Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

**Phase Diagrams for the $\nu = 1/2$ Fractional Quantum Hall Effect in Electron Systems Confined to Symmetric, Wide GaAs Quantum Wells**[1] L.N. PFEIFFER, J. SHABANI, Y. LIU, M. SHAYEGAN, K.W. WEST, K.W. BALDWIN, Department of Electrical Engineering, Princeton University — We report an experimental investigation of fractional quantum Hall effect (FQHE) at the even-denominator Landau level filling factor $\nu = 1/2$ in high quality wide GaAs quantum wells. The quasi-two-dimensional electron systems we study are confined to GaAs quantum wells with widths, W, ranging from 41 to 96 nm and have variable densities in the range of $4 \times 10^{10}$ to $4 \times 10^{11} cm^{-2}$. We present several experimental phase diagrams for the stability of the $\nu = 1/2$ FQHE in these quantum wells. We find that the densities at which the $\nu = 1/2$ FQHE is stable are larger for narrower quantum wells. Moreover, even a slight charge distribution asymmetry destabilizes the $\nu = 1/2$ FQHE and turns the electron system into a compressible state. We also present a plot of the subband separation ($\Delta_{SAS}$), which characterizes the interlayer tunneling, vs density for various W. Finally, we summarize the experimental data in a diagram that takes into account the relative strengths of the inter-layer and intra-layer Coulomb interactions and $\Delta_{SAS}$. We compare this experimental phase diagram of normalized inter-layer distance vs tunneling to recent theoretical calculations which have been used to conclude a two-component origin for the $\nu = 1/2$ FQHE.

[1]A portion of this work was performed at the National High Magnetic Field Laboratory which is supported by NSF Cooperative Agreement No. DMR- 1157490, the State of Florida and the US DOE.

Javad Shabani
California NanoSystems Institute, UC Santa Barbara

Date submitted: 14 Nov 2013 Electronic form version 1.4