Abstract Submitted
for the DAMOP17 Meeting of
The American Physical Society

Negative-Mass Hydrodynamics: Solitons and Shockwaves EDWARD DELIKATNY, MICHAEL FORBES, Washington State University — In this talk, I will present a microscopic description of the shockwaves and solitons that form when a trapped Bose-Einstein Condensate (BEC) is released and expands in the presence of Spin-Orbit Coupling (SOC). The SOC dispersion has regions of negative curvature $\left(\frac{\partial^2}{\partial k^2}E(k) < 0\right)$ which emulate an effective negative mass. We seed the edges of the trapped BEC with momentums in the negative mass region, the edges then push against the outward expansion leading to a self-trapping phenomenon. Using negative mass hydrodynamics we see a build up and trapping of shockwaves in the center of the BEC. Although remarkably stable, the shockwaves ultimately decay into trains of solitons which lead to a dynamic instability of the trapped BEC.

Edward Delikatny
Washington State University

Date submitted: 29 Jan 2017 Electronic form version 1.4