Condensed Matter Physics Seminar

Dynamics of magnetic moments in Kagome lattice near Mott transition

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Small seminar room on 8th floor, Sengen

The Heisenberg model with the nearest neighbor antiferromagnetic interaction has a spin liquid ground state on the kagome lattice. Real life antiferromagnets, which typically are Mott insulators, correspond to this limit only when the local Coulomb repulsion in the Mott insulator is much greater than the electronic bandwidth. At moderate repulsion, but still in the insulating phase, longer range, and multispin couplings arise. These can significantly affect the energy landscape and show up in the magnetic excitation spectrum probed by inelastic neutron scattering. We study the half-filled Hubbard model on the kagome lattice and show that the magnetic excitations evolve from a ``three peak'' structure in the deep Mott state, associated with strong $\sqrt{3} \times \sqrt{3}$ correlations in the kagome Heisenberg model, progressively, to a two peak and then a broad single peak feature as the system is pushed toward the Mott transition by reducing the repulsion. Simultaneously, the normalized temperature for crossover from damped propagating to diffusive behavior gets lowered by an order of magnitude as we head to the Mott transition from the Heisenberg limit.

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