

LG's View on Rel-18 5G-Advanced: cross-function related



Rel-18 cross-functionalities overview

eMBB evolution

- TCP boosting (RWS-210226)
- Enhancement for MIMO (RWS-210240)
- Enhancement for mobility (RWS-210227)
- Enhancement for SON
- Enhancement for NR QoE

Non-MBB evolution

Supporting diverse vertical applications

- Factory IAB (RWS-210228)
- Inter-UE duplication avoidance (RWS-210229)
- Enhancement for sidelink operation (RWS-210244)
- Enhancement for RAN slicing (RWS-210230)
- Enhancement for SDT (RWS-210231)
- Enhancement for NTN (RWS-210232)
- Enhancement for RedCap

Cross Functionalities

Both for eMBB & non-eMBB

- Full duplex operation (RWS-210241, RWS-210242)
- Physical layer aspects for AI/ML operation (RWS-210243)
- ML-aided predictive mobility (RWS-210233)
- AI/ML enabled NG-RAN
- Enhancement for positioning (RWS-210245)
- Enhancement for device requirement (RWS-210249)
- Enhancement for XR operation

* Separate Tdocs submitted for items in red color

Cross-function related [1/4]

- **Full duplex operation (RWS-210241, RWP-210242)**
 - Study feasibility of full duplex operation in NR for candidate scenarios/implementations. Study standardization impact to support full duplex operation in NR
 - gNB full duplex & UE half- or full- duplex operation
 - Sub-band full duplex & spectrum-shared full duplex operation
- **Physical layer aspects for AI/ML operation (RWS-210243)**
 - Identify use cases, deployment scenarios, and solutions for AI based physical layer enhancements
 - Study performance evaluation methodology for AI based solutions

Cross-function related [2/4]

- **ML-aided Predictive Mobility (RWS-210233)**
 - Identify possible scenarios that benefit from ML-aided mobility and link management
 - Evaluate performance benefits and feasibility of ML-aided mobility and link management
 - Study necessary enhancements to support ML-aided mobility and link management in areas including but not limited to RRM, RLM, and mobility procedures
 - Study possible methodologies for testing and evaluation of ML-aided mobility and link management procedures
- **AI/ML enabled NG-RAN**
 - Support for Intelligent Energy Saving
 - Support for Intelligent Load Balancing
 - Support for Intelligent Traffic Steering/Mobility Optimization
 - Support for Intelligent MDT/QoE

Cross-function related [3/4]

- **Enhancement for positioning (RWS-210245)**
 - Support of sidelink based and sidelink assisted positioning
 - Enhancements for UEs equipped with distributed antenna system
- **Enhancement for device requirement (RWS-210249)**
 - FR1 RF
 - Simultaneous Rx/Tx for Intra-band non-contiguous CA/DC in TDD band
 - FR2 RF
 - Vehicular UE requirement for
 - Power Class in 39GHz
 - Inter-band UL/DL CA (e.g. 28GHz + 39GHz)
 - Inter-band UL CA based on CBM
 - RRM
 - Different RX beam sets in FR2

Cross-function related [4/4]

- **Enhancement for XR operation**

- Rel-18 WI can be started based on the Rel-17 SI outcome, if Rel-17 SI concludes enhancements in the NR standards is necessary
- Main candidate area for enhancements can be latency reduction, UE power consumption reduction and capacity enhancements.



Annex

More detailed proposals for some selected topics

Full duplex operation^{[1][2]}

[1] RWS-210241

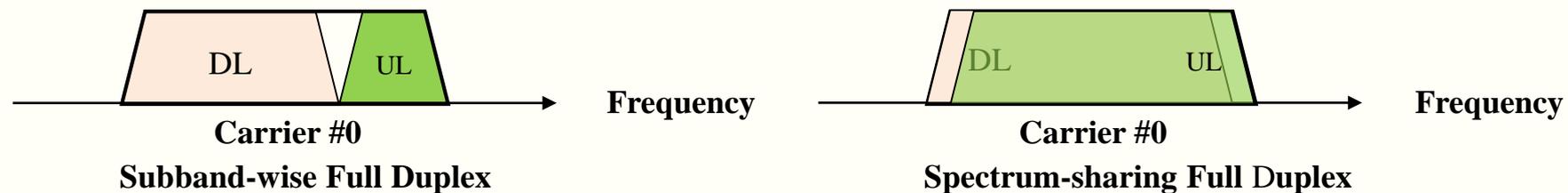
[2] RWS-210242

- **Motivation**

- For 5G, low latency packet delivery and efficient frequency resource utilization are especially important due to emerging various use cases and new service types (e.g., XR service, AI based service, self-driving car, etc.)
- To enhance the packet delivery latency and frequency resource utilization, full duplex operation is a good technical candidate

- **Potential categories for full duplex operation**

- “gNB full duplex + UE half duplex”, “gNB full duplex + UE full duplex”
- “subband-wise full duplex”, “spectrum-sharing full duplex”



- **Proposal**

- Introduce Rel-18 study item for full duplex operation, which targets:
 - Study feasibility of full duplex operation; scenarios for full duplex operation are defined/prioritized
 - Study standardization impacts and potential enhancements for the selected scenarios for full duplex operation

Physical layer aspects for AI/ML operation^[3]

[3] RWS-210243

- **Motivation**
 - AI/ML is a powerful tool to address challenges for air interface designs even though there are challenges such as performance verification/evaluation and difficulties on generalization/learning
- **Categorization**
 - Network AI based approaches (e.g. MTRP, interference management)
 - UE AI based approaches (e.g. channel prediction, UE-centric BM/link adaptation)
 - Joint operation of UE AI and NW AI (e.g. positioning)
- **Objective**
 - Identify use cases, deployment scenarios, and solutions for AI based physical layer enhancements
 - Study performance evaluation methodology for AI based solutions
 - Evaluate potential performance gain of AI based solutions

ML-aided predictive mobility^[4]

[4] RWS-210233

- **Motivation**

- The whole communication industry including ITU, 3GPP, IEEE, 5GAA, etc. is paving ways to incorporate Machine Learning (ML) into communication systems to tackle challenges of jointly optimizing stringent and diverse KPIs of communication networks.
- 3GPP SA1 already studied use cases and potential performance requirements for 5G system support of ML. 3GPP RAN3 is studying ML applications to NG-RAN in Rel-17.
- However, adoption of ML into radio interface is still uncharted. Rel-18 is the right time for 3GPP RAN to study achievable gain of adopting ML in radio interface as well as necessary enhancements of radio interfaces.
- Link stability and mobility performance are more challenged as operating frequencies are getting higher. Adopting prediction capabilities of ML can provide significant performance benefits on these areas.

- **Objective**

- Identify possible scenarios that benefit from ML-aided mobility and link management.
 - Consider network-centric prediction, UE-centric prediction and its hybrid form as prediction entities, based on prediction of beam and cell qualities.
 - Consider utilization of UE's local real-time information as prediction input.
- Evaluate potential benefits and feasibility of ML-aided mobility and link management.
 - Investigate the necessity of consolidating prediction models between UE and network, including update of prediction model parameter and/or prediction model replacement.
- Study necessary enhancements to support ML-aided mobility and link management
 - Establish predictive mobility procedure with a predictive RLM/RRM framework.
- Study possible methodologies for testing and evaluation of ML-aided mobility and link management procedures.

Enhancement for positioning^[5]

[5] RWS-210245

- **Support of sidelink based positioning**
 - Solution to provide absolute and relative position of a UE regardless of the network coverage
- **Support of sidelink assisted positioning**
 - Measurement in sidelink can improve the positioning accuracy provided by a Uu-based solution, e.g., by additionally providing the distance and/or angle from a UE placed in a known location and used as an anchor node.
- **Enhancements for UEs equipped with distributed antenna system**
 - A vehicle may be equipped with multiple antenna panels placed in different position and the distance between two panels can be several meters as shown in TR 37.885.
 - The current positioning solution may have limitation in achieving a positioning error smaller than the inter-panel distance as it is not supported to separate PRS transmission or reception in different antenna panels.
 - This aspect should be considered both in Uu and sidelink positioning.

Enhancement for device requirement [6]

[6] RWS-210249

- **Further enhancement for FR1 RF**
 - Simultaneous Rx/Tx for Intra-band non-contiguous CA/DC in TDD band
- **Further enhancement for FR2 RF**
 - PC2 (Vehicular UE) requirement on 39GHz(n259, n260) and inter-band DL/UL CA for PC2 in RF need to be introduced in FR2.
 - FR2 inter-band UL CA based on CBM needs to be specified in Rel-18
- **Further enhancement for RRM**
 - Study and specify RRM requirements related to different sets of RX beams between different MOs in FR2