Seminar

Detection of Antiferromagnetic Correlations in the Fermi-Hubbard Model

Randall Hulet

Rice University

Time: 4:00pm, June 12, 2014 (Thursday)
时间： 2014年6月12日 （周四）下午4:00
Venue: Conference Room 607, Science Building 5
地点： 理科五号楼607会议室

Abstract

Ultracold atoms in optical lattice hold great potential for realizing novel new quantum states of strongly correlated matter. The Hubbard model, consisting of a cubic lattice with on-site interactions and kinetic energy arising from tunneling to nearest neighbors is a "standard model" of strongly correlated many-body physics. Notably, it may also contain the essential ingredients of high-temperature superconductivity. At a density of one spin-1/2 particle per site, however, the Hubbard model is known to exhibit antiferromagnetism at temperatures below the Néel temperature T_N, a property shared by most of the undoped parent compounds of high-T_c superconductors. The realization of antiferromagnetism in a 3D optical lattice with atomic fermions has been impeded by the inability to attain sufficiently low temperatures.

We have detected antiferromagnetic correlations by spin-sensitive Bragg scattering of light. Comparison with quantum Monte Carlo constrains the temperature in the center of the lattice to ~1 T_N, a temperature 2.5 times lower than achieved in previous work. We will discuss the prospects of attaining even lower temperatures with this method.

About the Speaker

Randall Hulet is the Fayez Sarofim Professor of Physics at Rice University. His research in the field of ultracold atoms has focused on quantum degenerate gases of bosons and fermions. Most recently, he and his group have studied novel forms of superconductivity in one-dimensional systems and quantum magnetism in a three-dimensional lattice. He is recipient of the I. I. Rabi Prize of the American Physical Society, a NASA Distinguished Service Medal, the Willis E. Lamb Medal for Laser Science and Quantum Optics, and he is a member of the American Academy of Arts and Sciences.