THz Wireless Link for 650GHz Atmospheric Window

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Explosive growth in wireless telecommunications witnessed in the last decade is leading to a spectrum crunch. As more and more wireless devices with increased connectivity demands are introduced the network, allocated RF spectrum is getting congested, particularly in highly-populated areas. The demand for high data rate wireless connectivity will undoubtedly continue. Not surprisingly, the large bandwidth in the millimeter wave (mmW) range is being considered as the next medium to accommodate future need. An overhaul of the cellular backbone is already underway in high congestion areas to meet the growing data rate needs. Already, instead of the large honeycomb-grid cells, new multilayered networks, consisting of staggered large, medium and smaller cells (including, micro-cells and femto-cells) are being considered. These hetero-structured networks (HETNETs) can easily "off-load" some of the cellular traffic onto localized networks.

The terahertz (THz) frequency band offers potentially game-changing capability for point-to-point links and short range wireless transmission with extremely high data rates. More unregulated bandwidth is available in the THz than the rest of RF spectrum. In addition, THz links offer unique properties such as secure line-of-sight communications for medium-range mobile nodes. However, lack of low-cost electronic transceiver has been a major bottleneck for exploring the THz band. In this paper, we will investigate the performance of a THz link for the 650GHz atmospheric transmission window. To demonstrate feasibility, we will utilize an electronic transmitter/receiver pair using the network analyzer frequency extenders available at our laboratory. Atmospheric attenuation, link bandwidth and noise performance will be characterized to calculate link budget, maximum achievable link range, as well as link reliability.