

FM 4: Focus Talk: Quantum Simulation

Time: Monday 11:00–12:00

Location: 2004

Focus Talk

FM 4.1 Mon 11:00 2004

Quantum simulation with ultracold atoms in optical lattices — ●MONIKA AIDELSBURGER — Fakultät für Physik, Ludwig-Maximilians-Universität München, Germany — Munich Center for Quantum Science and Technology (MCQST), München, Germany

Ultracold atoms can be trapped in optical lattices to form artificial crystalline systems with highly-tunable parameters. They constitute powerful experimental platforms, which enable the controlled simulation of a variety of phenomena ranging from condensed matter to statistical physics. These systems are well isolated from the environment and the dynamic controllability of their parameters naturally

facilitates the investigation of complex out-of-equilibrium phenomena. Moreover, high-resolution imaging techniques provide unprecedented insight into the fundamental physics of quantum many-body systems via the direct observation of the underlying microscopic processes.

A promising new direction was recently opened with the successful realization of paradigmatic topological lattice models. Topological states of matter exhibit unique conductivity properties, one of the most prominent examples being the quantum Hall effect. I will discuss how topological systems can be engineered with charge-neutral atoms in optical lattices, explain related experiments on topological phenomena and present ongoing efforts towards the engineering of complete gauge theories.