Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Understanding the superconducting state in SrTiO3 interfaces: Possible two-band superconductivity J.T. HARALDSEN, Los Alamos National Laboratory, R.M. FERNANDES, Los Alamos National Laboratory and Columbia University, P. WOELFLE, University of Karlsruhe, A.V. BALATASKY, Los Alamos National Laboratory and NORDITA — We examine the possibility of multi-band superconductivity in $SrTiO_3$ interfaces by investigating the effects of a two-dimensional two-band model. In undoped $SrTiO_3$, one of the bands is occupied, while the upper band is empty. As the chemical potential shifts, due to doping by negative charge carriers or application of an electric field, the second band becomes occupied, giving rise to a strongenhancement of the transition temperature and a sharp feature in the gap functions, which is manifested in the local density of states spectrum. By comparing our results with tunneling experiments in Nb-doped $SrTiO_3$, we find that intra-band pairing dominates over inter-band pairing, unlikeother known multi-band superconductors. Given the similar transition temperature and band structure of $LaAlO_3$/$SrTiO_3$ heterostructures, we speculate that thesuperconductivity observed in $SrTiO_3$ interfaces may be similar in nature to that of bulk $SrTiO_3$,involving multiple bands with distinct electronic occupations.

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Date submitted: 25 Oct 2012 Electronic form version 1.4