Abstract Submitted
for the DAMOP11 Meeting of
The American Physical Society

Persistent currents from the decay of quantum turbulence: signatures of an inverse energy cascade in Bose-Einstein condensates[1] BRIAN P. ANDERSON, TYLER W. NEELY, E. CARLO SAMSON, EWAN M. WRIGHT, University of Arizona, SAM J. ROONEY, ASHTON S. BRADLEY, University of Otago, MATTHEW J. DAVIS, University of Queensland, KODY J. H. LAW, University of Warwick, RICARDO CARRETERO-GONZALEZ, San Diego State University, PANAYOTIS G. KEVREKIDIS, University of Massachusetts — We report the formation of persistent currents from the decay of turbulence in Bose- Einstein condensates (BECs). In our experiments, a BEC is pierced with a blue-detuned laser beam. By moving the trap center relative to the beam's position, vortices are stirred into the BEC, creating a quantum turbulent state. At finite temperatures, the turbulent state can decay to a persistent current about the blue-detuned laser beam that can last for up to 50 seconds; winding numbers up to 8 have been observed. Our experimental observations correspond well with numerical simulations of the non-equilibrium dynamics and calculations of vortex pinning by a laser beam. We interpret our results as evidence for an inverse energy cascade in dilute-gas BECs.

[1]This work is supported by the US National Science Foundation, the Army Research Office, and the New Zealand Foundation for Research, Science, and Technology

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Date submitted: 03 Feb 2011 Electronic form version 1.4