Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Direct observation of induced ferromagnetism in $SrTiO_3$ quantum wells confined in $GdTiO_3$ heterostructures RYAN NEED, BRANDON ISAAC, University of California Santa Barbara, Materials Department, BRIAN KIRBY, JULIE BORCHERS, NIST Center for Neutron Research, SUSANNE STEMMER, STEPHEN WILSON, University of California Santa Barbara, Materials Department — Complex oxide thin film heterostructures with charge transfer at the interface provide a uniquely tunable environment in which to study the physics of highly-correlated and quantum-confined electron systems. Previous studies using magnetoresistance measurements had suggested that thin $SrTiO_3$ layers become ferromagnetic when grown between thicker $GdTiO_3$ layers. Here we report the direct observation of induced ferromagnetism in $SrTiO_3$ quantum wells using polarized neutron reflectometry (PNR). Four $GdTiO_3/SrTiO_3$ superlattice structures with varying $SrTiO_3$ layer thickness were grown epitaxially on LSAT (001) substrates by hybrid molecular beam epitaxy. Chemical and magnetic depth-profiles were refined using a combination of x-ray and polarized neutron reflectivity measurements taken at temperatures ranging from 4-300K. We observed a critical thickness below which the $SrTiO_3$ layer have non-zero magnetism in the center of the well. These results are in excellent agreement with the previous magnetoresistance measurements and provide the first direct observation of induced-magnetism in this system.

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Date submitted: 05 Nov 2015 Electronic form version 1.4