

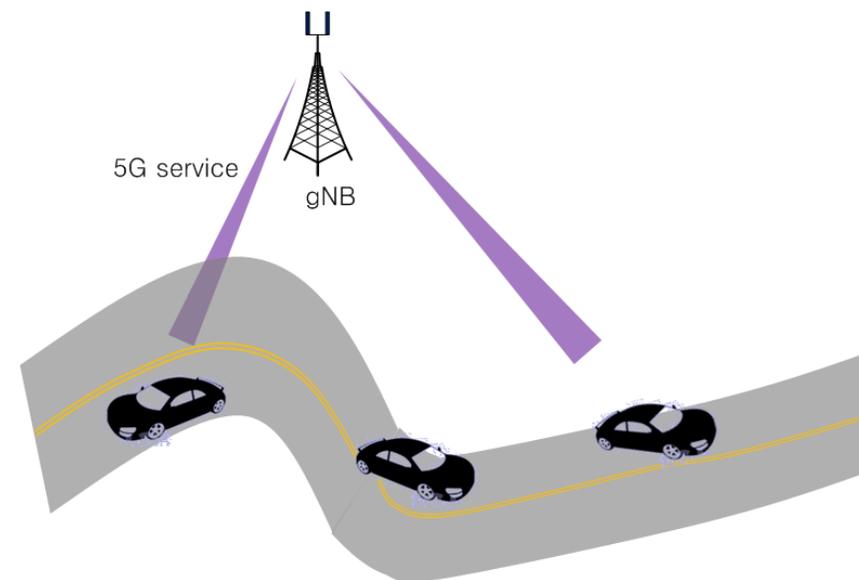
Agenda item: 9.1

Motivation for new SI : Study on vehicle UE for NR

LG Electronics

Motivation of Vehicle UE for NR

- In March 2017, RAN4 completed Rel-14 NR Study Item[1] and published TR38.803. Rel-15 Study Item on test methods for New Radio has been progressing in 3GPP RAN WG 4 based on the initial scope for testability topics in TR38.803. And Rel-15 Work Item on New Radio Access Technology has been progressing in 3GPP WG 1, 2, 3 and 4.
 - Above SIs & WI, RAN4 have not considered vehicle UE.
- A lot of automobile companies have shown significant interest in 5G service to be equipped into their vehicle. It is sure that vehicle UE can be a significant use-case in NR for 'Connected Car' concept
- For vehicle type UE unlike phone type UE, high power transmission and various antenna layouts (e.g., centralized or distributed antenna layout) could be potentially considered.

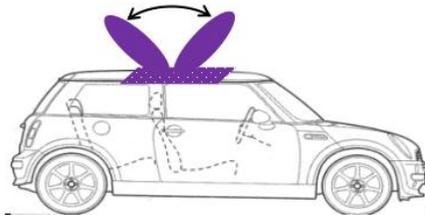


Motivation of Vehicle UE for NR

- Possible factors to impact on UE RF requirements
 - High transmission power
 - Antenna type
 - Antenna placement on vehicle body
 - Architecture of vehicle UE in aspect of how to connect RF, Baseband and Antenna.
 - Coordinate system

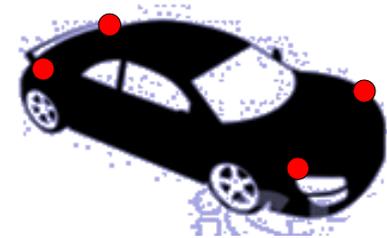
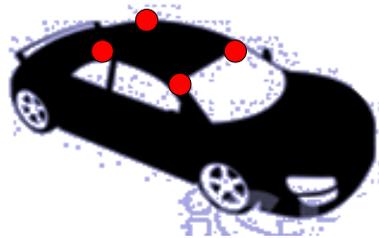
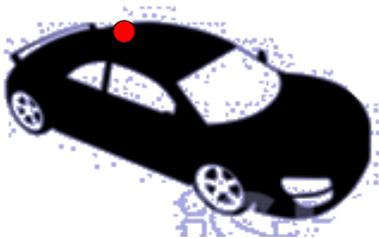
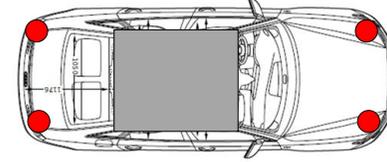
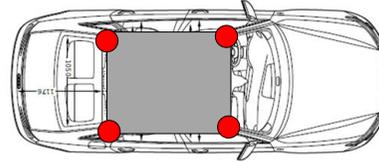
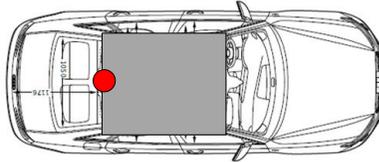
- High transmission power
 - Up to 43dBm for above 6GHz

- Antenna type
 - Horn, ULA and patch, etc
 - Related to Beam angle



Motivation of Vehicle UE for NR

➤ Antenna placement



(a) roof rear centre side

(b) roof side

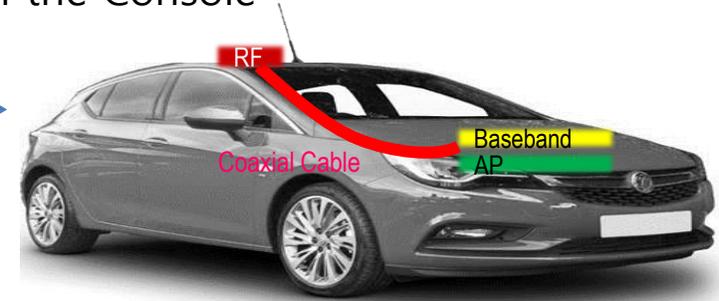
(c) head light & rear light side

- Centralized antenna can be equipped on vehicle body like (a)
- Distributed antenna can be equipped on vehicle body like (b) and (c)

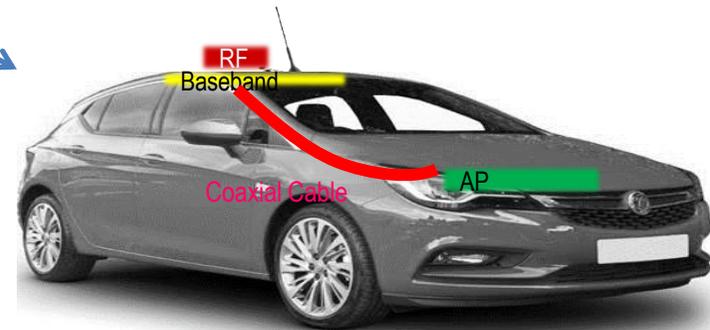
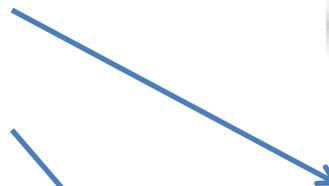
Motivation of Vehicle UE for NR

- Architecture of vehicle UE in aspect of how to connect RF, Baseband and Antenna.
 - Consider the architecture regarding that in general Remote Unit(RU) is equipped on the vehicle body and Central Unit(CU) is equipped on the Console

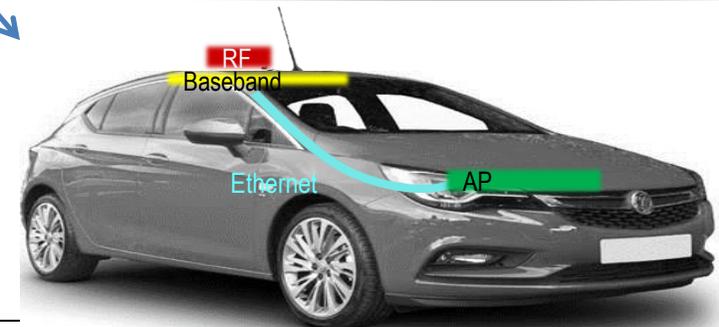
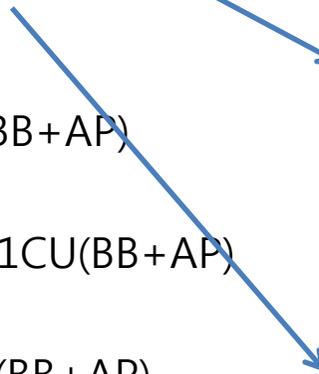
- 1RU(RF)-CoaxialCable-1CU(BB+AP)



- 1RU(RF+BB)-CoaxialCable-1CU(AP)



- 1RU(RF+BB)-Ethernet-1CU(AP)



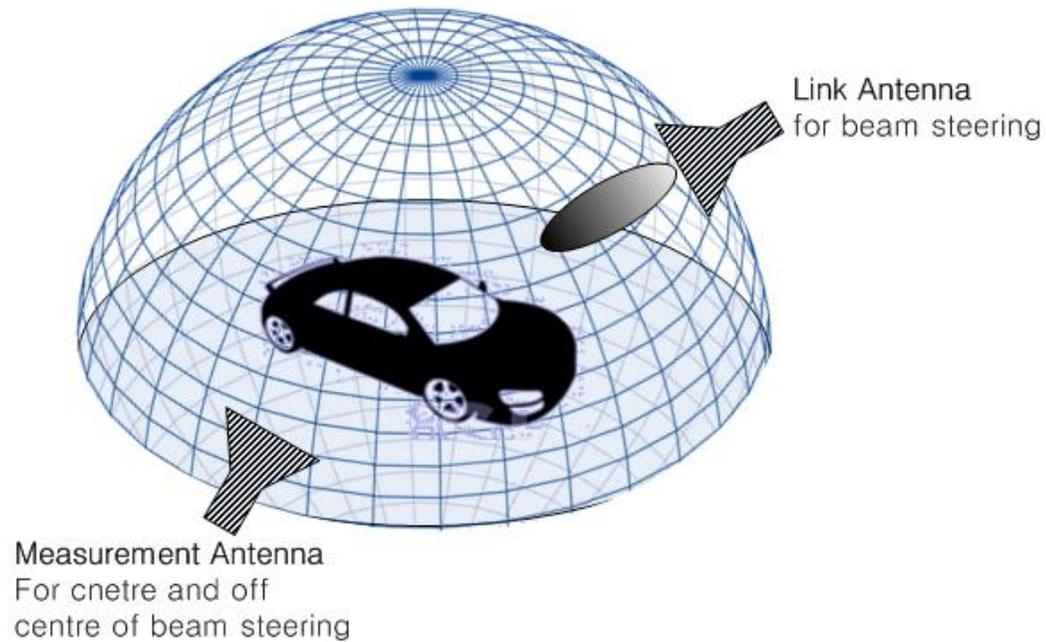
- Multiple RUs(RFs)-CoaxialCable-1CU(BB+AP)

- Multiple RUs([RF+BB]s)-CoaxialCable-1CU(BB+AP)

- Multiple RUs([RF+BB]s)-Ethernet-1CU(BB+AP)

Motivation of Vehicle UE for NR

- Coordinate system
 - Hemisphere model



Study scope for Vehicle UE for NR

- Targeting vehicular device supporting NR
 - Frequencies above 6GHz
 - Maximum transmission power up to 43dBm EIRP
 - Uu link as highest priority

- Architecture of vehicular UE
 - Investigate impact due to different antenna type(e.g. patch, ULA, horn), antenna placement, and antenna layout(e.g., centralized or distributed layout)
 - Investigate impact due to kinds of uniting ways of RF,BB and AP

- Investigate/Identify UE RF requirements impacted by architecture of vehicular UE
 - Investigate coexistence study for above 6GHz up to 43dBm EIRP
 - Identify related vehicular UE RF Tx/Rx requirement
 - Investigate feasibility of test methodology for above 6GHz

Conclusion

- To consider vehicle UE supported in NR, a study is required to investigate the impact due to the antenna type, antenna placement and architecture of RF, BB and AP of vehicle and based on the results to investigate/identify the vehicle UE RF requirements