

Witnessing quasi-particles in a strongly correlated electron system

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This presentation will focus on our recent results in Pump&Probe broadband spectroscopy on cuprates. The interaction between phonons and high-energy excitation of electronic origin in cuprates is studied in two compounds. In a archetypal strongly correlated charge-transfer insulator (La_2CuO_4), with the aid of a general theoretical framework (Hubbard Holstein Hamiltonian), we show that the interaction between electrons and bosons manifest itself directly in the photo-excitation processes of a correlated material and pilots the formation of itinerant quasi-particles which are suddenly dressed (~ 100 fs) by an ultrafast reaction of the bosonic field. In optimally doped YBCO we combine coherent vibrational time-domain spectroscopy with density functional and dynamical mean field theory calculations to establish a direct link between the c-axis phonon modes and the in-plane electronic charge excitations in optimally doped YBCO.