Jozef Stefan Institute, Department of Theoretical Physics

Solid State Group Seminars

Alaska Subedi
MPI Hamburg

Theory of nonlinear phononics for coherent light-control of solids

The use of light to control the structural and electronic properties of solids is an area of great interest for both basic research and potential applications. In this talk, I will present our recent work on a microscopic theory for ultrafast control of solids with high-intensity mid-infrared pulses. Our theory predicts the dynamical path taken by the crystal lattice using first principles calculations of the energy surface and classical equations of motion, as well as symmetry considerations. We identify two classes of dynamics. In the perturbative regime, displacements along the normal mode coordinate of the symmetry preserving Raman active mode can be achieved by cubic anharmonicities. This explains the light-induced insulator-to-metal transition in manganites observed experimentally. Furthermore, we predict a new regime in which ultra-fast instabilities that break crystal symmetry can be induced. This non-perturbative effect involves a quartic anharmonic coupling and occurs above a critical threshold below which the nonlinear dynamics of the driven mode displays softening and dynamical stabilization.

Tuesday, Sep 22,3:00pm

Seminarska soba za fiziko, Jozef Stefan Institute