Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Soliton in a lattice derived from quantum mechanics JUHA JAVANAINEN, UTTAM SHRESTHA, U. of Connecticut — Starting from the tenet that measurements are the agent that calls forth nonlinear phenomenology from linear quantum mechanics, we study solitons in an optical lattice carrying a Bose-Einstein condensate. We juxtapose the Bose-Hubbard model and the corresponding classical model. For certain parameter values the stationary lowest-energy state of the classical model is a localized soliton, while the quantum mechanical ground state is translationally invariant. However, if the numbers of the atoms at each lattice site are measured, a distribution of the atoms closely resembling the classical soliton is found. We demonstrate this with a Quantum Monte Carlo (QMC) analysis of the ground state, noting that every sample obtained from our particular QMC method is also a faithful simulation of what a measurement would give for the atom numbers at the lattice sites.

Juha Javanainen
U. of Connecticut

Date submitted: 22 Jan 2009 Electronic form version 1.4