Abstract Submitted
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Microscopic measurements of dynamics in Fermi-Hubbard and Ising systems[1] PETER SCHAUSS, PETER BROWN, DEBAYAN MITRA, ELMER GUARDADO-SANCHEZ, Princeton University, ALEXIS REYMBAUT, SIMON BERGERON, DOMINIC BERGERON, REZA NOURAFKAN, ANDRE-MARIE TREMBLAY, University of Sherbrooke, JURE KOKALJ, University of Ljubljana, DAVID HUSE, WASEEM BAKR, Princeton University — The ability to probe and manipulate cold atoms in optical lattices at the atomic level using quantum gas microscopes enables quantitative studies of dynamics. While there are many well-developed theoretical tools to study many-body quantum systems in equilibrium, simulating their dynamics is challenging with available techniques. Approximate methods need to be benchmarked, creating an urgent need for measurements in model experimental systems. Here we present two such measurements. First, we present experiments that probe the relaxation of density modulations in the doped Fermi-Hubbard model. This leads us to a hydrodynamic description that allows us to determine the conductivity. We observe bad metallic behavior that we compare to predictions from finite-temperature Lanzcos calculations and dynamical mean field theory. Second, we introduce a new platform to study the 2D quantum Ising model. By illuminating atoms in an optical lattice with light that excites them to a low-lying Rydberg state, we observe quench dynamics that leads to antiferromagnetic correlations. We compare the short-time dynamics to results from a dynamical numerical linked cluster expansion.

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