

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Dynamical Signature of Fractionalization at the Deconfined Quantum
Critical Point"

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Abstract: Deconfined quantum critical points govern continuous quantum phase transitions at which fractionalized (deconfined) degrees of freedom emerge. Here we study dynamical signatures of the fractionalized excitations in a quantum magnet (the easy-plane J-Q model) that realizes a deconfined quantum critical point with emergent $O(4)$ symmetry. By means of large-scale quantum Monte Carlo simulations and stochastic analytic continuation of imaginary-time correlation functions, we obtain the dynamic spin structure factors in the S_x and S_z channels. In both channels, we observe broad continua as expected from the collective fluctuation of the deconfined excitations. We also provide field-theoretical calculations at the mean field level that explain the overall shapes of the computed spectra, while also pointing to the importance of interactions and gauge fluctuations to explain some aspects of the spectral-weight distribution. We make further comparisons with the conventional Landau paradigmatic $O(2)$ transition in a quantum magnet, at which no signature of fractionalization are observed. The distinctive spectral signatures of the deconfined quantum critical point suggest the feasibility of its experimental detection in neutron scattering and nuclear magnetic resonance experiments.

12:00pm noon
Tuesday, March 27, 2018
Duboc Room (4-331)

Host: Itamar Kimchi