

MediaTek Views on RAN4 Rel-19: RF and OTA

Outline

- A summary of all MTK's Rel-19 proposals
- Detailed proposals to RF & OTA areas

A summary of all MediaTek Rel-19 RAN4 proposals

Area	Proposed objectives
RF & OTA (RP-233279)	Study on UE antenna correlation for FR1 multiple antennas (SI)
	MPR Reduction for RedCap (via relaxed emission requirements)
	3Tx for 2 bands with UL Tx switching between 1T2T and 2T1T

Area	Proposed objectives
RRM (RP-233280)	HO interruption minimization
	Relaxed RLM/BFD measurement for Redcap
	TS38.133 Spec clean-up (Kp calculation; MG integration)
	[MG] Pre-configured NCSG
	[MG] NCSG enh for SCell
Demod (RP-233280)	App layer throughput enh: OLLA and 4-layer
	CQI report for R-ML SU-MIMO receiver

Area	Proposed objectives
Cross-session (RP-233281)	Enhanced NTN testing for NGSO
	NTN RedCap UE Support
	NR NTN 3MHz channel bandwidth
	IoT NTN HPUE support
	In-band/guard-band co-existence of NB-IoT w/ NR

Study on UE antenna correlation for FR1 multiple antennas (SI)

- **Motivations**

- Gap between conducted and real-field performance for both Tx and Rx
- OTA TRP measurement for FR1 results in a randomized value by nature
 - Further analysis indicates that the deviation of TRP randomized measurements is directly associated with UE antenna correlation, e.g., an ECC with value larger than 0.3 may correspond to up to 2dB 2Tx TRP deviation.
- From Rx perspective, correlated antennas may offset the diversity gain from multiple antennas. And even for advanced receivers, antenna correlation may reduce its potential gain.
- With escalated interests of equipping a UE more and more antennas for both Tx and Rx while there is a limitation on the device size in particular for smart phones, understanding the impacts of antenna correlation on requirements and performance is essential to have robust and optimized operations at UE for both Tx and Rx.
- Studying the impacts of antenna correlation on RF requirements and performance from standardization perspective is crucial for advancing the UE design and optimization thus contributes to the development of future UEs that can meet the increasing demands for high-speed, reliable, and seamless connectivity in various application domains.
- A study item could be a suitable start for this purpose.

- **Objectives**

- Study potential impacts of UE antenna correlation on Tx requirements
- Study potential impacts of UE antenna correlation on Rx requirements and performance
- Study potential test methodologies for UE antenna correlation

MPR Reduction for RedCap (via relaxed emissions reqs)

[1/2]

Motivation

- For RedCap UEs, it is desirable to reduce MPR, where possible, without device cost increase
- UE Tx emission requirements (background)
 - ACLR/SEM requirements: determined according to inter-operator co-existence. Spurious emissions tighter than ITU-R
 - IBE requirements: defined for coexistence within the same operator channel, and are more relaxed than ACLR
 - PC3 MPR for QPSK/16QAM:
 - “outer-RB” allocations: most severed due to need to fulfil ACLR and SEM.
 - Inner RB allocations: smaller MPR due to distance from channel edge
- RedCap UE will operate in TDD spectrum blocks >>20MHz
 - But required to fulfil ACLR/SEM/Spurious reqs for 20MHz CBW
 - even when operating far from the edge of the operator’s spectrum block, which seems unnecessary from MPR viewpoint
 - Shifting start of OOB and Spurious by 10MHz can make outer RB allocation equivalent to inner RB allocation for MPR, [for DFT-s-OFDM waveform] with QPSK or 16QAM (see example on right)

- **Observation:** Relaxed OOB+Spurious emissions for RedCap UE operating 10MHz away from spectrum block edge can enable MPR of “outer RB” allocations to be reduced without changing RAN4’s Reference UE model complexity

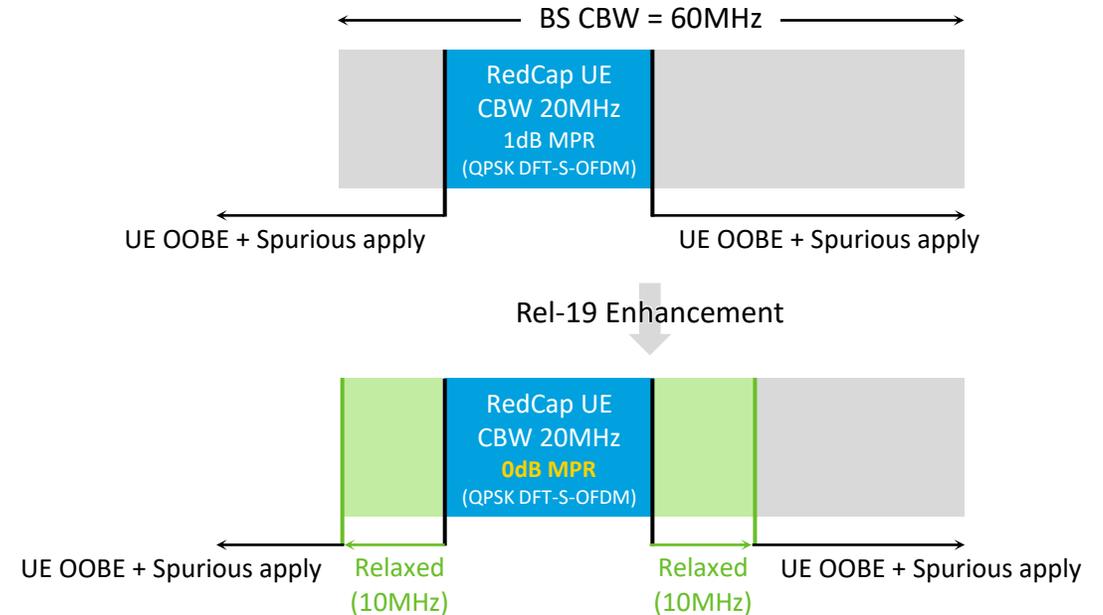


Table 6.2.2-1 Maximum power reduction (MPR) for power class 3

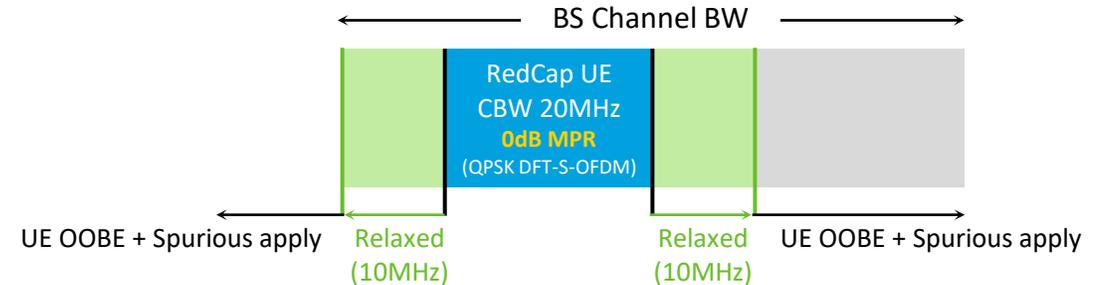
Modulation		MPR (dB)		
		Edge RB allocations	Outer RB allocations	Inner RB allocations
DFT-s-OFDM	Pi/2 BPSK	$\leq 3.5^1$	$\leq 1.2^1$	$\leq 0.2^1$
		$\leq 0.5^2$	$\leq 0.5^2$	0^2
	Pi/2 BPSK w Pi/2 BPSK DMRS	$\leq 0.5^2$	0^2	0^2
	QPSK	≤ 1	≤ 1	0
	16 QAM	≤ 2	≤ 2	≤ 1
	64 QAM	≤ 2.5	≤ 2.5	≤ 1
	256 QAM	≤ 4.5	≤ 4.5	≤ 1

MPR Reduction for RedCap (via relaxed emissions reqs)

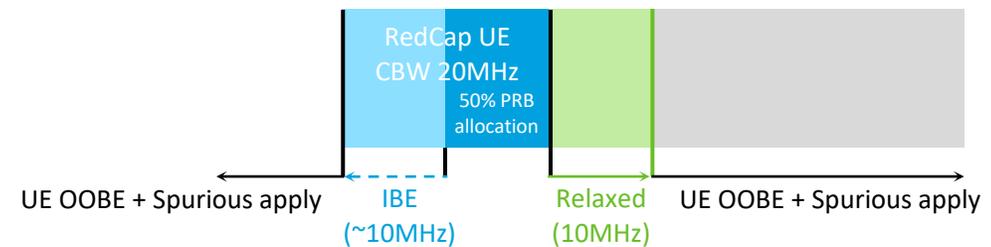
[2/2]

Objectives

- For a RedCap UE operating in TDD bands and operating with 20MHz channel bandwidth in Operator's spectrum block in the following Scenarios:
 - **Scenario 1:** $\geq 10\text{MHz}$ gap from channel BW edge to closest edge of a same Operator's spectrum block (BS channel BW) with full RB allocation allowed
 - **Scenario 2:** No gap from channel BW edge to closest edge of the same Operator's spectrum block (BS channel BW), but with max 50% partial RB allocation with first/last RB no closer to the spectrum block edge than an inner RB allocation in same channel BW
- Specify relaxed UE Tx OOB and Spurious emission requirements for [DFT-s-OFDM for] QPSK and 16QAM modulation, for scenario 1 (2-sides) and scenario 2 (1-side) by shifting the equivalent emission starting frequency such that outer-RB allocations become equivalent to inner-RB allocations, without increasing UE complexity vs RAN4 reference UE model [RAN4]
 - If identified as not permissible in a geographical region, this can also be restricted in spec as necessary.
- Specify corresponding reduced MPR requirements for outer-RB allocations specifically for the case where the relaxed RF emissions are applied [RAN4]
- Specify RRC signalling to allow the RAN to configure a specific UE with the relaxed RF emissions, and associated UE capability [RAN2]



Scenario 1



Scenario 2

NOTE: Such relaxation concept may be considered also for additional scenarios in the future, as highlighted during RAN Rel-19 Workshop on [RWS-230119](#) (see [meeting report](#)) but this may be more something for future work, as more evaluation may be needed first.

3Tx for 2 bands with UL Tx switching between 1T2T and 2T1T

• Motivations

- With 3Tx introduced for non-handheld devices in Rel-18, there is a **strong commercial interest** in applying UL Tx switching for 3Tx among 2 bands.
 - Both FDD and TDD UL MIMO gain market attractions.
- Technically, 3Tx capability may not be fully utilized or optimized in some certain scenarios
 - For example, for a 3Tx-capable UE supporting a band combination consisting of one FDD band and one TDD band, both of which support UL-MIMO operation.

In an area where a high SNR can be achieved , the configuration of 1Tx (FDD) UL-2Tx (TDD) UL takes advantage of large TDD BW

In an area with low SNR, the configuration of 2Tx (FDD) UL-1Tx (TDD) UL takes advantage of FDD low propagation loss.

- By enabling the support of Tx switching between FDD (1T) + TDD (2T) and FDD (2T) + TDD (1T), 3Tx transmission can adjust accordingly hence guarantee benefits from either large TDD BW or FDD low propagation loss.

• Objectives

- Specify UL Tx switching across 2 bands with restriction of up to 3 Tx simultaneous transmission for FR1 UEs, **where there is only one CC on each band**. In particular, UL Tx switching is performed between 1T2T and 2T1T for a 3Tx capable UE.
 - Specify the following RAN4 requirements for the scenario
 - Length of switching period
 - Time mask RF requirements
 - Uplink interruption and downlink interruption (RRM) requirements, if needed
- Specify UL Tx switching across 2 bands with restriction of up to 3 Tx simultaneous transmission for FR1 UEs, **where there is only one CC on one band, and two contiguous CCs on the other band**. In particular, UL Tx switching is performed between 1T2T and 2T1T for a 3Tx capable UE.
 - Specify the following RAN4 requirements for the scenario
 - Length of switching period
 - Time mask RF requirements
 - Uplink interruption and downlink interruption (RRM) requirements, if needed
- RAN1 work, if identified, can be triggered by LS

Thank you!