BROADBAND AND ULTRAFAST NEAR-FIELD SPECTROSCOPY AND IMAGING

Haim Suchowski

Department of Condensed Matter Physics, School of Physics and Astronomy, Tel Aviv University, Israel

Remarkable breakthroughs in science throughout history are inherently linked to advances in the study of light-matter interactions. We have witnessed significant advances in nano-optics and ultrafast physics for the past two decades, allowing for exploring phenomena in higher spatial and temporal resolution than ever before. In my talk, I will share our success in merging these extreme resolution capabilities to study ultrafast phenomena at nanoscale resolution. In particular, I will present our recent achievements in combining ultrabroadband sources with our scattering near field microscope, allowing observation of the broad frequency response as well as the ultrafast transient dynamics of plasmonic systems and in van-der-Waals materials. In particular, I will present our development of novel ultrafast pump-probe near-field imaging method and report for the first time, the ultrafast and deep-subwavelength direct visualization of exciton-polariton formation and propagation in multilayer WSe_2 at room temperature. Our experimental approach opens the way for extreme spatio-temporal imaging and control of linear and nonlinear light-matter interaction at the nanoscale.