September 27, 2021 10:00 AM
QED & Materials seminar
Jonathan Curtis

Title
"Spectroscopic signatures of time-reversal symmetry breaking superconductivity"

Abstract
The collective mode spectrum of a symmetry-breaking state, such as a superconductor, provides crucial insight into the nature of the order parameter. In this context, we present a microscopic weak-coupling theory for the collective modes of a generic multi-component time-reversal symmetry breaking super- conductor, and show that fluctuations in the relative amplitude and phase of the two order parameter components are well-defined underdamped collective modes, even in the presence of nodal quasiparticles. We then demonstrate that these "generalized clapping modes" can be detected using a number of experimental techniques including ac electronic compressibility measurements, electron energy loss spectroscopy, microwave spectroscopy, and ultrafast THz spectroscopy. Finally, we discuss the implications of our work as a new form of "collective mode spectroscopy" that drastically expands the number of experimental probes capable of detecting time-reversal symmetry breaking in unconventional superconductors such as Sr2RuO4, UTe2, and moiré heterostructures.