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Spin Transport in a Mott Insulator of Ultracold Fermions MATTHEW A. NICHOLS, Massachusetts Institute of Technology, LAWRENCE W. CHEUK, Harvard University, MELIH OKAN, THOMAS R. HARTKE, ENRIQUE MENDEZ, T. SENTHIL, Massachusetts Institute of Technology, EHSAN KHATAMI, San Jos State University, HAO ZHANG, NINGYUAN JIA, MARTIN W. ZWIERLEIN, Massachusetts Institute of Technology — Transport measurements provide a fundamental characterization of the dynamic response of a quantum system that is perturbed from equilibrium. In this poster, using a quantum gas microscope, we study spin transport in the 2D Fermi-Hubbard model, a model that is believed to capture essential features of high-temperature superconductivity. To realize the Fermi-Hubbard model, we confine ultracold 40K atoms in two hyperfine states with differing magnetic moments in a homogeneous square optical lattice. We then apply a magnetic field gradient and examine how the two spin distributions evolve in linear response in real time. For a half-filled system in the strongly correlated regime, we observe spin dynamics which are diffusive in nature and we extract both the spin conductivity and the diffusion coefficient. We compare these findings with novel numerical linked-cluster expansion (NLCE) calculations.

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