

Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Local Moment Formation and Magnetism at LaAlO₃/SrTiO₃ Interfaces¹ ONUR ERTEN, SUMILAN BANERJEE, MOHIT RANDERIA, The Ohio State University — One of the most exciting observations at oxide interfaces relate to the observation of magnetism at the LaAlO₃/SrTiO₃ (LAO/STO) interface, since neither material is magnetic in the bulk even with doping. Experiments [1,2] give incontrovertible evidence for local moments at the LAO/STO interface, consistent with an areal density close to 0.5 per interfacial Ti atom. The particular splitting of the t_{2g} orbitals at the interface, leads to a quarter-filled d_{xy} band on the top band. Using a slave-rotor approach for the on-site Coulomb interaction U and Hartree-Fock for nearest neighbor V , we show that local moments form in a checkerboard charge-ordered insulating (COI) state, even for a very modest values of U . Phonons further stabilize the COI state as the breathing mode couples cooperatively to the charge order. To understand the magnetic interactions between moments, we examine both the small superexchange and the dominant kinetic exchange mediated by conduction electrons. We show that this leads to a ferromagnetic double exchange model with some very interesting twists arising from the Rashba SOC of the conduction electron due to broken inversion at the interface. Ref: [1] L. Li et al., Nature Phys. 7 762. [2] J. A. Bert et al., Nature Phys. 7 76.

¹OE and MR are supported by NSF DMR-1006532, SB by DOE-BES DE-SC0005035.

Onur Erten
The Ohio State University

Date submitted: 13 Nov 2012

Electronic form version 1.4