

MEDIATEK

Rel-17: eNB-IoT

Expand NB-IoT footprint where the market demands

3GPP TSG RAN#84
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A.I. 8

MediaTek Inc.

Motivation

Market Demand for more capable NB-IoT (w/200kHz carrier)

- NB-IoT replacing GSM/EDGE for IoT in some markets but unable to address all requirements
- Underperforms with applications requiring connected mode with mobility for extended time periods: significant interruption times and UL interference
 - Tracker applications with frequent reporting (e.g. once every second or two seconds)
 - Media applications e.g. kids watch with audio
 - File downloads
- Worse real-time characteristics problematic for embedded “interactive” devices
 - Sales or payment terminal
- Worse spectrum efficiency and performance than GSM/EDGE

Consumer use cases

Examples

- Higher NB-IoT Data Rates

Applications	Description	Data Rate Requirement	Note
FOTA	Software upgrade	250 kbps~300 kbps	Payload size as 100KB (diff) ~ 1MB (full image)
Health/fitness	Heartbeat monitoring	192 kbps~256 kbps	Currently sending by BLE (Bluetooth Low Energy)
Smart home VAD (Voice Assistant Device)	Voice command for remote control	200 kbps	

- Lower latency

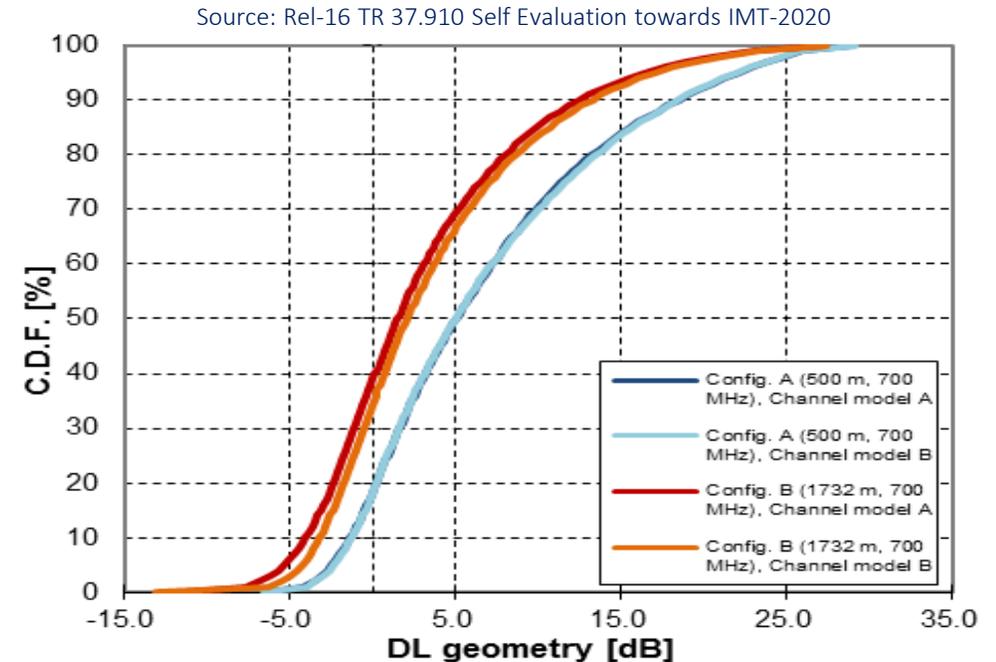
Applications	Latency Requirement
POS (point of sale) Machine	500 ms
Smart Grid Demand Response	500 ms
Smart Door (lock/unlock)	600 ms

Efficiency

Higher Order Modulation – preferred in Rel-16

[RP-191092](#)

- Objectives
 - Introduce 16QAM for PDSCH and PUSCH
 - New UE Category: Cat NB3
- Benefits
 - Better spectrum efficiency in cells with normal coverage (on par or better than GSM/EDGE)
 - Higher data rates in normal coverage enabling more demanding applications and lower response times
- UE aspects
 - Additional hardware complexity is not significant to the cost of the NB-IoT UE
 - Cat NB3 could in time be absorbed into the hardware evolution of all vendors



	DL	UL
Peak data rate (QPSK)	126.8 kbps	158.5 kbps
Peak data rate (16QAM)	253.6 kbps	317.0 kbps

16QAM can be used at SINR in the region of 7 dB
Up to 40% UEs can be scheduled with 16QAM with ISD=500m

Efficiency and Latency

NB-IoT carrier per coverage level

- Objective
 - Specify support for different coverage level support per carrier (with paging adapted accordingly)
- Benefits
 - Better handling of coverage and interference
 - Reduced latency for UEs in good coverage: Avoid UEs in bad coverage blocking Tx from UEs in better coverage (head-of-line blocking)
 - Rmax also for paging can be set low on carriers for normal coverage
 - ⇒ low PC for PDCCH decoding by UEs in normal coverage
 - Better deployment tailoring: UEs that need deep coverage could use stand-alone carriers, while UEs in good coverage could also use in-band carriers

Mobility during data transmission

- Motivations
 - Low NB-IoT data rate not suited to large data transfers: keeping the UE connected for extended time periods is required
 - Long interruption due to RLF-based mobility
 - RLF-based mobility causes increased NCell interference due to mobile UE not able to change cell during long transmission esp. UL interference
- Objectives
 - Specify UE mobility trigger other than RLF in connected mode, based on UE measurements
 - Keep the UE connected to the best cell radio-wise e.g. cell re-selection with RRC re-establishment in connected mode
 - Measurements in gaps e.g. DRX gaps, extended DL/UL transmission gaps (no new HW requirement)
- Benefits
 - Less interference, better overall performance
 - Less interruption at connected mode cell change

Thank You!