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Adiabatic dynamics with classical noise in optical lattice GUANGLEI XU, ANDREW DALEY, Department of Physics and SUPA, University of Strathclyde, UK — The technique of adiabatic state preparation is an interesting potential tool for the realisation of sensitive many-body states with ultra-cold atoms at low temperatures. However, questions remain regarding the influence of classical noise in these adiabatic dynamics. We investigate such dynamics in a situation where a level dressing scheme can make amplitude noise in an optical lattice proportional to the Hamiltonian, leading to a quantum Zeno effect for non-adiabatic transitions. We compute the dynamics using stochastic many-body Schrödinger equation and master equation approaches. Taking the examples of 1D Bose-Hubbard model from Mott insulator phase to superfluid phase and comparing with analytical calculations for a two-level system, we demonstrate that when the total time for the process is limited, properly transformed noise can lead to an increased final fidelity in the state preparation. We consider the dynamics also in the presence of imperfections, studying the resulting heating and dephasing for the many-body states, and identifying optimal regimes for future experiments.

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