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, 16 January 2013

"Field-induced Mott transition in kagome lattice Hubbard model"

Speaker: Dr. **Tomoko Kita** (Condensed Matter Theory Group)

Abstract:
Geometrical frustration has attracted much interest in the field of strongly correlated electron systems. In the frustrated systems, a lot of intriguing phenomena such as the heavy fermion behavior in LiV_2O_4, spin liquid ground state in organic materials, etc. have been observed. Theoretically, the Mott transition in the kagome lattice Hubbard model has been studied as a typical strongly frustrated electron system and it has been shown that the first-order Mott transition occurs at finite temperature [1]. In a metallic phase near the transition, the antiferromagnetic spin correlations are suppressed down to low temperature due to geometrical frustration, and heavy quasiparticles are formed at low temperature [1]. A magnetic field which changes magnetic properties may significantly affect the Mott transition. In a triangular lattice organic material, the field-induced first-order transition has indeed been observed [2]. However, the application of a magnetic field to the frustrated Hubbard model has not yet been addressed.
In this study, we investigate the effects of magnetic field on the Mott transition in the Hubbard model on the kagome lattice by means of the cellular dynamical mean field theory combined with the continuous-time quantum Monte Carlo method [3]. We find that an applied magnetic field induces the first-order metal-insulator transition in a metallic phase near the zero-field Mott transition point. Around the field-induced transition, the quasiparticle weight is increased with increasing field, which is qualitatively different from the results of the single-site dynamical mean field study.

Reference:

[1] T. Ohashi et al.: Phys. Rev. Lett. **97** (2006) 166401; Y. Furukawa et al.: Phys. Rev. B **82** (2010) 161101.
[2] F. Kagawa et al.: Phys. Rev. Lett. **93** (2004) 127001; M. de Souza et al.: Phys. Rev. B **86** (2012) 085130.
[3] G. Kotliar et al.: Phys. Rev. Lett. **87** (2001) 186401; P. Werner et al.: Phys. Rev. Lett. **97** (2006) 076405.