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Higgs Oscillations of Non-equilibrium Superconductors[1] NATHAN CHENG, University of British Columbia, NIKOLAJ BITTNER, Max Planck Institute for Solid State Research, MONA BERCIU, University of British Columbia, DIRK MANSKE, Max Planck Institute for Solid State Research — In superconductors studied under equilibrium conditions, the Higgs mode is often overdamped by the continuum of excitations in the superconductor, or not directly coupled with experimental observables except in special cases of superconductors with fortuitous properties. However, under non-equilibrium conditions, such as immediately following a strong light pulse, collective Higgs oscillations are induced as a result of changes to the Mexican hat potential regardless of the superconductor type. These experiments employ ultrafast pump-probe spectroscopy, which stretch and shrink the free energy Mexican hat potential causing oscillations. This amounts to introducing excitations that disrupt the condensate and break electron pairs. If the time scale of the pump is faster than the intrinsic response time of the condensate and the energy from the light is sufficiently small to not entirely destroy the condensate paired state, this process can induce oscillations in the collective modes of the condensate about a new induced equilibrium. This talk will describe a density matrix formalism approach to solving the non-equilibrium effects of a pump-probe pulse on the superconducting condensate and the effects of different superconducting symmetry on the response.

[1]Quantum Matter Institute, University of British Columbia, Max Planck Institute for Solid State Research

Nathan Cheng
Univ of British Columbia

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