Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Competition between Kondo screening and Magnetism in the LaAlO3/SrTiO3 Interface JONATHAN RUHMAN, ARJUN JOSHUA, SHAHAL ILANI, EHUD ALTMAN, Weizmann Institute of sceince — We present a theory of magnetic phenomena at LaAlO3/SrTiO3 interfaces, which includes coupling between the conduction bands and local magnetic moments originating from charge traps at the interface. Tuning the itinerant electron density drives transitions between a heavy Fermi liquid phase with screened moments and various magnetic states. The dependence of the magnetic phenomena on the electron density stems from competing magnetic interactions between the local moments and the different conduction bands. At low densities only the lowest conduction band, composed of the d_{xy} orbitals of Ti, is occupied. Its antiferromagnetic interaction with the local moments leads to screening of the moments at a Kondo scale that increases with density. However, above a critical density the d_{xz}/d_{yz} bands begin to populate. Their ferromagnetic interaction with the local moments competes with the antiferromagnetic interaction of the d_{xy} band leading to eventual reduction of the Kondo scale with density. We explain the distinct magneto transport regimes seen in experiments as manifestations of the magnetic phase diagram computed from the model. We also present interpretation of previously unpublished data supporting the theoretical model.

Jonathan Ruhman
Weizmann Institute of sceince

Date submitted: 14 Nov 2013 Electronic form version 1.4