Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Tunneling of an extended object in a dissipative environment: suppression of tunneling of vortices caused by a remote gate. KAREN MICHAELI, Department of Condensed Matter Physics, The Weizmann Institute of Science, Rehovot 76100, Israel, ALEXANDER FINKEL'STEIN, Weizmann Institute of Science, Israel and Department of Physics, Texas A&M University, USA. — A strong decrease of the resistance of a superconducting film measured in magnetic field has been observed when a metallic gate is placed above the film. [1] We study how the magnetic coupling between vortices in a superconducting film and electrons in a remote unbiased gate affects the tunneling rate of the vortices. We examine two approaches to analyze tunneling in the presence of low-energy degrees of freedom: (i) the response of the electrons inside the metallic gate to a change in the vortex position is described as "tunneling with dissipation" (ii) the scattering of the electrons by the magnetic flux of the vortex leads to the Orthogonality Catastrophe that opposes the vortex tunneling. We show that the gate can cause a dramatic suppression of the vortex tunneling restoring the superconducting property in accord with the experiment.

[1]N. Mason, and A. Kapitulnik, Phys. Rev. B. 65, 220505(R) (2002).

Karen Michaeli
Dept. of Condensed Matter Physics, The Weizmann Institute of Science,
Rehovot 76100, Israel

Date submitted: 23 Nov 2007 Electronic form version 1.4