Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Local vortex–defect interaction in moving vortex lattices observed by STM MICHAEL DREYER, JONGHEE LEE, HUI WANG, University of Maryland, College Park, MD 20740, USA, BARRY BARKER, Lab. for Phys. Sci., 8050 Greenmead Dr., College Park, MD 20740, USA — When applying a magnetic field to a type II superconductor, part of the magnetic flux penetrates the sample forming a current vortex. At high enough fields and low enough defect concentration the vortices form a 2D triangular lattice. We observed the vortex lattice on $NbSe_2$ single crystals using STM ($B = 250 - 750$ mT, $T = 4.2$ K). Due to a slow decay of the magnetic field of our superconducting magnet (~ -5 nT/s) the vortices collectively move at an average speed of about 5 pm/s. The motion was observed by tracking the center of a vortex across consecutive images of the vortex lattice. The motion shows distinct acceleration/deceleration cycles we associate with collective pinning events on nearby defect sites. A more subtle observation was the deviation of the vortex positions from their 'expected' location within the lattice of up to 3 nm. A similar effect was found in 2D simulations of a moving vortex lattice near defect sites. Since it takes an additional force to move a vortex out of position, we can identify subsurface defects and analyze the defect–vortex interaction. Results of the analysis will be presented.

Michael Dreyer
University of Maryland, College Park, MD 20740, USA

Date submitted: 30 Nov 2006 Electronic form version 1.4