

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

“Chiral spin liquid and the gapless liquid state in kagome spin
1/2 system”

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Abstract: The kagome spin-1/2 model has been proposed to host different exotic phases including gapped Z₂ spin liquid and chiral spin liquid based on accurate density matrix renormalization group simulations. Searching for microscopic understanding of the emerging and collapsing of these phases, we study the quantum phase diagrams and the interplay of nearest (J₁) and different further neighboring (J₂, J₃) couplings in the kagome lattice model. In the pure XY model, we find the chiral spin liquid emerges with the presence of small perturbing 2nd and 3rd neighboring XY interactions $J_{2\{xy\}} \sim J_{3\{xy\}} \sim 0.05$ (setting $J_{1\{xy\}} = 1$), which indicates that the pure nearest neighboring XY model is a critical state of the chiral spin liquid. This picture is supported by the robust spin gap, and a large number of low energy singlet excitations below the spin gap. The singlet excitations may be considered as magneto-roton minimum of the systems representing symmetry broken low energy excitations. Furthermore, the quantum phase obtained is insensitive to the strength of the NN spin-z coupling, which connects the quantum phase of the NN XY model with the NN Heisenberg model. We will also discuss the quantum phase diagram for the SU₂ invariant systems and explore the nature of different quantum phase transitions involving the spin ordered phases outside the chiral spin liquid, which are driven by varying of the Heisenberg coupling J₃.

12:00noon
Wednesday, September 17, 2014
***Low Seminar Room (6C-333)**