Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Modeling Scanning SQUID Magnetometry Images of Magnetic Dipoles LISA QIAN, BEENA KALISKY, BRANNON KLOPFER, BO DWYER, KATHRYN MOLER, Stanford University — Scanning superconducting quantum interference devices (SQUIDs) with sub-micron sized pick-up loops are the most sensitive detectors of local magnetic flux and can have spin sensitivities down to 100 mu_B/sqrt(Hz). This makes them the ideal candidate for detecting magnetic dipole signals from individual nanomagnets. However, because the image kernel of the SQUID is not usually well known, quantitative analysis of magnetometry images can often be difficult. By using similarly measured SQUID magnetometry of superconducting vortices, we show that it is possible to fit images of magnetic dipoles by combining images of two monopoles. This fitting technique allows us to extract the magnetic moment as well as the information on the spatial extent of the imaged dipole. To quantify the statistical errors of the fit and the systematic errors of the measurement, we fabricated and measured nanomagnet bars of different lengths This analysis technique, in conjunction with scanning SQUID microscopy, can be used to study individual nanomagnets in a wide variety of fields, ranging from biology to condensed matter physics.

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Date submitted: 11 Nov 2011 Electronic form version 1.4