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Strongly interacting Fermi gases in an optical lattice NIELS STROHMAIER, ROBERT JOERDENS, ETH Zurich, KENNETH GUENTER, Ecole Normale Superieure, Paris, YOSUKE TAKASU, Kyoto University, MICHAEL KOEHL, University of Cambridge, HENNING MORITZ, TILMAN ESSLINGER, ETH Zurich — When cold fermionic atoms are placed in the periodic potential of an optical lattice, they behave similarly to electrons in a crystal. However, the properties of this synthetic material can be changed at will. Here, we report on the experimental realization and investigation of strongly interacting Fermi gases with tunable interactions. By changing the interaction strength we are able to control the transport properties: while dipole oscillations are observed for a non-interacting gas, the atomic cloud relaxes very slowly to its equilibrium position for strong attractive interactions. We suggest an interpretation in the framework of the Hubbard model including external confinement: local fermionic pairing occurs, leading to a drastically reduced tunneling rate. Furthermore, experimental results on the behavior of repulsively interacting Fermi gases will be presented.

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