清华大学高等研究院

Institute for Advanced Study, Tsinghua University

物理学术报告 Physics Seminars (biweekly)

Date: **2013-09-23, Monday**

Venue: **Conference Hall 322, Science Building, Tsinghua University**

Talk I 2:30-3:30pm: Dynamics and conductivity near quantum criticality

Prof. Daniel Podolsky（***Technion, Israel*** ）

The Higgs mode is a ubiquitous collective excitation in condensed matter systems with broken continuous symmetry. Its detection is a valuable test of the corresponding field theory, and its mass gap measures the proximity to a quantum critical point. However, since the Higgs mode can decay into low energy Goldstone modes, its experimental visibility has been questioned. In this talk, I will show that the visibility of the Higgs mode depends on the symmetry of the measured susceptibility. I will also present an analysis of the evolution of the Higgs mode upon approach to the Wilson-Fisher fixed point in 2+1 dimensions and demonstrate that the Higgs mode survives as a universal resonance in the scalar susceptibility arbitrarily close to the quantum critical point. I will discuss the implications of these results for experiments on lattice Bose condensates near the Mott insulator to superfluid transition.

3:30-4:00pm Tea, Coffee, and Cookie

Talk Ⅱ 4:00-5:00pm: Localization and topology protected quantum coherence at the edge of 'hot' matter

Prof. Ehud Altman（***Weismann Institute., Israel***）

Topological phases are often characterized by special edge states confined near the boundaries by an energy gap in the bulk. On raising temperature, these edge states are lost in a clean system due to mobile thermal excitations. Recently however, it has been established that disorder can localize an isolated many body system, potentially allowing for a sharply defined topological phase even in a highly excited state. Here we show this to be the case for the topological phase of a one dimensional magnet with quenched disorder, which features spin one-half excitations at the edges. The time evolution of a simple, highly excited, initial state is used to reveal quantum coherent edge spins. In particular, we demonstrate, using theoretical arguments and numerical simulation, the coherent revival of an edge spin over a time scale that grows exponentially bigger with system size. This is in sharp contrast to the general expectation that quantum bits strongly coupled to a 'hot' many body system will rapidly lose coherence.