**3GPP TSG-RAN WG4 Meeting #104-e R4-2214394**

**Electronic Meeting, 15 ‒ 26 August 2022**

**Title: WF on RedCap UE demodulation and CQI reporting requirements**

**Agenda Item:** 9.18.6

**Source: Ericsson**

**Document for:** Approval

# Topic #1: General topics for UE demodulation and CSI reporting requirements

## Sub-topic 1-1: Specification structure

**Way forward: Whether to introduce UE demodulation and CSI reporting requirements for 2Rx RedCap UE supporting HD-FDD in FDD bands as well as 1Rx UE**

* Option 1: Yes
	+ The requirements with HD-FDD are the same as the corresponding (full-duplex) FDD requirements if introduced.
		- If introduced, interested companies can evaluate if the same requirements can be applied for both 2Rx HD-FDD and 2Rx FD-FDD.
* Option 2: No

**Agreement**: **Section names for RedCap UE demodulation and CSI reporting requirements**

* If new section is added for RedCap performance requirements, put ‘for RedCap’ (not ‘for RedCap UE’) for the section name

**Agreement**: **Applicable FR2 bands for RedCap UE**

* In FR2 bands, specify RedCap UE demodulation and CSI reporting requirements for FR2-1 only

# Topic #2: UE demodulation requirements

## Sub-topic 2-1: PDSCH demodulation requirements

**Agreement: Define 256QAM demodulation requirements for 1Rx RedCap UE in FR1 or not.**

* Define 256QAM demodulation requirements for 1Rx RedCap UE in FR1
	+ Set MCS20

# Topic #3: CSI reporting requirements

**Agreement: CQI feedback scheduling pattern in static/fading condition (periodic CSI reporting) for both FD-FDD and HD-FDD**

* Configure the following parameters for CQI feedback scheduling pattern in static/fading condition (periodic CSI reporting) for both FD-FDD and HD-FDD:
	+ CSI-RS periodicity and offset: 10/1
	+ CSI-Report periodicity and offset: 10/9
	+ CQI/RI/PMI delay: [14ms]
	+ Interested companies are encouraged to evaluate the performance difference between CQI delay 14ms and 10ms in RAN4#104-bis-e. If significant performance degradation is observed compared with CQI delay 10ms, RAN4 will revisit the CQI/RI/PMI delay
		- If CQI delay 10ms is applied, consider CSI periodicity and offset is set to 10/5.

**Agreement: Lower test points for CQI reporting test in fading condition for 2Rx (FR1 FDD and TDD)**

* Set SNR=6/7dB for lower test points for CQI reporting test in fading condition for 2Rx

**Way forward: Static channel matrix used for 1Rx UE and SNR test point offset for CQI reporting tests**

* Interested companies are encouraged to evaluate the options for the static channel matrix and SNR test point offset.
	+ Option 1: Set the static channel matrix in the frequency domain as$H\_{1RX}=\left[\begin{matrix}1&j\end{matrix}\right]$. Set SNR test point X=[0]dB lower than 2Rx test case.
	+ Option 2: Keep the previous agreement on the static channel matrix in the frequency domain, that is,$H\_{1RX}=\left[\begin{matrix}1&1\end{matrix}\right]$. Set SNR test point X=3dB lower than 2Rx test case.

**Agreement: Mapping of CQI index to information bit payload**

* For RedCap CSI reporting test using CQI table 1, apply the following configuration for mapping of CQI index to information bit payload
	+ FR1
		- Reuse value 0 for the overhead parameter for TBS determination
		- Set 52RB for 10MHz/15kHz and 51RB for 20MHz/30kHz

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| TBS Scheme | TBS.1-1 | TBS.1-2 | TBS.1-X1 | TBS.1-X2 | TBS.1-X3 | TBS.1-X4 |
| MCS table | 64QAM |
| Number of allocated PDSCH resource blocks | 66 | 66 | 52 | 52 | 51 | 51 |
| Number of consecutive PDSCH symbols | 12 | 12 | 12 | 12 | 12 | 12 |
| Number of PDSCH MIMO layers | 1 | 2 | 1 | 2 | 1 | 2 |
| Number of DMRS Res (Note 1) | 24 | 24 | 24 | 24 | 24 | 24 |
| Overhead for TBS determination | 6 | 6 | 0 | 0 | 0 | 0 |
| Available RE-s | 7590 | 7590 | 6240 | 6240 | 6120 | 6120 |
| CQI index | Spectral efficiency | MCS index | Modulation | Information Bit Payload per Slot |
| 0 | OOR | OOR | OOR | N/A | N/A | N/A | N/A | N/A | N/A |
| 1 | 0.2344 | 0 | QPSK | 1800 | 3624 | 1480 | 2976 | 1480 | 2856 |
| 2 | 0.2344 | 0 | 1800 | 3624 | 1480 | 2976 | 1480 | 2856 |
| 3 | 0.3770 | 2 | 2856 | 5640 | 2408 | 4744 | 2408 | 4616 |
| 4 | 0.6016 | 4 | 4480 | 8968 | 3752 | 7424 | 3752 | 7296 |
| 5 | 0.8770 | 6 | 6528 | 13064 | 5504 | 11016 | 5376 | 10760 |
| 6 | 1.1758 | 8 | 8712 | 17928 | 7296 | 14600 | 7168 | 14344 |
| 7 | 1.4766 | 11 | 16QAM | 11016 | 22032 | 9224 | 18432 | 8968 | 17928 |
| 8 | 1.9141 | 13 | 14344 | 28680 | 12040 | 24072 | 11784 | 23568 |
| 9 | 2.4063 | 15 | 17928 | 35856 | 15112 | 30216 | 14600 | 29192 |
| 10 | 2.7305 | 18 | 64QAM | 20496 | 40976 | 16896 | 33816 | 16896 | 33816 |
| 11 | 3.3223 | 20 | 25104 | 50184 | 20496 | 40976 | 20496 | 40976  |
| 12 | 3.9023 | 22 | 29192 | 58384 | 24576 | 49176 | 24072 | 48168 |
| 13 | 4.5234 | 24 | 33816 | 67584 | 28168 | 56368 | 27656 | 55304 |
| 14 | 5.1152 | 26 | 38936 | 77896 | 31752 | 63528 | 31240 | 62504 |
| 15 | 5.5547 | 28 | 42016 | 83976 | 34816 | 69672 | 33816 | 67584 |
| Note 1: Number of DMRS Res includes the overhead of the DM-RS CDM groups without dataNote 2: PDSCH is not scheduled on slots containing CSI-RS for tracking, CSI-RS for CSI acquisition and CSI-RS for beam refinement or slots which are not full DLNote 3: PDSCH is not scheduled on slots containing PBCH, i.e. slot#0 per 20ms periodicityNote 4: Spectral efficiency is based on MCS Table defined in Table 5.1.3.1-1 of TS 38.214 [12]Note 5: TBS.1-3, TBS.1-4, TBS.1-5 and TBS.1-6 are applicable to RedCap UE. |

* + FR2
		- Reuse existing test for CQI reporting under static condition in clause 8.2.2.2.1 and corresponding CSI RMC for RedCap UE in FR2-1

**Agreement: PMI feedback scheduling pattern (aperiodic CSI reporting) for both FD-FDD and HD-FDD**

* Configure the following parameters for PMI reporting tests for both FD-FDD and HD-FDD:
	+ CSI request: 1 in slots i, where mod(i, 5) = 1, otherwise it is equal to 0.
		- Reuse the FRC from Rel-15 PMI test (R.PDSCH 1-6.1 FDD)
	+ Aperiodic Report Slot Offset: 3 slots
	+ CQI/RI/PMI delay: 6ms

**Agreement: Whether to define RI reporting requirements for RedCap 2Rx UEs**

* Define RI reporting requirements for RedCap 2Rx UEs
	+ Apply Test 2 only
* Replace fading CQI test for 2 Rx UE (high SNR point) by RI test case (Test 2)

# Others

* Interested companies are encouraged to provide both the ideal and impairment simulation results for RedCap UE demodulation and CSI reporting requirements in RAN4#104-bis-e.