

Small Angle Neutron Scattering and the Vortex Lattice of UPt_3

W. J. Gannon^a, W. P. Halperin^a, J. A. Sauls^a, K. Schlesinger^b, M. R. Eskildsen^b, and J. Gavilano^c

^aDepartment of Physics and Astronomy, Northwestern University, Evanston, IL USA

^bDepartment of Physics, University of Notre Dame, Notre Dame, IN, USA

^cETH Zurich and Paul Scherrer Institute, Villigen, Switzerland

UPt_3 is among the most well studied of the unconventional superconductors. However, there are still many unanswered questions, two of which are: understanding chirality in the superconducting B-phase and understanding the nature of the B-C transition. Central to theories describing both of these areas are predictions for unusual vortex structures. Small angle neutron scattering (SANS) provides a unique way to explore the bulk vortex lattice (VL) and thus can be used to investigate the bulk superconducting state without electronic surface scattering which complicates results from other probes. Ongoing SANS experiments on high quality single crystals in a novel geometry seek to explore the the relationship between field history and the VL in UPt_3 . Results show well defined diffraction patterns and narrow rocking curves at fields well into the C-phase and interesting behavior for a variety of field histories. These results will shed new light on chirality, the B-C transition, and VL metastability.

Support is from DOE/BES awards DE-SC0005051 and DE-FG02-05ER46248.