

Title: Non-Hermitian Electromagnetics: New Opportunities and Enabling Applications

Abstract: Over the past decade, non-Hermitian wave physics and its characteristic singularities “exceptional points (EPs)” have reshaped wave engineering, enabling new paradigms for signal generation, routing, and sensing. This talk will begin with an overview of non-Hermitian physics and parity-time (PT) symmetry, highlighting how the formal analogy between Schrödinger’s and Maxwell’s equations enables electromagnetic systems with unconventional wave phenomena like spectral phase transition, unidirectional invisibility, and topological encircling.

I will then present our recent advances in translating these concepts to the RF and microwave domains. Examples include EP-enabled wireless sensors with unprecedented sensitivity and resolution, a new class of wideband, lossless, matched non-Hermitian metamaterials exhibiting extreme effective material properties, and entropy-enhanced electromagnetic fingerprints for hardware security. Finally, I will introduce the self-dual absorber–emitter singularity in PT-symmetric systems and discuss its potential for realizing ultrasensitive interferometric sensors, tailoring laser thresholds, and building a super-directive antenna.