Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

The d-band manifold in $SrTiO_3$: high mobility Shubnikov–de Haas effect in magnetic fields to the quantum limit. S. JAMES ALLEN, Physics Dept., BHARAT JALAN, Materials Dept., UCSB, GURU KHALSA, ALLAN MACDONALD, Physics Dept., UT Austin, JAN JAROSZYNSKI, National High Magnetic Field Lab, FSU, SUSANNE STEMMER, Materials Dept., UCSB —
The molecular beam epitaxial growth of high mobility ($> 30{,}000$ cm^2/volt.sec), low electron density ($\sim 10^{17}$ - $10^{18} cm^{-3}$) La doped $SrTiO_3$ has provided an opportunity to explore the lowest conduction band states, which are derived from the Ti d-band. Despite the long history of experiments on these d-band states, including magneto transport, we are left without a firm quantitative model of the manifold at the conduction band minimum. But, these states form the basis of quantum confined 2D electron systems at oxide interfaces with $SrTiO_3$ and delta doped layers, both the subject of current interest. To remedy this, we have performed magneto transport at temperatures down to ~ 0.4 K, in magnetic fields to 31 Tesla, which is sufficient to reach the quantum limit, in high mobility samples and with carrier densities that tune the Fermi energy through the energy splitting caused by the low temperature tetragonal distortion. In close analogy to hole states in conventional semiconductors, we use 5 "Luttinger" parameters and the splitting energy, to describe these results and compare with the current understanding of the $SrTiO_3$ d-band structure.

S. James Allen
Physics Dept.,UCSB

Date submitted: 19 Nov 2010 Electronic form version 1.4