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Performance Evaluation of Ray Tracing based Automatic Planning Algorithms for 300 GHz Backhaul Links

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One of the early communications applications for sub-THz frequencies are wireless backhaul links. These wireless backhaul links can be used in cases where fibre links are technically not possible or prohibitively expensive [1]. The Horizon 2020 EU-Japan project ThoR is working towards the implementation and demonstration of 300 GHz backhaul links [2]. In ThoR also ray tracing based automatic planning algorithms for these links [3,4] have been developed. In this contribution we will provide an extensive performance evaluation and comparison of these algorithms.

The automatic planning and the subsequent performance evaluation has been carried out in five realistic deployment scenarios in the cities of Hannover, Berlin (both in Germany) and Shinjuku (Japan) taking into account both mesh and star network topologies. In case of star topologies, also non-line-of-sight (NLOS) links are considered enabling a backhaul link between sites via one reflection on building wall. The latter becomes especially relevant, when antennas are deployed at lamp-post levels in areas with many high-rise buildings. For all three algorithms and all five scenarios, three planning parameters have been varied: maximum link distance, a safety angle margin mitigating interference and the antenna height.

For the evaluation of the planned networks, system level simulations have been conducted to determine the signal-to-interference-plus-noise ratio (SINR) using channel bandwidths of 5 GHz and 50 GHz. The underlying ray tracing based propagation prediction also considers atmospheric attenuation and the impact of wind on the sway of the poles, where the antennas are mounted. Two different weather conditions have been investigated: clear sky and bad weather (50 mm/h rain and wind velocity of 20 m/s).

References

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