Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Pairsuperfluid in Dynamically Constraint Bose-Hubbard Models

LARS BONNES, University of Stuttgart, STEFAN WESSEL — We consider ultracold atoms loaded into a two-dimensional optical lattice with strong three-body losses, i.e. three bosons sharing one lattice site scatter inelastically and dissipate from the system. This process dynamically stabilizes a three-body on-site repulsion in analogy to the quantum Zeno effect. The system studied here is described by a Bose-Hubbard model on a square lattice with on- site attraction. The maximal number of particles per lattice site is restricted to two in order to take the three-body repulsion into account. Field theoretical considerations and numerical simulations using Matrix Product States in one dimension suggest the existence of a dimer superfluid phase for small tunneling rates that is effectively described by the condensation of boson pairs and the absence of an atomic condensate. In this work we explore the ground state and finite-temperature phase diagram for our model using large-scale quantum Monte- Carlo simulations. Our main emphasis is the detection of the dimer superfluid phase and we address the issue of extrapolating our finite-temperature data to the thermodyanmic limit at $T = 0$. Furthermore, we explore the possibility of adding an explicit dimer hopping term that drastically changes the behavior of our system.

Lars Bonnes
University of Stuttgart

Date submitted: 22 Nov 2010 Electronic form version 1.4