Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Scanning SQUID measurements of magnetism in $LaAlO_3/SrTiO_3$ heterostructures H. NOAD, E. M. SPANTON, J. A. BERT, B. KALISKY, K. C. NOWACK, C. BELL, M. KIM, Y. HIKITA, M. HOSODA, H. K. SATO, SIMES, SLAC National Laboratory, Y. XIE, Department of Applied Physics, Stanford University, P. WITTLICH, Max Planck Institute for Solid State Research, Stuttgart, H. Y. HWANG, SIMES, SLAC National Laboratory, J. MANNHART, Max Planck Institute for Solid State Research, Stuttgart, K. A. MOLER, SIMES, SLAC National Laboratory — $LaAlO_3$ and $SrTiO_3$ are both nonmagnetic band insulators. It is therefore surprising that signatures of magnetism in $LaAlO_3/SrTiO_3$ heterostructures (LAO/STO) have been seen in a wide variety of experiments. Using scanning superconducting quantum interference device (SQUID) microscopy we previously found that, above a critical thickness of three unit cells of LAO, there can be heterogeneous patches of ferromagnetism. The observed ferromagnetic patches are sparse, and many samples show very few ferromagnetic patches. Scanning SQUID observations suggest that, although ferromagnetic patches can arise, the ground state of LAO/STO is not strongly ferromagnetic. In the few samples studied at millikelvin temperatures, we also observed a relatively homogeneous paramagnetic response with a 1/T-like dependence, suggesting a landscape of localized spins. Theoretical proposals for the origin of magnetism in LAO/STO include intrinsic spin polarization near the interface and cation or oxygen vacancy defects. Measurements on samples with deliberately tuned oxygen content will help us to evaluate these proposals.

Hilary Noad
Stanford University

Date submitted: 06 Nov 2015 Electronic form version 1.4