Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

**The Phase Diagram of the $\nu = 5/2$ Fractional Quantum Hall Effect: Effects of Landau Level Mixing and Non-Zero Width**[1] MICHAEL PETERSON, Cal State Univ- Long Beach, KIRYL PAKROUSKI, ETH Zurich, THIERRY JOLICOEUR, CNRS and Universite Paris-Sud, VITO SCAROLA, VA Tech, CHETAN NAYAK, Microsoft, University of California Santa Barbara, MATTHIAS TROYER, ETH Zurich — We study the phase diagram of the $\nu = 5/2$ state by exactly diagonalizing an effective Hamiltonian describing the fractional quantum Hall effect of electrons under realistic conditions in GaAs semiconductors. The effective Hamiltonian takes Landau level mixing into account to lowest-order perturbatively in $\kappa$, the ratio of the Coulomb energy scale to the cyclotron gap and we incorporate non-zero width $w$ of the quantum well and sub-band mixing. Using the torus and sphere, we analyze the non-trivial competition between candidate ground states with 4 criteria: overlaps with trial wave functions; the size of energy gaps; the sign of an order parameter for particle-hole symmetry breaking; and entanglement spectrum. We find the ground state is in the universality class of the Moore-Read Pfaffian state, rather than anti-Pfaffian, for $\kappa < \kappa_c(w)$, where $0.6 < \kappa_c(w) < 1$. Landau level mixing and non-zero width suppress the excitation gap with Landau level mixing having a larger effect. Our findings have important implications for the identification of non-Abelian fractional quantum Hall states.

[1]We thank DARPA, Microsoft, Swiss National Science Foundation (NCCR QSIT), Swiss National Supercomputing Centre (CSCS), European Research Council, AFOSR, and the Centre National de la Recherche Scientifique.

Michael Peterson
Cal State Univ- Long Beach

Date submitted: 13 Nov 2014 Electronic form version 1.4