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Decoherence and heating of fermions in optical lattices SAUBHIK SARKAR, STEPHAN LANGER, JOHANNES SCHACHENMAYER, ANDREW J. DALEY, University of Pittsburgh — A key challenge in current experiments with ultracold fermionic atoms in optical lattices is to reach sufficiently low temperatures in order to explore many interesting quantum phases, including magnetically ordered states. Incoherent scattering of light from the lasers that form the lattices can contribute significantly to the heating, which competes with processes cooling the system into these states. We study the robustness of the magnetically ordered many-body states to this mechanism, deriving a many-body master equation for two-component fermions and investigating how the heating is influenced by choices in the atomic physics as well as parameters of the many-body Hamiltonian. Specifically, we show that for alkaline earth atoms these states can be particularly robust in a far-detuned optical lattice, as direct decoherence of spin states is strongly suppressed, and the decoherence rate for the many-body state becomes proportional to the probability of virtual double-occupations in the Mott Insulator state.

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