

Quantum Criticality of an Ising Superfluid

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We present an experimental platform to simulate quantum magnets and create novel excitations based on ultracold atoms loaded in an optical lattice. Superfluid domains with ferromagnetic interactions are observed in situ when the lattice is externally modulated above a critical value. A careful study of the dynamics within one domain suggests the appearance of roton excitations in the ferromagnetic phase, which greatly suppress superfluidity near the quantum critical point. Connection of our system to quantum Ising model is discussed.