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Agenda Item 15

Views on Non Terrestrial Networks

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OUTLOOK

- Stage 1: use cases & requirements for 5G Satellite integration in the 5G System
  - Misc. vertical stakeholders incl. public safety, media&entertainment, transportation&logistics
- Stage 2 and Stage 3 Studies
  - Integration of NTN in the 5G System (overall architecture, radio & core)

- MediaTek views on NTN deployment, use cases and enhancements
  - NR (5GS)
  - NB-IoT

OVERVIEW

- Deployment and Use Cases of NTN
- Doppler and Propagation Delay in NTN
- NR-NTN
- NB-IoT NTN

LEO Deployment and Use Cases of NTN

- NTN viability tied to reusing same cellular device form factor and antenna design[†]
- LEO deployments support the above
  - Typical LEO Satellite RTT compatible with many Real-Time applications
  - Typical LEO Link budget compatible with below data rates for Pedestrian and NB-IoT Use Cases

Use Case	UE	Satellite configuration	Frequency band	BW	DL data rates	UL Data rate
Pedestrian (NR)	Class 3	LEO	2 GHz	10 MHz	10 Mbps	1 Mbps
IoT (NB-IoT)	Class 3	LEO	2 GHz	180 kHz	100 kbps	100 kbps

[†]LEO deployment with beam spot of 100 km diameter

Doppler and Propagation Delay in NTN

- Doppler and propagation delay can be handled by the UE, provided:
  - Satellite Network Doppler pre-compensation
    - Typical device implementation can accommodate residual Doppler for initial cell access, tracking of synchronisation parameters.
  - Satellite Network propagation delay pre-compensation
    - Legacy UL Timing Alignment procedure can be re-used to compensate residual TA

NR-NTN Normative Work

- NR HARQ scheduling delay cannot accommodate satellite propagation delays
  - Legacy HARQ scheduling delay K1, K2 < Satellite RTT
- Specification impact
  - System information, common signalling [RAN2]
  - Mobility [RAN2, RAN4]
    - Idle mode beamspot / cell re-selection
    - RRM measurement, triggering of RRM report
    - RLF/HOF, HO Delay / packet interruption
  - Scheduling enhancements [RAN1, RAN2]
    - HARQ optimization with max 16 HARQ processes
    - UL timing alignment and Random Access procedures
  - Disabling of Closed Loop Power Control, CSI [RAN1, RAN2]
  - RRM/RF performance requirements [RAN4]
- Timeframe: Release 17

NB-IoT NTN Normative Work

- Very limited specification impact
  - System information, common signalling [RAN2]
  - Mobility [RAN2, RAN4]
    - Idle mode beamspot / cell re-selection
    - RRM measurements
  - RRM/RF performance requirements [RAN4]
- No specification impact for HARQ and RACH procedures with LEO deployment
  - Legacy HARQ scheduling delay K0 can accommodate delay
- No major mobility-related issues identified
  - No CSI and no HO in connected mode
  - UE re-selects new cell when RLF is triggered
- Timeframe: Release 16 (2019 Q3/Q4) or Release 17