Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Experimental Observation of Quantized Vortex Reconnection and Turbulence in Superfluid Helium[1] MATTHEW PAOLETTI, University of Maryland, KATEPALLI SREENIVASAN, International Centre for Theoretical Physics and University of Maryland, DANIEL LATHROP, University of Maryland
— We present experimental studies of the first direct visualization of reconnecting quantum vortices and the decay of superfluid turbulence in ^{4}He. Micron-sized solid hydrogen particles are used for particle tracking. The cores of the superfluid vortices trap the hydrogen particles, thereby allowing direct visualization of the dynamics of the line-like defects. We generate superfluid turbulence by driving a thermal counterflow. After pulsing the counterflow, the system relaxes through a cascade of reconnection events. We examine the dynamics of pairs of particles trapped on reconnecting vortices and observe that these particles separate as power laws in time with a scaling exponent distributed about the predicted value of $1/2$. We show that reconnection leads to power-law tails in the velocity probability distribution function, which is in stark contrast to the Gaussian tails that are ubiquitous in classical turbulence and thermal motion.

[1]We would like to acknowledge support from NSF, NASA, and the Center for Nanophysics and Advanced Materials at the University of Maryland

Matthew Paoletti
University of Maryland

Date submitted: 04 Jan 2008 Electronic form version 1.4