Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

A study of the critical current density in optimally-doped, thin-film cuprate superconductor $YBa_2Cu_3O_{7-\delta}$[1] E.S. BACKUS, M. LILLY, M.C. SULLIVAN, Department of Physics, Ithaca College, Ithaca, NY — Scaling analysis of voltage vs. current isotherms has often been used to study the normal-superconducting phase transition in cuprate superconductors, though there is little consensus in the literature as to the values of the critical exponents for this phase transition. Studying the critical current will give us another way to examine the normal-superconducting phase transition, and perhaps rectify the lack of consensus regarding the critical exponents. We designed a photolithographic mask with several meander patterns to test, varying the lengths and thicknesses of the patterned wires. We conducted reverse-polarity measurements sent through the meander patterns of thin-films of the cuprate superconductor $YBa_2Cu_3O_{7-\delta}$. Because the critical current density in this material is so high, several extrinsic effects must be taken into consideration in order to avoid heating, including: determining the most effective number of measurements, the wait time between measurements, and the wait time between increments of temperature in order to reduce the error. I present my results as a plot of the critical current as a function of temperature in zero-field, and the critical exponent.

[1]Supported by NSF grant DMR-0706557.

Emily Backus
Ithaca College

Date submitted: 28 Nov 2008 Electronic form version 1.4