Abstract Submitted
for the DAMOP19 Meeting of
The American Physical Society

Numerical Simulations of the Fast Adiabatic Transport of an Ultracold Quantum System[1] JUNJIANG LI, E. CARLO SAMSON, Miami University — We study numerically the spatial transport of the ultracold atoms at very short time intervals without loss of fidelity. In many quantum technologies, one often needs to transport a quantum system through space rapidly while preserving fidelity. Among the many protocols designed to address this, shortcuts to adiabaticity (STA) is of special interest as it is incredibly robust against different kinds of quantum systems. However, its implementation requires an auxiliary potential be provided over a large region of space, which can be difficult to satisfy experimentally. One of the specific goals is to determine the relationship between the minimum transfer time and the minimum range of the auxiliary potential. To that end, we studied the behavior of Bose-Einstein condensates being transported by the STA protocol by numerically solving the Gross-Pitaevskii equation. Specifically, we are investigating the correlation between transport times and the necessary spatial extent of the auxiliary potential for a coherent transport. Preliminary results show an inverse correlation, which implies a limit on how fast a system can be transported when this protocol is implemented in experiments. We evaluate the performance of this fast transport protocol using experimentally feasible parameters.

[1]JL acknowledges support from the Office of Undergraduate Research (Miami University)

Junjiang Li
Miami University

Date submitted: 01 Feb 2019 Electronic form version 1.4