

Quantum Universality in Few-Body Systems

Cheng Chin

Physics Department and James Franck Institute, University of Chicago

We discuss prospects to investigate universality in few-body systems derived from bosonic and fermionic atoms in the quantum threshold regime. In particular, we describe new spectroscopic tools to identify and explore the universality of quantum systems with a designated number of ultracold atoms, ratcheting our comprehension from a single atom to many. Universality has been well established in the two- and many-body regimes, describing the physics of these systems solely by the two-body scattering length; it is unclear, however, how universality persists in the intermediate few-body regime. Among other directions, I propose a novel interferometric detection of two- and three-body interactions by probing the evolution of quantum superpositions of atomic occupancies in optical lattice sites. Possible limitations on the technique, and remedies based on precision control of atoms in the internal and external degrees of freedom will be discussed.