Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

**Applications of the Stochastic Gross-Pitaevskii equation to Atom Interferometers**[1] DONATELLO GALLUCCI, STUART P. COCKBURN, NICK P. PROUKAKIS, School of Mathematics and Statistics, Newcastle University — The stochastic Gross-Pitaevskii equation (SGPE) has proven to be a versatile tool for modeling weakly-interacting quasi-one-dimensional bosonic gas experiments at finite temperatures. In this work we examine the validity of its application to the experimentally-relevant case of transversally-split atom interferometers. While the Bose gas samples used in interferometry are typically very elongated, and therefore require a model including phase and density fluctuations, a full description of the dynamical process of splitting and recombining such samples requires a three-dimensional formulation. We therefore consider key issues which arise in solving the SGPE in greater than one-dimension, such as the role of the momentum cut-off, due to the inherently classical field nature of the approximations on which this model is based, and the closely related issue of partial inclusion of important thermal mode dynamics. Maintaining a stochastic element to the quasi-condensate dynamics is shown to result in an axially-varying phase difference across the split interferometer arms, and the emerging patterns upon recomination are analysed. The possibility of modeling existing experiments is also considered.

[1]We acknowledge the UK EPSRC for funding.

Donatello Gallucci
School of Mathematics and Statistics, Newcastle University

Date submitted: 02 Feb 2011 Electronic form version 1.4