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Investigating Floquet dynamics in driven Fermi-Hubbard systems FREDERIK GOERG, MICHAEL MESSER, KILIAN SANDHOLZER, JOAQUIN MINGUZZI, KONRAD VIEBAHN, ANNE-SOPHIE WALTER, REMI DESBUQUOIS, TILMAN ESSLINGER, Institute for Quantum Electronics, ETH Zurich — Strong periodic driving can be used to coherently control the properties of interacting quantum systems and to engineer novel effective Floquet-Hamiltonians, which feature for example topological band structures. We realize a strongly interacting Fermi gas in a periodically driven hexagonal optical lattice and investigate its charge and magnetic properties. When driving at a frequency close to the interaction energy, we show that anti-ferromagnetic correlations can be enhanced or even switched to ferromagnetic ordering. Furthermore, we investigate the Floquet dynamics of the underlying many-body state in the high-frequency and near-resonant driving regimes. We compare the evolution of the double occupation to an equivalent realization in a static lattice as well as to non-equilibrium ab-initio DMFT calculations. This allows to identify timescales on which the system is well described by an effective static Hamiltonian. Moreover, we find that heating and atom loss due to the drive can be strongly suppressed by minimizing the dispersion of higher bands of the underlying hexagonal lattice. With our near-resonant driving scheme, density-dependent dynamical gauge fields can be realized which lead to exotic interacting topological phases.

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