Abstract Submitted
for the DAMOP18 Meeting of
The American Physical Society

Observation of Spin Transport in the 2D Fermi-Hubbard Model MATTHEW NICHOLS, MELIH OKAN, Massachusetts Institute of Technology, LAWRENCE CHEUK, Harvard University, ENRIQUE MENDEZ, THOMAS HARTKE, HAO ZHANG, Massachusetts Institute of Technology, EHSAN KHATAMI, San Jose State University, MARTIN ZWIERLEIN, Massachusetts Institute of Technology — In solid state systems, a plethora of interesting phenomena manifest themselves in the transport properties of a material. Several prototypical examples include the quantum hall effect, superconductivity, and giant magnetoresistance. With this in mind, an in-depth exploration of the transport properties of the 2D Fermi-Hubbard model, a model which is believed to capture the essential aspects of high-temperature superconductivity in the cuprates, is worth pursuing. In this poster, using a quantum gas microscope which allows for single-site readout, we study spin transport in such a system. By applying a magnetic field gradient to a homogeneous sample of ultracold ^{40}K atoms trapped in a square optical lattice, we examine how the system evolves in real time under a spin-dependent perturbation. For a half-filled system in the Mott-insulating regime, we observe spin dynamics which are diffusive in nature. This allows us to extract both the spin diffusion coefficient and the spin conductivity as functions of the Hubbard parameters. These findings are compared with novel numerical linked-cluster expansion (NLCE) calculations.

Matthew Nichols
Massachusetts Institute of Technology

Date submitted: 26 Jan 2018 Electronic form version 1.4