

## Project Description

### Background

Sub THz frequency bands (e.g.) offer directional, high bandwidth, and short-range RF communication links. Microsoft proposes to explore the use of wireless communications at these frequencies to supplement the wired communication links in data centers. Apart from high throughput communication, Sub THz links have several features that make them attractive for use in datacenters. First, highly directional beams achieved by large element antenna arrays allow coexistence of multiple communication links through spatial multiplexing; the short communication range of Sub THz beams due to high atmospheric attenuation enhances spatial reuse. The directional antenna arrays enable setting up and tearing down of RF links on-demand. A large indoor operating environment and the ability to enhance the building walls to minimize RF propagation enables the establishment of wide-bandwidth high data rate links with minimum interference to potential outdoor deployments, promoting efficient spectrum sharing and coexistence.

While there are existing Sub THz testbeds deployed at academic and cooperate research labs, the proposed testbed will uniquely focus on evaluating the use of multi-hop RF links to mitigate the obstacles present in data centers and will focus on topologies suitable for typical structure and layout of large-scale datacenters.

Some previous work has examined free-space optical links for similar purposes. However, these optical links exhibit poor performance in datacenters due to the challenge of accurately pointing the optical beams in the presence of vibrations. We anticipate Sub THz RF will not suffer from alignment issues due to the relatively large and adjustable beam width. The ability to electronically steer the RF beam rapidly will also enable us to develop appropriate control loops to further mitigate challenges caused by equipment vibrations. Consequently, the entire experimental research program will be conducted indoors.

### Interference Protection

Microsoft's proposed experiment will take place exclusively indoors at low power levels that preclude any substantial risk of harmful interference—no more than 1W (ERP). Notably, the Commission has previously granted authority to engage in testing under its Spectrum Horizons rules for longer periods than requested herein (10 years) and without explicit indoor-only restrictions.<sup>1</sup>

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<sup>1</sup> See Grant, ELS File No. 1144-EX-CN-2021 (rel. Jan. 24, 2022).