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Measurement and control of electron dynamics using THz light fields (I)

Monday 11 June 2018 13:30 (30 minutes)

Phase-locked, few cycle pulses of THz light are powerful tools for both probing and controlling charge carriers in condensed matter. Used as time-resolved spectroscopic probes, meV scale excitations can be monitored with sub-picosecond temporal resolution. In this talk, I discuss recent multi-THz measurements on organometallic metal halide perovskites revealing exciton energetics, screening dynamics and the effects of strong spin-orbit interactions. In addition to probing dynamics, strong field THz pulses can be used to control the motion of charged particles on sub-cycle time scales. I will discuss our recent work on sub-cycle THz field emission of femtosecond electron wavepackets from metal nanotips. Electrons are accelerated in the local THz fields to keV energies with femtoCoulomb bunch charges, a step towards a light field-driven ultrafast electron microscope. Finally, a new method for arbitrarily shaping THz fields in time will be presented, based on an optically addressable dynamic waveguide. The ability to create multiple pulse sequences from a single THz pulse opens the door to advanced forms of multi-dimensional THz spectroscopy.

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