Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Suppression of Interlayer Phase Coherence by Gauge Fluctuations in Bilayer Composite Fermi Liquids ROBERT CIPRI, YAFIS BARLAS, N.E. BONESTEEL, Dept. of Physics and NHMFL, Florida State University — The ν =1/2+1/2 bilayer quantum Hall system exhibits at least two phases as a function of layer spacing, d. For $d/l \gg 1$, (l is magnetic length), the system decouples into two $\nu = 1/2$ composite fermion (CF) liquids. For d/l sufficiently small, the system enters an incompressible bilayer quantum Hall state. Recently, Alicea et al. [1] have proposed a state which might exist for intermediate layer spacing ($d \sim l$). In this "interlayer phase coherent" state, CFs tunnel coherently between layers forming well-defined bonding and antibonding Fermi seas, though there is no actual tunneling of physical electrons. Here we show that scattering from gauge fields in the CF liquids leads to strong layer-dependent fluctuations in the Aharonov-Bohm phases seen by CFs which suppress interlayer phase coherence. This suppression appears as a singular contribution to the correlation energy which inhibits any T=0 phase transition into an interlayer phase coherent state, and drives any such transition first order. Work supported by US DOE.

[1] J. Alicea, O.I. Motrunich, G. Refael, M.P.A. Fisher, PRL 103, 256403 (2009).

Robert Cipri
Dept. of Physics and NHMFL, Florida State University

Date submitted: 28 Dec 2010 Electronic form version 1.4