“Quantum Magnetism with Ultracold Atoms – A Microscopic View on Artificial Quantum Matter”

Markus Greiner

Harvard University

Understanding the behaviors of strongly-interacting spin systems is one of the central objectives of modern manybody quantum physics. I will present experiments in which we have realized quantum magnetism with ultracold atoms in an optical lattice. We carry out a quantum simulation of an Ising spin chain and demonstrate a quantum phase-transition from a paramagnetic phase to an anti-ferromagnetic phase. The magnetic phases are detected in situ through our quantum gas microscope. This work opens a wide range of new possibilities for studying quantum magnetism. Exotic states of matter and frustrated spin physics in optical lattices are now within experimental reach.