凝縮系物理学ゼミナール

日時：12月 8日 （水）13：30～

場所：理学部5号館　413号室

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「 Many-body effects in a Bose-Fermi mixture in optical lattices 」

In recent years, strongly interacting atoms in optical lattices have attracted much interest. In these systems, one can tune the interaction strength in cold gases by Feshbach resonances, and thereby simulate typical models used to study quantum many-body physics. Furthermore, the discovery of Feshbach resonances in a mixture of fermions and bosons, (e.g. ^{6}Li - ^{23}Na, ^{40}K - ^{87}Rb, and so on) creates a new route to realizing a physical system without any analog in the conventional condensed matter field.

Motivated by this, we study a mixture of strongly interacting spinless bosons and fermions in optical lattices described by Bose-Fermi Hubbard Hamiltonian. To treat bosonic degrees of freedom, we use a generalized dynamical mean field theory (GDMFT). We study the ground state properties of the Bose-Fermi mixture system by means of GDMFT combined with the numerical renomalization group method. A particularly interesting point raised for the supersolid state is that an unusual peak structure emerges in the density of states (DOS) for fermions near the Fermi surface. We show that an anomalous peak structure is induced by the density fluctuations of bosons through the fermion-boson interaction term.