GPP TSG-RAN WG4 Meeting # 107
Incheon, KR, May 22- May 29, 2023
Agenda Item: 13
Source: MediaTek inc.
Document for: information

R4-2308513

Motivation for Rel-19 RAN4 –led WI on realistic NTN testing

Issue

- RAN4 RRM and demod requirements for NR NTN (NR_NTN_solutions) was introduced in Rel-17, and for IoT NTN (LTE_NBIOT_eMTC_NTN_req) the requirements have just been completed early in Rel-18.
- Two different types of satellites were considered, e.g., Geostationary orbit (GSO) and Non-geostationary orbit (NGSO)
  - In the current RRM and Demod test cases, the DL arrival timing and Doppler frequency offsets of the modelled channel were agreed to be fixed.
  - Under an NGSO field scenario, a large/continual variation in DL arrival timing and Doppler frequency will likely be observed at the UE. As these characteristics are not well represented by the current RAN4 modelling, it may lead to unpredictable UE performance in the field for an NGSO deployment.
- The above issue is not in current scope of the NR_NTN_enh/IoT_NTN_enh WIs in Rel-18 and not considered in TU planning. This is to say, typically only 2 quarters (3 meetings) are allowed to discuss the performance part, which is insufficient to deal with all the required detail.
- Therefore, we suggest starting a dedicated performance part WI to introduce more realistic NTN NGSO RRM/demod test scenarios in Rel-19 and corresponding enhanced UE requirements. The requirements would at least be mandatory for Rel-19 UEs, and optionally applicable for Rel-17/18 UEs.

Proposal

- *Proposal: Introduce a performance part WI to construct a framework for realistic NTN testing environments in Rel-19*

- In the next pages, we provide our initial thinking of the detail WI plan for information

Annex: Detail WI plan

- In our understanding the whole work can be divided into the following 2 phases with 4 steps

  1. Call for input from Satellite operators
  2. Derive the channel parameters and confirm testability (TE)
  3. Translate the trajectory into SIB19 parameters and capture the channel models
  4. Define test cases and requirements

Annex: Detail WI plan

- Study phase
  - Step 1: Call for input from Satellite operators
    - Collect inputs from Satellite operators about satellite position, velocity and time
    - Input format alignment, e.g., granularity in time
  - Step 2: Derive the channel parameters and confirm testability (TE)
    - Derive (e.g., with simulation) the expected arrival timing change and Doppler frequency change.
    - Determine the in-coverage starting and ending time
    - Consider categorization for different scenarios (e.g., according to satellite height or), if needed.
- Work phase
  - Step 3: Translate the trajectory into SIB19 parameters and capture the channel models
    - Implement the ephemeris with different message formats for SIB19
    - Model of arrival timing and Doppler frequency which are expected to be applied to existing NTN channel models (e.g., NTN_TDL_x)
  - Step 4: Define test cases and requirements
    - Select a sub-set of test cases to be replaced realistic channel model with corresponding SIB info
    - Define the test requirements

Annex: Detail WI plan

- Other potential open issues to be discussed
  - Total # of newly introduced pairs of NTN channel model and SIB info
  - Whether to consider fader link
  - Setting of T_service
  - SIB and channel model for neighboring cells
  - Release independent

Thank You!