Abstract Submitted
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Fractional Quantum Hall Bilayers at Half-Filling: Tunneling-driven Non-Abelian Phase[1] DONNA SHENG, Cal State Univ - Northridge, WEI ZHU, LANL, ZHAO LIU, Dahlem Center for Complex Quantum Systems and Institut of Theoretische Physik, DUNCAN HALDANE, Princeton — Multicomponent quantum Hall systems with internal degrees of freedom provide a fertile ground for the emergence of exotic quantum liquids. Here we investigate th e possibility of non-Abelian topological order in the half-filled fractional quantum Hall (FQH) bilayer sys tem driven by the tunneling effect between two layers. By means of the state-of-the-art density-matrix re normalization group, we unveil finger print evidence of the non-Abelian Moore-Read Pfaffian state emerging in the intermediate-tunneling regime, including the ground-state degeneracy on the torus geometry and the topol ogical entanglement spectroscopy (entanglement spectrum and topological entanglement entropy) on the sphe rical geometry, respectively. Remarkably, the phase transition from the previously identified Abelian (331) Halperin state to the non-Abelian Moore-Read Pfaffian state is determined to be continuous, which is signaled by the continuous evolution of the universal part of the entanglement spectrum, and discontinuities in the excitat ion gap and the derivative of the ground-state energy. Our results provide a proof-of-principle demonstration of realizing a non-Abelian state through coupling different degrees of freedom.

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