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On the Requirements on Reflective Intelligent Surfaces in THz NLOS Backhaul Links

Thomas Kürner(1), Bo Kum Jung (1), Christoph Herold (1)

(1) TU Braunschweig, Germany; e-mail: t.kuerner@tu-braunschweig.de; bo.jung@tu-braunschweig.de; c.herold@tu-braunschweig.de

The use of THz frequencies around 300 GHz is an attractive option to provide wireless backhaul links in ultra-densified Beyond5G/6G networks in cases where fiber links are either not available or too expensive to deploy. In the recently finished Horizon 2020 EU-Japan project ThoR (TeraHertz end-to-end wireless systems supporting ultra-high data Rate applications) [1] the feasibility of 300 GHz backhaul links have been successfully demonstrated. In the same project automatic methods to plan THz backhaul links have been developed, showing that even in case of NLOS between two nodes wireless connections are possible by exploiting reflections on building walls [2,3].However, this suffers from the drawback that either walls providing specular reflection are required and/or detailed knowledge of the reflection and scattering properties of the corresponding candidate building walls have to be known. This information is usually not available for almost all building walls. The use of Reflective Intelligent Surfaces with defined properties, which may be even designed for the specific purpose may significantly increase the degrees of freedom in the planning of THz backhaul links. Furthermore, RIS can improve the backhaul link connection by providing lower reflection losses also in non-specular directions, see Figure 1. The recently started Horizon Europe TERRAMETA project [4] aims to demonstrate the feasibility of Terahertz (THz) Reconfigurable Intelligent Surface (RIS) assisted ultra-high data rate wireless communications networks. THz backhaul links are among the most relevant use cases for their application. As a first step, the concrete requirements on RIS for THz backhaul links need to be derived. This is done simulation-based using TUBS in-house developed Simulator for Mobile Networks (SiMoNe). In this contribution results of this requirements study will be presented and the benefit of using RIS in such systems will be analyzed. The performance will be evaluated based on given indicators such as savings of fiber connections.

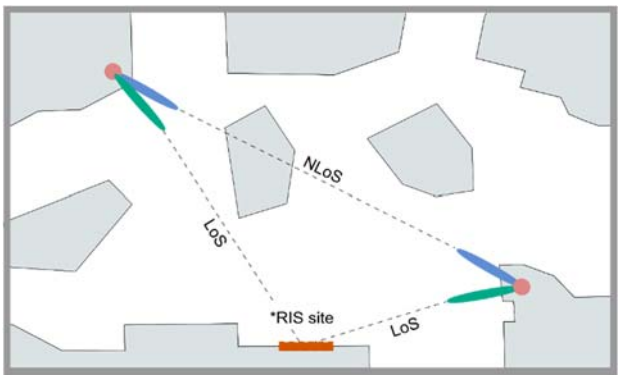

Figure 1. Scenario for the Application of RIS in case of NLOS between two Nodes

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References

[1] https://thorproject.eu/
[2] B. K. Jung and T. Kürner, Automatic Planning Algorithms for 300 GHz Wireless Backhaul Links, IEICE TRANSACTIONS on Communications, vol. E105-B, No.6, pp.685-693, 2021
[3] B. K. Jung and T. Kürner, Simulation and Automatic Planning of NLoS Backhaul Links at 300 GHz using Ring Topology, 2023 17th European Conference on Antennas and Propagation (EuCAP), 2023
[4] https://terrameta-project.eu