HL 41: Metal-insulator transitions

Time: Thursday 12:45–13:00 Location: H13

HL 41.1 Thu 12:45 H13

Ultrafast Insulator-Metal Transition in Vanadium Dioxide: Coherent Lattice Dynamcis and Electronic Correlations — •Rupert Huber[1], Carl Kübler[1], Henri Ehrke[1], Rene Lopez[2,3], Andrej Halabica[2], Richard Haglund[2], and Alfred Leitenstorfer[1] — [1]Fachbereich Physik, Universität Konstanz, 78464 Konstanz, Deutschland — [2]Department of Physics and Astronomy, Vanderbilt University, Nashville, Tennessee 37235, USA — [3]Department of Physics and Astronomy, University of North Carolina, Chapel Hill, North Carolina 27599, USA

Multi-THz pulses are employed to directly monitor the femtosecond transient behavior of the most important order parameter of the insulator-to-metal phase transition in VO2: the conductivity. Excitation with near infrared light pulses of a duration of 12 fs launches ultrafast dynamics of the ion lattice and the electronic system. Two-dimensional multi-THz measurements allow for a spectral discrimination of structural and electronic contributions revealing their subtle interplay. We find fingerprints of coherent modulations of mid infrared phonons and self-trapping of excitons induced by impulsively excited structural distortions. Wave packet motion at a frequency of 6 THz associated with excitation of V-V dimers is observed. For pump fluences beyond a temperature-dependent threshold, a structurally assisted electronic delocalization emerges within a fraction of the V-V oscillation period.