Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

" Signatures of a Deconfined Phase Transition on the Shastry-Sutherland Lattice: Applications to Quantum Critical SrCu2(BO3)2"

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Abstract: We study a possible deconfined quantum phase transition in a realistic model of a two-dimensional Shastry-Sutherland quantum magnet, using both numerical and field theoretic techniques. Using the infinite density matrix renormalization group (iDMRG) method, we verify the existence of an intermediate plaquette valence bond solid (pVBS) order, with two fold degeneracy, between the dimer and Neel ordered phases. We argue that the quantum phase transition between the N´eel and pVBS orders may be described by a deconfined quantum critical point (DQCP) with an emergent O(4) symmetry. By analyzing the correlation length spectrum obtained from iDMRG, we provide evidence for the DQCP and emergent O(4) symmetry in the lattice model. Such a phase transition has been reported in the recent pressure tuned experiments in the Shastry-Sutherland lattice material SrCu2(BO3)2. The non-symmorphic lattice structure of the Shastry-Sutherland compound leads to extinction points in the scattering, where we predict sharp signatures of a DQCP in both the phonon and magnon spectra associated with the spinon continuum. The effect of weak interlayer couplings present in the three dimensional material is also discussed. Our results should help guide the experimental study of DQCP in quantum magnets.

12:00pm noon
Tuesday, September 17, 2019
Duboc Room (4-331)

Host: Adrian Po