Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Lorentz Imaging of Superconducting Flux Vortices with a Commercial Transmission Electron Microscope[1] JAMES LOUDON, PAUL MIDGLEY, University of Cambridge — Magnetic flux penetrates type II superconductors along normal channels called flux vortices, each containing a single quantum of flux. It is beneficial to image these vortices and study their response to external stimuli as they determine the performance of many superconducting devices. Tonomura's research group have demonstrated that vortices can be imaged by transmission electron microscopy because of the deflection the electrons suffer as they pass through the magnetic flux within the vortices (Harada K. *et al.*, Nature 360, 51, 1992). This technique offers spatial resolution superior to other techniques, real-time imaging and is sensitive to magnetic flux throughout the material, not simply surface fields. To our knowledge, Tonomura's is the only group to have successfully employed this technique and their experiments required custom-built high voltage microscopes. Here we demonstrate that flux vortices can be imaged with a commercially available electron microscope, opening the field for other researchers. We show images of flux vortices in $Bi_2Sr_2CaCu_2O_{8+\delta}$ and analyze their arrangements as a function of applied magnetic field and temperature.

[1]This work was funded by EPSRC, UK; Homerton College, University of Cambridge and Cornell Center for Materials Research, NSF-MRSEC

James Loudon
Cornell University

Date submitted: 17 Nov 2006 Electronic form version 1.4