agreement>** **:**

* Lower Doppler (10Hz, 20dB): reported TDCP index is no bigger than a certain value (e.g., 6), with at least 80% probability
	+ TC1 for low doppler condition+15kHz SCS FDD: value 6
	+ TC2 for low doppler condition+30kHz SCS TDD: value 5
* Higher Doppler
	+ TC3 for high doppler condition+15kHz SCS FDD, 300 Hz, SNR=[10]dB
		- Reported TDCP index is larger than 8, with at least 80% probability
	+ TC4 for high doppler condition+30kHz SCS TDD, 300Hz, SNR=[10]dB
		- Reported TDCP index is larger than 6, with at least 80% probability

# <Topic 3 other RRM performance requirement >

**Issue 3-1-1: Test cases for FR2 separate DL/UL TCI state switching**

**< Agreement>** **:**

Agreement on the applicability rule:

* If UE supports separate DL/UL TCI states, it is tested only for Separate DL TCI state switch and Separate UL TCI state switch
* If UE supports only joint TCI states, it is tested only for Joint TCI state switch

**Issue 3-1-3: AoA setup for s-DCI mTRP cases:**

**< Agreement>** **:**

* Define the 3 AoA setup with three active probes.

**Issue 3-1-2: Test configuration of for s-DCI mTRP cases:**

**< Agreement>** **:**

4 TCIs state in the test.

During T1:

probe 1: TCI#0, RS#0

probe 2: TCI#1, RS#1

During T2

 Probe 1: TCI#2, RS#2

 Probe 3: TCI#3, RS#3

**Issue 3-1-4: Test configuration of two TA timing test cases:**

**< Agreement>** **:**

Define the test cases for the two TAs feature including two MRTD configurations, assuming either MRTD > CP or MRTD < CP

For UE supports the capability of “rxTimingDiff-r18”, the UE is only required to be tested in configuration with RTD>CP.

For UE not support the capability of “rxTimingDiff-r18”, the UE is only required to be tested in configuration with RTD<CP.