Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Strong coupling theory of holes in an antiferromagnet and applications to ultracold atoms"

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Abstract: When a mobile hole is moving in an antiferromagnet it distorts the Neel order and forms a magnetic polaron. In contrast to the usual polaron problem, the kinetic energy term of the hole in the Hamiltonian also corresponds to an interaction term between the hole and the spin environment. As a consequence, the commonly applied Landau-Pekar wavefunction cannot be used to solve the magnetic polaron problem at strong couplings. In this talk a strong-coupling theory of magnetic polarons is presented, which is based on a spinon and holon slave-particle description. The theory is applied to analyze the properties of single hole inside an antiferromagnet realized by ultracold atoms. After providing a brief overview of the recent progress in this field, possible future experiments are discussed. This includes new spectroscopic probes of the ro-vibrational excitations of magnetic polarons as well as far-from equilibrium dynamics of a single hole in a Neel state.

12:00pm
Tuesday, April 18, 2017
Duboc Room 4-331

Host: Debanjan Chowdhury