Abstract Submitted
for the DAMOP20 Meeting of
The American Physical Society

Precision Gross-Pitaevskii modeling of a dual-Sagnac interferometer[1] MARK EDWARDS, CHARLES HENRY, STEPHEN THOMAS, COLSON SAPP, Georgia Southern University, CHARLES CLARK, JQI and NIST — A recent experiment[1], performed in the group of Cass Sackett, implemented a dual Sagnac interferometer for rotation sensing using a Bose–Einstein condensate confined in an harmonic potential. The condensate is first split into two pieces using standing–wave Bragg lasers and then allowed to fly apart until the two pieces come to a stop. These two pieces are then split again along a perpendicular direction creating two pairs of condensates moving around a circle in opposite directions. They re-overlap after one trip around the circle at which point they are split a third time and the number of stationary atoms is measured. We have simulated this experiment using a a model based on the Lagrangian Variational Method where the condensate pieces are represented by Gaussian clouds. We have mapped out the region of validity of this model by direct numerical simulation using the 3D Gross–Pitaevskii equation. In addition to performing simulations under experimental conditions where the number of atoms was $N = 10^4$, we also simulated the interferometer operation for larger condensates where atom–atom interactions must be accounted for.

[1]This work was supported by the US National Science Foundation grant no. PHY-1707776

Mark Edwards
Georgia Southern University

Date submitted: 30 Jan 2020 Electronic form version 1.4