Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Spectrum of Quantum Entanglement in Fractional Quantum Hall States[1] HUI LI, F.D.M. HALDANE, Princeton University — We present numerical studies of the bipartite entanglement in fractional quantum Hall (FQH) states. We partitioned the (spherical geometry) Landau-level orbitals into two hemispheres: the entanglement spectrum derives from the Schmidt decomposition $|\psi\rangle = \sum_i \exp(-\beta_i/2)|\psi_A^i\rangle \otimes |\psi_B^i\rangle$, where $|\psi_A^i\rangle$ (or $|\psi_B^i\rangle$) are orthonormal. The β_i are "energy levels" of a system with thermodynamic entropy at "temperature" $k_B T = 1$ equivalent to the entanglement entropy. The *entanglement spectrum*, *i.e.*, the relation between the β_i and the quantum numbers that classify $|\psi_A^i\rangle$ (or $|\psi_B^i\rangle$), serves as a "fingerprint" of the topological phase of the FQH state, and reveals much more information than just the entanglement entropy, a single number. The spectrum of, *e.g.*, the 1/3 Laughlin state has far fewer levels than expected for a generic wavefunction, and its low-energy spectrum corresponds to that of a conformal field theory (CFT). We studied the wavefunctions that interpolate between the Laughlin state and the ground state of a realistic Coulomb interaction potential at $\nu = 1/3$: the generic number of levels is restored, but the low-lying CFT structure remains essentially unchanged. We also describe the interpolation between the Moore-Read state and the Coulomb interaction ground state at $\nu = 5/2$.

[1]Supported in part by NSF MRSEC DMR02-13706.

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Date submitted: 29 Jan 2008

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