Max-Planck-Institut für Struktur und Dynamik der Materie

Max Planck Institute for the Structure and Dynamics of Matter

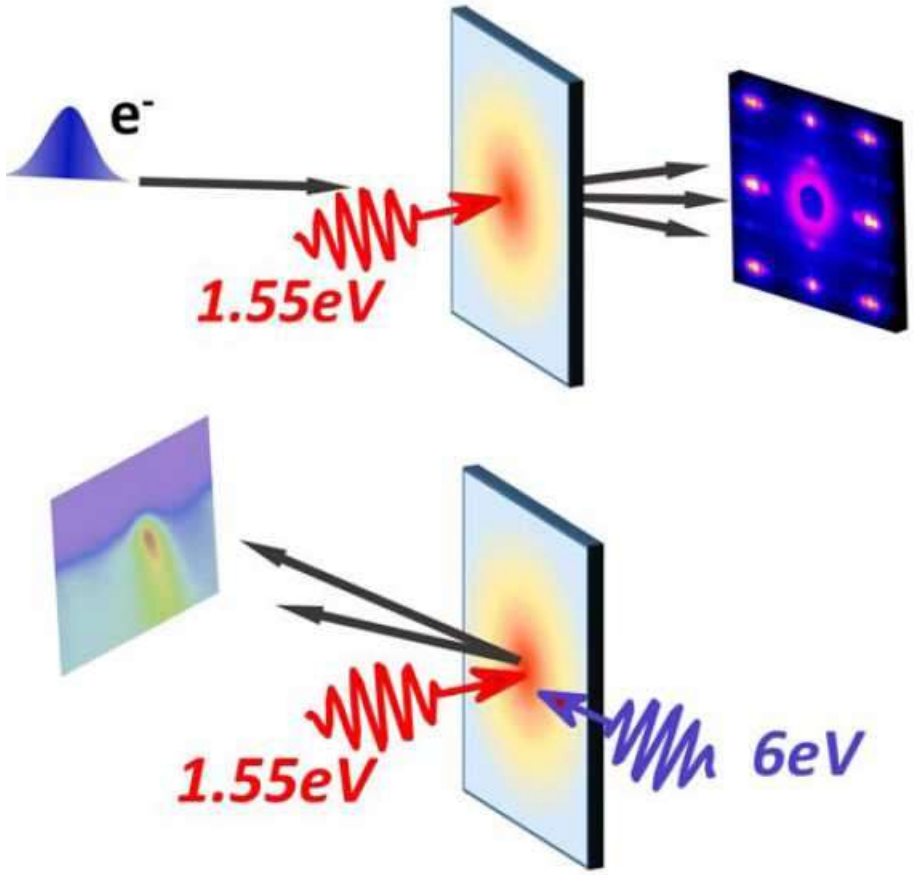
Thursday, December 7th, 2018 – 10:30 a.m.
CFEL Seminar room IV (Bldg. 99)

Uwe Bovensiepen

University of Duisburg-Essen, Faculty of Physics

A time domain perspective on electron-boson coupling in superconducting materials

Experiments in the time domain allow to determine the electron-boson coupling strength by analyzing the second moment of the Eliashberg function α2·F(ω) using the relaxation time constant of thermalized, hot electrons after optical excitation. [1] While this approach works well for conventional superconducting materials, it is under discussion for unconventional superconductors due to competing electron and boson dynamics on similar time scales. [2,3] It is therefore desired to identify well defined bosonic or electronic signatures in time-resolved spectroscopy. In this talk results of femtosecond time- and angle-resolved photoemission on cuprate and Fe-based superconductors will be presented. Experimentally observed, well defined boson signatures [4,5], which originate from restrictions in the relaxation phase space [6] will be discussed. We show that coupling to specific bosonic excitations, which were identified by ultrafast electron diffraction for the case of Bi-2212 to consist of in-plane lattice vibration, [7] inhibits thermalization of the excited electron distribution. Such microscopic insight provides opportunities to analyze the electron-boson coupling directly, without the assumption of a thermalized electron distribution.



[1] Brorson et al., Phys. Rev. Lett. **64**, 2172 (1990).

[2] Perfetti et al., Phys. Rev. Lett. **99**, 197001 (2007).

[3] Baranov and Kabanov, Phys. Rev. B **89**, 125102 (2014).

[4] Rameau et al., Nature Commun. **7**, 13761 (2016).

[5] Avigo et al., New J. Phys. **18**, 093028 (2016).

[6] Kemper et al., Ann. Phys. **529**, 1600235 (2017).

[7] Konstantinova et al., Sci. Adv. **4**, eaap7427 (2018).

Host: Angel Rubio