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Interaction-controlled transport of an ultracold Fermi gas ROBERT JORDENS, NIELS STROHMAIER, ETH Zurich, YOSUKE TAKASU, Kyoto University, KENNETH GUNTER, Laboratoire Kastler Brossel Paris, MICHAEL KOHL, University of Cambridge, HENNING MORITZ, TILMAN ESSLINGER, ETH Zurich — We explore the transport properties of an interacting Fermi gas in a three-dimensional optical lattice. In analogy to the characterization of transport behavior in condensed matter systems through conductivity measurements, we study the atom cloud's center of mass motion after a sudden displacement of the trap minimum. Different interaction strengths and lattice fillings are shown to have a characteristic influence on the dynamics. With increasingly strong attractive interactions the weakly damped oscillation, observed for the non-interacting case, turns into a slow drift: local pairs with a reduced tunneling rate are formed for strong inter-atomic attraction. Application of this technique in other interaction regimes, lattice depths and fillings in the Fermi-Hubbard model may provide a tool for the identification of quantum phases such as the fermionic Mott-insulator. Experimental results on repulsively interacting Fermi gases will be presented.

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