

Theoretical simulations of pump-probe spectroscopies in solids

In this talk I will discuss recent progress of theoretical simulations of the nonequilibrium dynamics following laser excitations on femtosecond time scales. I will show two examples: (i) the nonequilibrium dynamics following laser stimulation in a cuprate high- T_c superconductor, where an electron-boson dissipation pathway could be identified in a theoretical-experimental collaboration [1,2,3]; and (ii) the proposed generation of Floquet states in solids with the prospect of engineering effective Hamiltonians [4,5]. I will use this to discuss different theoretical approaches to the nonequilibrium many-body problem - from models to materials - and the future opportunities they offer for the field of pump-probe spectroscopies.

[1] M. A. Sentef et al., *Phys. Rev. X* 3, 041033 (2013)

[2] A. F. Kemper et al., [Phys. Rev. B 90, 075126 \(2014\)](#)

[3] J. D. Rameau et al., [arXiv:1505.07055](#), to appear in *Nature Communications*

[4] M. A. Sentef et al., [Nature Communications 6, 7047 \(2015\)](#)

[5] H. Hübener et al., [arXiv:1604.03399](#), to appear in *Nature Communications*