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Strongly correlated Fermions in optical lattices: static and dynamic properties ULRICH SCHNEIDER, LUCIA HACKERMÜLLER, THORSTEN BEST, SEBASTIAN WILL, SIMON BRAUN, Universität Mainz, Germany, IMMANUEL BLOCH, Universität Mainz, Max Planck Institut für Quantenoptik, Garching, Germany — Fermionic atoms in optical lattices can serve as a model system for condensed matter physics: They implement the Hubbard model with high experimental control of the relevant parameters. We study static and dynamic properties of ultracold fermions in different regimes, varying from a metal to a band insulator in the non-interacting system and including complex metals and the Fermionic Mott Insulator for strongly repulsive systems. In the experiment, spin mixtures of fermionic ^{40}K are loaded into a combination of a blue detuned three dimensional optical lattice and a red detuned dipole trap. This combination of optical potentials allows an independent control of lattice depth and harmonic confinement, thus enabling us to explore different regimes. In addition to the static properties we present measurements of the dynamic response of the system to changes of the external parameters.

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