**3GPP TSG-RAN WG4 Meeting # 111 R4-2410345**

**Fukuoka City, Fukuoka, Japan, 20th ‒ 24th, 2024**

**Agenda item:** 7.19.4

**Source:** Moderator (Samsung)

**Title:** Ad-hoc minutes #2 for NR\_MIMO\_evo\_DL\_UL WI

**Document for:** Information

# Introduction

This Ad-hoc minutes is to cover the below issues:

# Topic: RRM performance part

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

[Background]: In RAN4#110-bis meeting, it is agreed as:

|  |
| --- |
| Agreements for the test case definition:* Define the same test case for both 15kHz with FDD and 30kHz with TDD in the same sub-clause.
* Channel models: TDL-A30
* Doppler:
	+ Two TCs with low and high Doppler
		- TC1: low (10) for both 15kHz and 30kHz
		- TC2: high
			* Option 1: high (300)
			* Option 2: 100 for 15kHz SCS, and 200 for 30kHz SCS
	+ BW:
		- 10MHz for FDD and TDD
	+ SNR:
		- Option 1: 20dB for TC1
		- Option 2: 10dB or 20dB for TC2
	+ The distance between two TRSs: 1
* Report index: Bring CR for both options, make decision in the next meting
	+ Option 1:
		- lower 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
 |

* Proposals

In below table:

Use TC1 for low doppler condition+15kHz SCS FDD

Use TC2 for low doppler condition+30kHz SCS TDD

Use TC3 for high doppler condition+15kHz SCS FDD

Use TC4 for high doppler condition+30kHz SCS TDD

|  |  |  |  |
| --- | --- | --- | --- |
|  | Doppler (Hz) | SNR | Report index |
| Apple | TC1: 10 | 20 | [0, 6] for Y2=70% |
| TC2: 10 | [0, 7] for Y2=70% |
| TC3: 100 | [4, 12] for Y2=70% |
| TC4: 200 | [4, 12] for Y2=70% |
| Qualcomm | TC1: 10 | 20 | CDP is higher than 90% at X1= 1 |
| TC2: 10 | CDP is higher than 90% at X1= 2 |
| Down select from:300Hz for TC3 and TC4100Hz for TC3 and 200Hz for TC4 | 300Hz for TC3 and TC4:* CDP is lower than 10% at
	+ X2 = 8 (TC3)
	+ X2 = 4 (TC4)

100Hz for TC3 and 200Hz for TC4:* CDP is lower than 10% at
	+ X2 = 2 (TC3)

X2 = 2 (TC4) |
| Samsung | TC1: 10 | 20 |  |
| TC2: 10 | Reported TDCP is less than 6 for 90% tests |
| TC3: 300 |  |
| TC4: 300 | Reported TDCP is higher than 6 for 90% tests |
| Huawei | TC1: 10 | 10 | [5,13] with Y2=80% |
| 20 | [0,8] with Y2=80% |
| TC2: 10 | 10 | [5,13] with Y2=80% |
| 20 | [0,8] with Y2=80% |
| TC3: 300 | 10 | [8,15] with Y2=80% |
| 20 | [6,15] with Y2=80% |
| TC4: 300 | 10 | [7,15] with Y2=80% |
| 20 | [3,14] with Y2=80% |
| MediaTek | TC1:10 | 20 | 90% of reported TDCP values should be larger than a certain value (CDF 10% is used to determine the value). |
| TC2:10 |
| TC3:100 | 90% of reported TDCP values should be less than a certain value (CDF 90% is used to determine the value). |
| TC4:200 |
| Nokia | TC1: 10 | 20 | pass criteria is TCDP > X1 for 90 % of the samples.* 1. X1 is defined as quantized maximum value among the 90th percentile among all companies excluding outliers.
 |
| TC2: 10 |
| TC3: 300 | 10 | pass criteria is TCDP < X2 for 90 % of the samples.* 1. X2 is calculated as quantized minimum value among the 10th percentile among all companies excluding outliers.
 |
| TC4: 300 |
| Ericsson | TC1: 10 | 20 | Choose one from option 1 and option 2 |
| TC2: 10 |
| TC3: 300 | 10 |
| TC4: 300 |

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Agreement:

* Lower Doppler: reported TDCP index is no bigger than a certain value (e.g., 6), with 90% propability
* Higher Doppler
	+ For TC4, use 300Hz
	+ For TC3, further discuss whether to use 100Hz or 300Hz together with the threshold for the report index.

Discussion:

Lower Doppler(10Hz, 20dB): reported TDCP index is no bigger than a certain value (e.g., 6), with at least 90% probability

* TC1 for low doppler condition+15kHz SCS FDD: value 6
* TC2 for low doppler condition+30kHz SCS TDD: value 5

Apple: we need the margin. Since we want to non-overlapped range with high doppler. Suggest to decrease 90% to 70~80% to consider the margin.

MTK: why there cannot be overlapped range?

Higher Doppler

* TC3 for high doppler condition+15kHz SCS FDD, 300 Hz, SNR=10
	+ Reported TDCP index is larger than 8, with at least 80% probability
* TC4 for high doppler condition+30kHz SCS TDD, 300Hz
	+ Reported TDCP index is larger than 6, with at least 80% probability

Ericsson: we can agree this as a package.

QC: why high SNR cause higher error in high doppler

Xiaomi: the test metric is accepted.

QC: remove all high doppler case for requirement.

Ericsson: keep both low doppler and high doppler as well

QC: fine with this version with bracket

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]
	+ Reported TDCP index is larger than 8, with at least 80% probability
* TC4 for high doppler condition+30kHz SCS TDD, 300Hz, SNR=[10]
	+ Reported TDCP index is larger than 6, with at least 80% probability

# Topic: RRM core part maintenance

### eUTCI for mTRPs

**Issue 1-2-1: 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)
		- For all the cases: OL=1 if SSB overlaps or adjacent to SSB from other TRP in FR2 and SSB periodicity is less than that of other TRP, 0 otherwise
	+ Proposal 2 (Samsung, Nokia)
		- if the first SSB which after decoding the MAC-CE overlaps or adjacent to the first SSB which after decoding another MAC-CE from other TRP in FR2 and SSB periodicity is equal to that of other TRP
			* If the MAC CE arrived first, OL=0; Otherwise OL=1
		- If the first SSB which after decoding the MAC-CE overlaps or adjacent to the first SSB which after decoding another MAC-CE from other TRP in FR2 and SSB periodicity is less than that of other TRP, OL=1
		- Otherwise, OL=0
	+ Proposal 3 (MediaTek)
		- how to handle the overlapped or adjacent case are up to UE implementation.

Discussion:

Nokia: last meeting, when we discuss the delay. P2 is one option. Another one is based on the dedicated coresetPoolIndex. From network side, we cannot depend on UE implementation. We are fine to addiction delay on dedicated coresetPoolIndex as well. OL = 1 if the SSB overlapps or is adjacent to the SSB from the other TRP in FR2 and the SSB is associated to the TRP with the lowest corestPoolIndex

MTK: ask question, does NW from one TRP knows MAC-CE command from the other TRP. If NW knows, NW can avoid this case.

Apple: on mDCI, we need the information both from NW side and UE side. Time of MAC-CE command cannot used.

corestPoolIndex is information clear on NW side and UE side.

Ericsson:

Tentative 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.

**Ericsson would like to check before the end of the meeting.**

**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)?**

* Proposals
	+ Proposal 1 (Apple, Samsung)
		- Additional time for DL timing reference tracking should be added in conditions.
		- Proposal 1a (Apple)
			* In the condition: no timing reference associated with the same coresetPoolIndex.
		- Proposal 1b (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.
	+ Proposal 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?**

* 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. Details in CR R4-2407850

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

* Proposals
	+ Proposal 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.