凝縮系物理学ゼミナール

Condensed Matter Seminar

Location: Room 413, School of Science Bldg. 5 (理学 5 号館 413 号室)

Date: 13:30-15:00, Wednesday, 2 November 2011

"Renormalization effects in a Bose-Fermi mixture in optical lattices"

Speaker: Mr. Kazuto Noda (Condensed Matter Theory Group)

Abstract:

Recently, correlated atom systems in optical lattices have attracted much interest. Due to the high controllability of the lattice structure and onsite interactions, these systems are expected to be quantum simulators of Bose and Fermi Hubbard Hamiltonians. The realizations of Bose-Femi mixture system in optical lattices pave a new way to create an ideal stage of studying Bose-Fermi Hubbard model. The previous study on this model [1,2] shows a sharp peak in the density of states for the fermions near the Fermi surface in the supersolid state. Motivated by this, we study a mixture of strongly interacting spinless bosons and fermions in optical lattices described by Bose-Fermi Hubbard Hamiltonian. In order to treat bosonic degrees of freedom, we use a generalized dynamical mean-field theory combined with the numerical renormalization group. We reveal the origin of the anomalous peak in the DOS near the Fermi surface which emerge from the interaction between quasiparticles induced by the bosonic gapless excitation via the boson fermion interaction.

References:

[1] I. Titvinidze, M. Snoek, and W. Hofstetter, Phys. Rev. Lett. 100, 100401 (2008).
[2] I. Titvinidze, M. Snoek, and W. Hofstetter, Phys. Rev. B 79, 144506 (2009).