**3GPP TSG-RAN WG4 Meeting # 110bis R4-240xxxx**

**Changsha, China 15th ‒ 19th April, 2024**

**Agenda item:** 6.19.5

**Source:** Moderator (Samsung)

**Title:** Adhoc minutes for [110bis][223] NR\_MIMO\_evo\_DL\_UL

**Document for:** Information

# Introduction

This topic summary covers the open issues:

# RRM perfermance requirements

**Issue 3-1-1: TCs design for two TAs**

* Proposals
  + Proposal 1: (Samsung, Nokia)
    - Both UE transmit timing and UE timing advance adjustment
      * TC #1: FR1 UE transmit timing from two TRPs.
      * TC #2: FR2 UE transmit timing from two TRPs.
      * TC #3: FR1 UE timing advance adjustment for two TRPs.
      * TC #4: FR2 UE timing advance adjustment for two TRPs.
  + Proposal 2: (Huawei)
    - Only UE timing advance adjustment for two TRPs
  + Proposal 3: (Huawei, MediaTek, vivo, Ericsson)
    - Only UE transmit timing from two TRPs
      * TC #1: FR1 UE transmit timing from two TRPs.
      * TC #2: FR2 UE transmit timing from two TRPs.

**Issue 3-3-1: TCs design for s-DCI mTRP cases:**

* Proposals

|  |  |  |
| --- | --- | --- |
|  |  | Supporter |
| TC1 | separate DL TCI state switch | Apple, Samsung, MediaTek, Ericsson, Nokia |
| TC2 | separate UL TCI state switch | Apple, Samsung, MediaTek, Ericsson, Nokia |
| TC3 | Joint TCI state switch | MediaTek&Ericsson&Nokia: one test  Apple: no |

**Issue 3-2-1: Whether to define TCs for m-DCI mTRP cases?**

* Proposals
  + Proposal 1: (Apple, Samsung)
    - Define TC for m-DCI mTRP cases
    - 1a: (Apple, Samsung)
      * (Apple): If agree to introduce additional delay component to ULTCI state switch for 2TA
      * (Samsung): mDCI FR1 two TRPs (one serving cell, and another cell with different PCI) + UL TCI + both TCIs are known, two TAs, RTD>CP
    - 1b: (Huawei, Nokia)
      * Huawei: mDCI FR1 two TRPs (one serving cell, and another cell with different PCI) + DL TCI + known TCI, two TAs, RTD>CP
      * Nokia: DL TCI when SSBs from the two TRPs overlapped or are adjacent
  + Proposal 2: (Apple, MediaTek)
    - Do not define TC for m-DCI mTRP cases

**Issue 2-1-1: TDCP tests:**

**According to de GTW discussion:**

Report index:

Option 1:

Low doppler: CDP at X1 is higher than Y1 = [90]%

High doppler: CDP at X2 is lower than Y2 = [10]%

X1, X2 Y1 and Y2 can be different for TDD and FDD

Option 2:

[X1, X2] for Y2 = FFS

**CR split:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | TDCP mapping tables | Section 10 |  |
|  |  | Common configuration such as:  CSI-RS  TCI states  AoA | Annex (whether to have a separate CR or the dedicated CR author to introduce the modification in the common configuration) |  |
| TDCP  Test cases | TC#1 | TDCP:  Cover:  Low doppler  High doppler | Annex |  |
| Timing  Test cases | TC# | FR1 UE transmit timing from two TRPs. | Annex |  |
| TC# | FR2 UE transmit timing from two TRPs. | Annex |  |
| TC# | FR1 UE timing advance adjustment for two TRPs | Annex |  |
| TC# | FR2 UE timing advance adjustment for two TRPs | Annex |  |
| mDCI  mTRP | TC# | FR1 inter-cell, two TA, RTD>CP, DL TCI state | Annex |  |
| TC# | FR1 inter-cell, two TA, RTD>CP, UL TCI state | Annex |  |
| sDCI  mTRP | TC# | separate DL TCI state switch | Annex |  |
| TC# | separate UL TCI state switch | Annex |  |
| TC# | joint TCI state switch | Annex |  |

# RRM core requirements maintenance

**According to discussion in GTW:**

**Agreement: Consider Proposal 1a and 2 for further discussion**

**Issue 1-2-3: For mDCI mTRP, how to specify UL TCI state switching requirements for eUTCI if UE supporting two TAs (RTD<CP and RTD>CP)?**

* Proposals
  + Proposal 1a
    - * Known case: THARQ + + TOk-ref (Tfirst-SSB-DLRef + OL\*T SSB-DLRef + 2ms)+NM\*( Tfirst-PL-RS + 4\*Ttarget\_PL-RS + 2ms)
      * Unknown case: THARQ + + TL1-RSRP + TOuk-ref (Tfirst-SSB-DLRef + OL\*T SSB-DLRef + 2ms)+ Tfirst-PL-RS + 4\*Ttarget\_PL-RS + 2ms
  + Proposal 2
    - No additional DL RS tracking time for UL TCI state switching

**Issue 1-2-4-a: Scheduling restriction of L1-RSRP measurement when RTD>CP in FR1 for serving cell or cell with different PCI from serving cell:**

* + Scheduling availability of UE performing L1-RSRP measurement with a same subcarrier spacing as PDSCH/PDCCH on FR1：no restriction
  + Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing as PDSCH/PDCCH on FR1：
    - Option 1: (Apple, Xiaomi, Samsung)
      * Support simultaneousRxDataSSB-DiffNumerology: no restriction
      * not support simultaneousRxDataSSB-DiffNumerology
        + The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on symbols and 1 symbol before and after symbols corresponding to the SSB indexes configured for L1-RSRP measurement
        + Option 1a: (Samsung) change 1 to 2 in above
    - Option 2: (Huawei)
      * + no restriction
    - Option 3: (MediaTek, Ericsson)
      * Support simultaneousRxDataSSB-DiffNumerology: no restriction
      * not support simultaneousRxDataSSB-DiffNumerology
        + The UE is not expected to transmit PUCCH/PUSCH/SRS or receive PDCCH/PDSCH/CSI-RS for tracking/CSI-RS for CQI on symbols which are overlapped or partially overlapped with SSB symbols configured for L1-RSRP measurement

**Issue 1-2-4-b: Scheduling restriction of L1-RSRP measurement when RTD>CP in FR1 for cell with different PCI from serving cell:**

* Proposals
  + - Option 1: (Apple, Xiaomi, Samsung)
      * + The UE is not expected to transmit PUCCH/PUSCH/SRS on the same symbols and 1 symbol before or after the OFDM symbols corresponding to the SSB indexes configured for L1-RSRP measurement, where the transmission of PUCCH/PUSCH/SRS may be on serving cell(s) and cell(s) with PCI different from serving cell(s), and restricted symbols may partially or fully overlap with UL symbols
        + Option 1a (Samsung): change 1 to 2 in above
    - Option 2: (Huawei)
      * + no restriction
    - Option 3: (MediaTek, Ericsson)
      * + The UE is not expected to transmit PUCCH/PUSCH/SRS on the symbols configured for L1-RSRP measurement which are overlapped or partially overlapped with SSB symbols configured for L1-RSRP measurement.

**Issue 1-2-1: For sDCI mTRP, how to specify DL MAC CE based dual TCI state switch the switching delay requirements for Case 1, if SSB are adjacent in FR2?**

Previous Agreement: The SSB periodicity is the same for serving cell

* THARQ + + max{TOk1\*(Tfirst-SSB1 +AD1\*TSSB1+ TSSB-proc), TOk2\*(Tfirst-SSB2 +AD2\*TSSB2+ TSSB-proc)} / NR slot length
  + AD1 = 1 if SSBs are adjacent in FR2 and TSSB1 =TSSB2 ; 0 otherwise
  + AD2 = 1 if SSBs are adjacent in FR2 and TSSB2 = TSSB1 ; 0 otherwise
* Proposals
  + Proposal 1 (Apple)
    - THARQ + + max{TOk1\*(Tfirst-SSB1 +AD1\*TSSB1+ TSSB-proc), TOk2\*(Tfirst-SSB2 +~~AD~~~~2~~~~\*T~~~~SSB2~~~~+~~ TSSB-proc)} / NR slot length;

AD1 = 1 if SSBs are adjacent in FR2 and TSSB1 =TSSB2 ; 0 otherwise

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

Previous Agreement: OL=1 if SSB overlaps or adjacent to SSB from other TRP in FR2 and SSB periodicity is less than that of other TRP

* Proposals
  + Proposal 1 (Apple, Nokia)
    - Add “equal to”
    - OL=1 if SSB overlaps or adjacent to SSB from other TRP in FR2 and SSB periodicity is equal to or less than that of other TRP, 0 otherwise.
  + Proposal 2 (Nokia)
    - OL=1 if the SSB overlaps or is adjacent to the SSB from the other TRP in FR2 and the SSB periodicity is the same than that of the other TRP and the SSB is associated to the TRP with the lowest coresetPoolIndex;
* Recommended WF
  + Agree Proposal 1 and capture in draft CR. Discuss Proposal 2

**Issue 1-2-5: Whether to add clarification in sDCI TCI state switch?**

* Proposals
  + Proposal 1 (Xiaomi)
    - For sDCI, UE is not expected to receive or transmit on the target TCI state before UE completes the DL and UL TCI state switch of both TRPs.

**Issue 1-2-6: Whether to add scheduling restriction of DL and UL TCI state switch for mDCI?**

* Proposals
  + Proposal 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 (in R4-2404579)

**Issue 1-2-7: Revert the previous agreement for unknown TCI state for both sDCI mDCI?**

* Proposals
  + Proposal 1 (MediaTek):
    - When any of the TCI state is unknown, longer delay is expected, no specific requirement.

**Issue 1-2-8: Add clarification for PL-RS for MAC-CE UL TCI state switch?**

* Proposals
  + Proposal 1 (MediaTek):
    - The requirements are only applicable when PL-RS of the two TCI states are not overlapped or adjacent.

**Mapping tables:**

[Background]: It is agreed to define the mapping table in section 10 of RRM spec.

To Qualcomm: the proposal is not to add mapping table in RAN4 spec which is disobeyed with the agreement. To clarify during the meeting.

**Issue 2-1-2: TDCP Measurement Report Mapping – amplitude**

* Proposals
  + Proposal 1: (Apple, Xiaomi, Huawei)
    - Define the mapping table as: use RAN1 points for each boundary of the range

|  |  |
| --- | --- |
|  | **TDCP Range** |
| 0 | 0.9945< TDCP <=1 |
| 1 | 0.9922< TDCP <=0.9945 |
| 2 | 0.9890< TDCP <=0.9922 |
| 3 | 0.9844< TDCP <=0.9890 |
| … | … |
| 12 | 0.6464< TDCP <=0.75 |
| 13 | 0.5< TDCP <=0.6464 |
| 14 | 0.2929< TDCP <=0.5 |
| 15 | 0≤ TDCP <=0.2929 |

* + Proposal 2: (Samsung, Nokia, MediaTek)
    - use the RAN1 points as the middle (but not the centre due to non-uniform) of each range as

|  |  |
| --- | --- |
| Estimated TDCP value | Report index |
| 0.9953≤Estimated TDCP≤1 | 0 |
| 0.99335<Estimated TDCP<0.9953 | 1 |
| … | … |
| 0≤Estimated TDCP<0.39645 | 15 |

**Issue 2-1-3: TDCP Measurement Report Mapping – phase**

* Proposals
  + Proposal 1: (Apple, Xiaomi, Samsung)
    - Define the mapping table as: use RAN1 points for each boundary of the range
  + Proposal 2: (Nokia)
    - Define the mapping table as: use average of RAN1 points for each boundary of the range