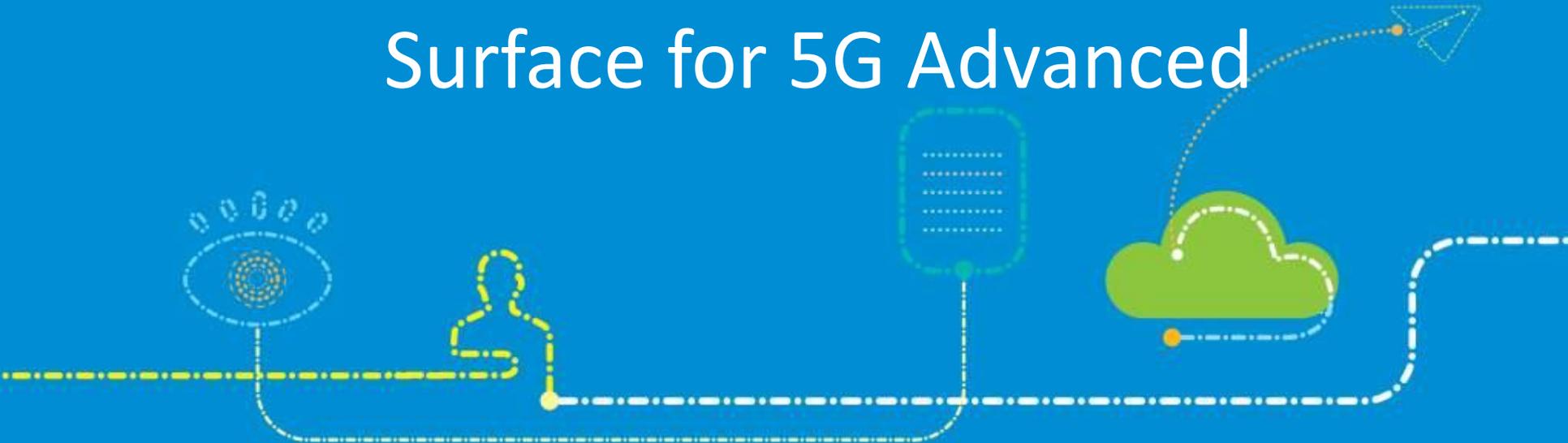


3GPP TSG RAN Meeting #93e
Electronic Meeting, Sept 13- Sept 17, 2021

Source: ZTE, Sanechips
Agenda: 9.0.2

RP-212385
ZTE
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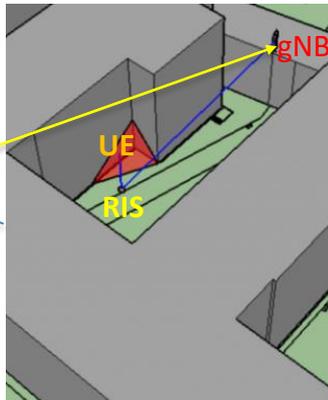
Support of Reconfigurable Intelligent Surface for 5G Advanced



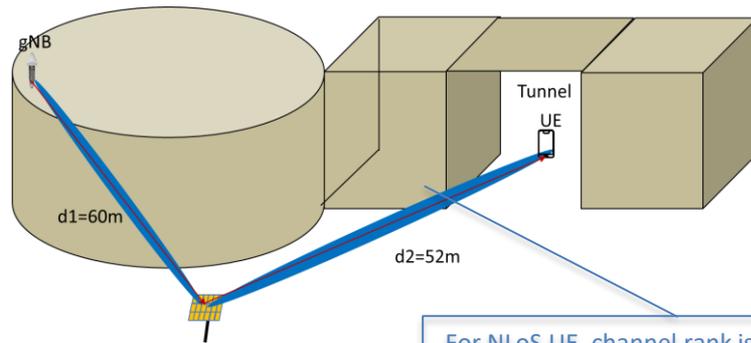
Ubiquitous antennas - Reconfigurable Intelligent Surface (RIS)

- RIS is beneficial for coverage/throughput/energy efficiency with applicability in various scenarios including indoor, outdoor and O2I [RWS-210465].
- Maturity and benefits have already justified by both simulation and field measurements, and it's right time to initiate the work in 3GPP
 - Field measurement results

With RIS, 10dB-20dB RSRP improvement is observed in this area where gNB-UE link is not LOS.



28GHz

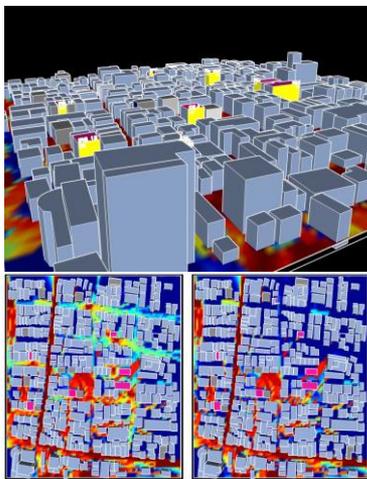


For NLoS UE, channel rank is increased to 3-4 with RIS assistance, and DL throughput is improved by 40%.

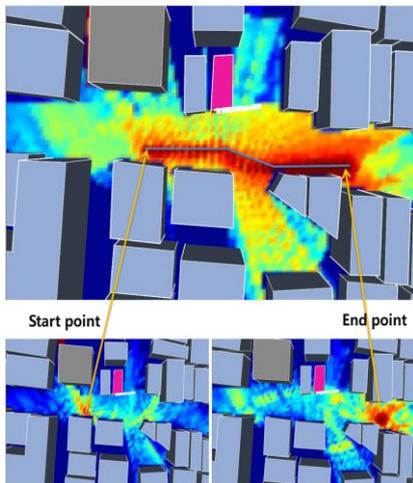
3.6GHz

- Simulation results

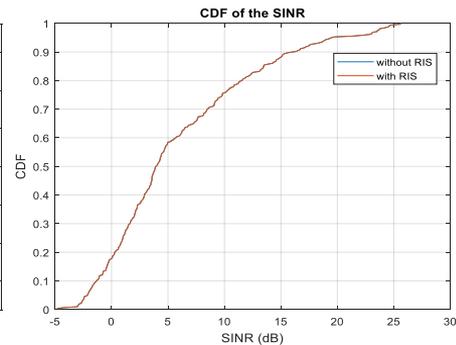
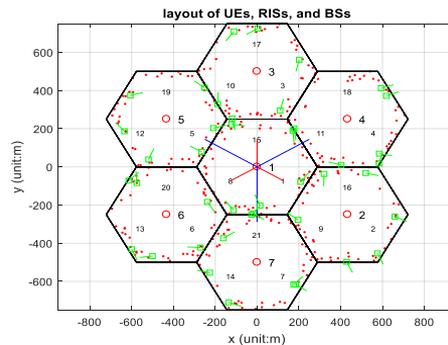
RIS evaluation for Inter-operator co-existence with
 RIS for Operator-A@2GHz
 gNB-UE for Operator-B@3GHz



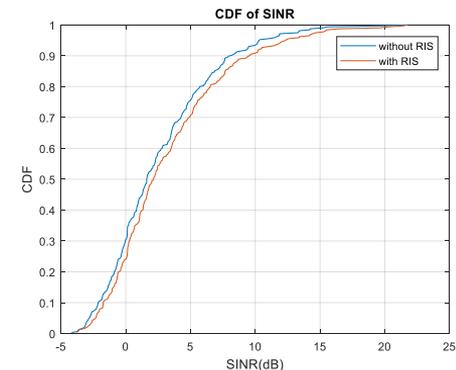
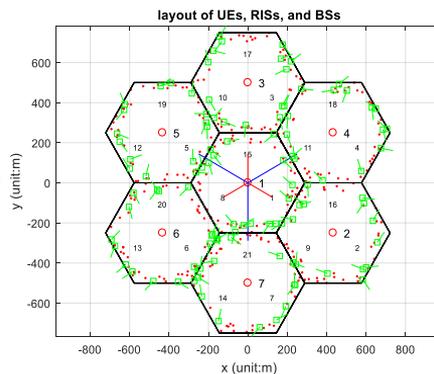
(a) Cell-specific coverage



(b) UE-specific beam tracking



- Negligible impacts for LoS/NLoS UEs in operator-B** with 2 RISs per sector deployed for operator-A

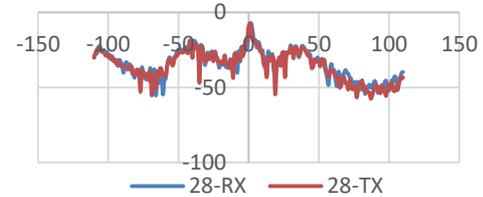
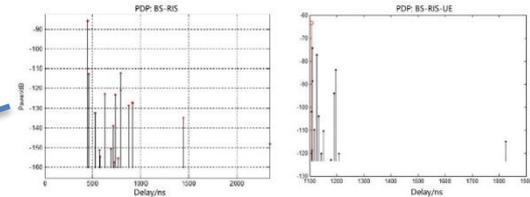


- Slight SINR improvement for NLoS UEs in operator-B** if more RISs are deployed for operator-A

RIS for performance improvement @ 28 GHz (Aligned frequency for RIS and system deployment)

Objectives to support RIS: channel modeling methodology

- Evaluation methodology [RAN1]
 - Scenarios setup e.g., indoor, dense urban, etc.
 - RIS component modelling, e.g., Topology/Type (e.g., active/passive)
 - Channel modeling including both **Hybrid** and **Statistic** channel model (Updated procedure and parameter sets for each channel component)
 - Large scale:
 - Decaying slope for large scale attenuation: Product-distance model $(d1*d2)^2$ by assuming the scattering
 - » $d1, d2$ refers to the separation distance between gNB-RIS, RIS-UE, respectively.
 - LoS/NLoS probability
 - » Considering the potential high-rise deployment of RIS
 - Potential reuse of model defined for UAV (TR36.777)
 - Small scale
 - Multi-paths association between rays/cluster among the links
 - » Additional delay for RIS-UE link for synthetic channel combined with gNB-UE link
 - » Angular domain parameters association between gNB-RIS link and RIS-UE link
 - » Potential key-hole impacts for transmission-based RIS
 - Polarization
 - » Per path and per polarization impacts for RIS with semi-deterministic calculation instead of XPR



Reciprocity is kept for RIS

Objectives to support RIS: technical enhancements

- Principle for enhancement:
 - Motivation on the enhancement: To enable the **dynamic** RIS operation
 - Management of additional network entity : all procedures (e.g., registration, authentic, OMA) will be terminated at RAN side via implementation
 - Joint study on side control information can be considered for RIS and smart repeater (to identify the common part) [RP-212376]
 - Transparency to the UE is preferred at least in Rel-18
- Side control information with essential feature[RAN1/2]
 - Beamforming information configuration
- Potential areas for study[RAN1]:
 - Beam management/CSI enhancement
 - Training/CSI mechanism for RIS-gNB / RIS-UE (considering near/far field)
 - RACH enhancement
 - Cope with potential issue for extended coverage
 - Interference coordination/mitigation

Thanks



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