

Towards Scalable Multi-User Wireless Networking in mmWave and Terahertz Spectrum



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Tuesday, July 18th, 2023
11:00 AM • MSEE 112

Zoom: <https://purdue-edu.zoom.us/j/97753515503> Meeting ID: 977 5351 5503

Abstract

Millimeter-wave and terahertz bands are emerging as the most promising spectrum to meet the data-rate and latency demands of future wireless applications, including virtual reality and autonomous cars. Moreover, the large spectral availability together with the mm-scale wavelength, opens the opportunity of scaling the capacity of future wireless networks by supporting highly directional, high data rate multi-user transmission and reception. My research builds a foundation for scalable multi-user wireless systems in such high-frequency regimes yielding a paradigm shift in the design and development of future wireless systems. In this talk, I will begin by presenting emerging transceiver architecture that can enable directional sub-THz steering without traditional multi-antenna arrays. I will discuss how to exploit the key characteristics of sub-THz signals and the proposed architecture to enable the first scalable single-shot single-antenna multi-user system in THz bands with angularly dispersive links that are robust to client and environmental mobility. By exploiting electro-magnetics of antenna to protocol design, signal processing, and end-to-end system design with analytical model-driven evaluations and over-the-air experiments, I will show how the multi-user performance of an angularly dispersive THz link fundamentally depends on frequency, angle, and bandwidth utilized by users, through non-linear mechanisms and achieving close to Tb/s aggregate data rates using just a single-element antenna link. I will then discuss the opportunities offered by this platform to enhance next-generation communication and sensing capabilities in unprecedented ways. In particular, we tackle the mobility, blockage, and scalability challenges of highly directional wireless networks by efficiently adapting steering direction for mobile users. Finally, I will share several research directions in wireless networking, sensing, and security in mmWave and THz networks that I would like to pursue in the future.

Bio

Keerthi is currently a Senior Researcher at Qualcomm Wireless R&D. She received her Ph.D. in Electrical and Computer Engineering from Rice University in December 2022. Her research focuses on theoretical analysis and modeling to hardware implementations and experimental evaluations of architectures, protocols, and applications for next-generation communication and sensing systems with a focus on Millimeter-wave and Terahertz networks. She has published in top-tier IEEE and ACM conferences and journals and is a recipient of Best Paper Award at IEEE INFOCOM 2021 and Best Paper Award at IEEE VTC 2020. Keerthi is a Texas Instrument Distinguished Fellow, Rice ECE Star Doctoral Student'22, and N2Women Young researcher fellow.

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