Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Subdiffusion and heat transport in a tilted Fermi-Hubbard system[1] ELMER GUARDADO-SANCHEZ, BENJAMIN M. SPAR, WASEEM S. BAKR, Princeton University — Understanding the transport properties of strongly interacting quantum systems is of great interest. Recently, quantum microscopy has been used to study diffusive charge transport in a cold atom Fermi-Hubbard system [1], revealing a strange metal phase with T-linear resistivity. In this work, we use the same technique to study the late-time effective hydrodynamics of a Fermi-Hubbard system subject to an external linear potential (a "tilt"). The tilt couples mass transport to local heating through energy conservation. Due to this coupling the system quickly heats up to near infinite temperature in the lowest band of the lattice. We study the high-temperature transport and thermalization in our system as a function of tilt strength and find that the associated decay time τ crosses over as the tilt strength is increased from characteristically diffusive to subdiffusive with $\tau \propto \lambda^4$. In order to explain the underlying physics and emphasize its universal nature we develop a hydrodynamic model that exhibits this crossover. For strong tilts, the subdiffusive transport rate is set by a thermal diffusivity, which we are thus able to measure as a function of tilt in this regime. [1] P. T. Brown et al, Science 363, 379-382 (2019)

[1]This work was supported by the NSF, the David and Lucile Packard Foundation, and the AFOSR Young Investigator Research Program. W.S.B. was supported by an Alfred P. Sloan Foundation fellowship.

Elmer Guardado-Sanchez
Princeton University

Date submitted: 31 Jan 2020 Electronic form version 1.4