Abstract Sentef Bled

New3SC 2016

Michael Sentef
MPSD Hamburg

Driving order: Theory of ultrafast dynamics in superconductors

Understanding the collective motion of electrons in solids and their interplay with lattice vibrations is a central goal of condensed matter physics. Time-domain spectroscopies with tailored laser pulses offer novel ways to manipulate emergent ordering phenomena in superconductors or charge-density waves. Here I will show recent progress in the theoretical description of ultrafast dynamics in superconductors. I will discuss collective Higgs modes that can be excited in optically pumped electron-phonon superconductors [1]. Motivated by experiments that control electrons via resonant driving of the crystal lattice, I will then show how light-enhanced superconductivity plays out in the time domain [2]. Finally, I will show some preliminary results regarding laser control of competing superconducting and charge-density wave states.

[1] A. F. Kemper et al., Direct observation of Higgs mode oscillations in the pump-probe photoemission spectra of electron-phonon mediated superconductors, Phys. Rev. B 92, 224517 (2015).

[2] M. A. Sentef et al., Theory of light-enhanced phonon-mediated superconductivity, Phys. Rev. B 93, 144506 (2016).