

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Magnetic response of Sr_2RuO_4 nanocrystals: search for chiral currents and fractional vortices¹ D.J. BAHR, University of Illinois, M.J.A. STOUTIMORE, University of Maryland, R. BUDAKIAN, D.J. VAN HARLINGEN, University of Illinois, Y. MAENO, Kyoto University — The ruthenate superconductor Sr_2RuO_4 may have a chiral order parameter of the form $p_x \pm ip_y$, making it a candidate for nucleation of excitations with non-Abelian statistics that could enable topologically-protected quantum computing. To test this scenario, we have measured the magnetic response of Sr_2RuO_4 nanocrystals to search for spontaneous chiral currents and half-integer vortices. Each nanocrystal ($2\mu\text{m} \times 2\mu\text{m} \times 0.5\mu\text{m}$) was extracted from a large single crystal with bulk transition temperature in the range 1.2K-1.4K. It was then glued into the pickup loop of a flux transformer or a gradiometer that is inductively-coupled to a dc-SQUID magnetometer. We monitor the diamagnetic screening of the crystal and the entry of discrete vortices in perpendicular and parallel applied magnetic fields and as a function of temperature to search for the existence of half-quantum vortices in this system. We are also developing other techniques such as nanoscale Scanning SQUID Microscopy for probing the vortex dynamics in Sr_2RuO_4 .

¹Work supported by the Department of Energy Basic Energy Sciences grant DE-FG02-07ER46453.

Daniel Bahr
University of Illinois

Date submitted: 21 Nov 2009

Electronic form version 1.4