Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Tunneling Spectroscopy of Strongly Correlated Electron Liquids in $SrTiO_3$ PATRICK MARSHALL, EVGENY MIKHEEV, SANTOSH RAGHAVAN, SUSANNE STEMMER, University of California, Santa Barbara — Tunneling spectroscopy is used to probe the electronic structure of the two-dimensional electron liquid confined in $R\mathrm{TiO_3}/\mathrm{SrTiO_3}/R\mathrm{TiO_3}$ quantum wells (R = Gd, Sm). The conductance spectra of metallic quantum wells exhibit power law behavior at high energies, reflecting the influence of disorder on the density of states. At low energies a pseudogap is observed in quantum wells containing 5 SrO layers and fewer, coinciding with the quantum phase transition in this system. As the quantum well thickness is reduced the DOS around the Fermi level vanishes in quantum wells embedded in $GdTiO_3$, consistent with the metal-insulator transition occurring at thicknesses of 2 SrO layers and fewer. In $SmTiO_3$-embedded quantum wells the metallic state persists down to the lowest thickness and temperature, with the emergence of coherence peaks indicating the onset of an ordered phase in the itinerant state with possible density wave order. The results shed light on the interplay of disorder, electron-electron interactions, and electron-lattice coupling in strongly correlated systems.

Patrick Marshall
University of California, Santa Barbara

Date submitted: 05 Nov 2015 Electronic form version 1.4