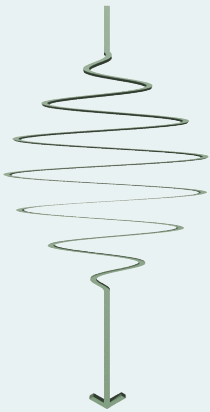


September 27th, 2013 - 11:00

Seminar Room IV, CFEL (Bldg. 99, 01.111)



Max Planck
Research
Department
for
Structural
Dynamics



SEMINAR

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Ultrafast Charge Localization in Stripe-ordered Nickelates

The doping of charges in Mott insulators gives rise to a wealth of new phenomena including high-TC superconductivity, colossal magnetoresistance or metal-insulator transitions. In such materials, self-organized electronically-ordered phases are a recurring feature, resulting in e.g. fluctuating charge stripes whose role in high TC superconductivity is under debate. However the relevant cause-effect relations between real-space charge correlations and the low-energy excitations remain hidden in time-averaged studies.

In this seminar I present the first ultrafast mid-infrared study of the model stripe-ordered system $\text{La}_{1.75}\text{Sr}_{0.25}\text{NiO}_4$. Ultrafast experiments in combination with equilibrium optical spectroscopy and X-Ray diffraction experiments reveal charge localization and lattice vibrational coupling as dynamical precursors of stripe formation. The opening of a pseudogap at a crossover temperature T^* far above long-range stripe formation establishes the onset of electronic localization which is accompanied by a strongly enhanced Fano asymmetry of Ni-O stretch vibrations. Ultrafast excitation triggers a sub-picosecond dynamics that exposes a strong and rapid dependence of electron-phonon coupling on the local charge arrangement. The results clarify the role of charge localization in forming the pseudogap in nickelates, opening a path to understanding this mysterious phase in a broad class of complex oxide materials.



Host: Andrea Cavalleri, MPD-CFEL