# Massachusetts Institute of Technology
# Department of Physics

---

# Condensed Matter Theory Seminar

## "Quasiparticle collapsing and charge modulation as manifestations of Mott physics"

**Zheng-Yu Weng, Tsinghua University**

**Abstract:** Quasiparticle collapsing is a central issue in the study of strongly correlated electron systems. In the one-dimensional case, the quasiparticle collapsing in the form of spin-charge separation has been well established, but the problem remains elusive in dimensions higher than one. By using density matrix renormalization group (DMRG) algorithm, we find that in an anisotropic two-leg t-J ladder, an injected single hole behaves like a well-defined quasiparticle in the strong rung limit, but undergoes a ``phase transition" with the effective mass diverging at a critical point towards the isotropic limit. After the transition, the quasiparticle collapses into a composite object of a self-localized charge (holon) and a deconfined spin-1/2 (spinon), accompanied by a novel charge modulation due to the quantum interference effect. A substantially enhanced binding energy between two holes is also found in the quasiparticle collapsing regime. We discuss the underlying mechanism, which may be generic for a doped Mott insulator of any dimensions.

**12:00noon**
**Tuesday, November 4, 2014**
**Low Room 6C-333**

---

**Host: Liang Fu**