Abstract Submitted
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Breaking of Particle-Hole Symmetry by Landau Level Mixing and the $\nu = 5/2$ Quantized Hall State[1] EDWARD REZAYI, Physics Department CSU-Los Angeles, STEVEN SIMON, Rudolf Peierls Centre for Theoretical Physics, Oxford University, UK — The nature of the nu=5/2 quantum Hall state has been a puzzle for several decades. Based on a large body of numerical work, the community has been slowly converging to the conclusion that the 5/2 state is the same phase of matter as described by the Moore-Read wavefunction. However, two recent papers [1,2] point out that in fact two inequivalent possibilities still remain–the Moore-Read wavefunction, and its particle-hole conjugate, the so-called Anti-Pfaffian, which are distinct topological phases. In the absence of Landau-level mixing (an approximation used in all prior numerical works) these two possibilities cannot be distinguished. In the current work, we perform numerical studies aimed to determine if the fractional quantum Hall state observed at filling ν=5/2 is the Moore-Read wavefunction or the Anti-Pfaffian. Using a truncated Hilbert space approach we find that for realistic interactions, including Landau-level mixing, the Moore-Read state is strongly favored. We also confirm that the ground state remains polarized even in the absence of Zeeman energy when Landau level mixing is allowed. [1] M. Levin, B. I. Halperin and B. Rosenow, Phys. Rev. Lett. 99, 236806 (2007). [2] S.-S. Lee, S. Ryu, C. Nayak and M. P. A. Fisher, Phys. Rev. Lett. 99, 236807 (2007).

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