Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Size effects in the nonlinear resistance in a virtual Berezinskii-Kosterlitz-Thouless state of superconducting films ALEX GUREVICH, National High Magnetic Field Laboratory, VALERII VINOKUR, Argonne National Laboratory — We show that the size effects strongly affect the nonlinear electric field-current ($E - I$) relation of superconducting films. We calculate $E(J)$ due to thermally-activated hopping of single vortices driven by current I across the film in a magnetic field H, taking into account interaction of free vortices with their antivortex images and peaks in the Meissner currents at the film edges. Unbinding of virtual vortex-antivortex pairs not only mimics the transport uniform BKT behavior, it can dominate the observed $E(J)$ and result in the field-dependent ohmic resistance at small I. We show that $E(I)$ can be tuned by changing the film geometry and propose experimental tests of this theory.

Alex Gurevich
NHMFL

Date submitted: 21 Nov 2008 Electronic form version 1.4