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Cold bosons in noisy optical lattices JOHANNES SCHACHENMAYER, Department of Physics and Astronomy, University of Pittsburgh, HANNES PICHLER, PETER ZOLLER, Institute for Theoretical Physics, University of Innsbruck, and Institute for Quantum Optics and Quantum Information, Innsbruck, ANDREW DALEY, Department of Physics and Astronomy, University of Pittsburgh — Cold atoms in optical lattices open the possibility to experimentally study strongly interacting many-body quantum systems with controllable parameters. A key challenge to prepare interesting quantum states in these systems is to achieve sufficiently low temperatures. At these temperatures a deep theoretical understanding of possible heating processes and how they affect the characteristics of the quantum state becomes essential. In every realistic experiment there exist many sources of noise that cause phase and amplitude fluctuations in the standing laser waves that form the optical lattice potential. This classical noise can lead to heating and a significant change of the quantum state. We study the stochastic many-body non-equilibrium dynamics of bosons in an optical lattice and determine how the state changes depending on the characteristics of the noise. We do this by solving time-dependent stochastic many-body Schrödinger equations, both analytically and numerically.

Johannes Schachenmayer
Department of Physics and Astronomy, University of Pittsburgh

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