Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

"Non-Abelian Fractional Quantum Hall Effect and Quantum Phase Transition for 1/2 Bilayer System"

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Abstract: Multicomponent quantum Hall systems with internal degrees of freedom provide an exciting playground for the emergence of exotic quantum liquids. Theoretically, different non-Abelian phases become possible by coupling Abelian states together, although we do not know much about what microscopic models with generic interactions can realize non-Abelian phases. Here we investigate the possibility of non-Abelian topological order in the half-filled fractional quantum Hall (FQH) bilayer system driven by the tunneling effect between two layers. By means of the state-of-the-art density-matrix renormalization group, we unveil "finger print" evidence of the non-Abelian Moore-Read Pfaffian state emerging in the intermediate-tunneling regime, including theground-state degeneracy on the torus geometry and the topological entanglement spectroscopy (entanglement spectrum and topological entanglement entropy) on the spherical geometry, respectively. Remarkably, the phase transition from the previously identified Abelian (331) Halperin state to the non-Abelian Moore-Read Pfaffian state is determined to be continuous, which is signaled by the continuous evolution of the universal part of the entanglement spectrum and groundstates, and discontinuity in the excitation gap. I will also discuss experimental evidence for detecting non-Abelian phases in bilayer systems.

12:00pm
Tuesday, November 29, 2016
Duboc Room (4-331)

Host: Liang Fu