Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Vortex stability influenced by surface topology I. NEUMANN, P. VOLL, N. APROBERTS-WARREN, R.J. ZIEVE, UC Davis — We examine the stability of a pinned superfluid helium vortex line. The vortex pins around a thin wire, which terminates at each end at either a rounded bump, a conical indentation, or a flat surface. With the cryostat stationary, we measure the persistence of the vortex. With no external disturbance, it remains indefinitely. We briefly heat the cell and find the temperature at which the vortex depins. By observing the vortex motion after it partially detaches from the wire, we can determine at which terminus it detached. We find that pinning terminating at a bump is generally the easiest to overcome thermally, and pinning at a flat end is the hardest. This pattern would not be expected from considerations of vortex line energy alone. We take the observations as evidence of an additional contribution to the pinning energetics. One possibility is an interaction of the vortex with the curvature of the containers surface which favors pinning at points of negative Gaussian curvature, making the bump terminus a less advantageous pin site. The combined effects of vortex line energy and this surface curvature interaction may explain the observed vortex depinning behavior.

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Date submitted: 20 Nov 2006 Electronic form version 1.4