Abstract Submitted
for the DAMOP12 Meeting of
The American Physical Society

Decay of a superfluid current of ultra-cold atoms in a toroidal trap AMY MATHEY, Center for Optical Quantum Technologies and Institute of Laser Physics, University of Hamburg, CHARLES W. CLARK, JQI, NIST and the University of Maryland, LUDWIG MATHEY, Center for Optical Quantum Technologies and Institute of Laser Physics, University of Hamburg — Using a numerical implementation of the truncated Wigner approximation, we simulate the experiment reported by Ramanathan *et al.*, Phys. Rev. Lett. **106**, 130401 (2011), in which a Bose-Einstein condensate is created in a toroidal trap and set into rotation via a Gauss-Laguerre beam. A potential barrier is then placed in the trap to study the decay of the superflow. We find that the current decays via thermally activated phase slips, which can also be visualized as a vortex crossing the barrier region in radial direction. Adopting the notion of critical velocity used in the experiment, we determine it to be lower than the local speed of sound at the barrier. This result is in agreement with the experimental findings, but in contradiction to the predictions of the Gross-Pitaevskii equation.

Amy Mathey
Center for Optical Quantum Technologies and
Institute of Laser Physics, University of Hamburg

Date submitted: 25 Jan 2012 Electronic form version 1.4