

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Non-equilibrium dynamics and state preparation in bilayer optical lattices STEPHAN LANGER, University of Pittsburgh, ANDREW J. DALEY, University of Pittsburgh, University of Strathclyde — We study dynamical schemes to obtain low entropy ground states of strongly interacting many body systems. The focus of our work is on ultra-cold Bose and Fermi gases in bilayer optical lattice systems with separately tunable interlayer coupling, energy offset between the layers and repulsive interactions. The case of two coupled one-dimensional chains is treated in a numerically exact manner using the adaptive time-dependent density matrix renormalization group which allows us to study the change of offset and interlayer coupling in real time. We identify parameter regimes where the ground state of the coupled system in the limit of small interlayer coupling consists of a Mott insulator in one layer and a superfluid/metallic state in the other layer can serve as an entropy reservoir. We then investigate the time-dependent dynamics of this system, studying entropy transfer between layers and the emergence of characteristic many-body correlations as we change the layer offset energy and coupling strength. In addition to applications as a preparation scheme for fully interacting Mott-insulator states, feasible with available experimental techniques, the investigated protocols could be easily adapted to also allow for a controlled preparation of highly excited states.

Stephan Langer
University of Pittsburgh

Date submitted: 13 Nov 2013

Electronic form version 1.4