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A numerical study of the disorder effect on the 5/2 fractional quantum hall system HAO WANG, Department of Physics and Astronomy, Virginia Tech, D. N. SHENG, Department of Physics and Astronomy, California State University Northridge, F. D. M. HALDANE, Department of Physics, Princeton University, V. W. SCAROLA, Department of Physics and Astronomy, Virginia Tech — We study the 5/2 fractional quantum hall (FQH) system in the presence of random disorder using exact diagonalization in the torus geometry. We examine the low-lying spectra with different unit cells and find a persistent and robust spectral gap characterizing the incompressible Pfaffian-like states. This gap narrows with increasing disorder strength. The structure factor also exhibits robust characteristics of a uniform quantum hall liquid. The topologically invariant chern number has been calculated to determine the mobility gap of the FQH states, which is used to compare with the experimentally measured activation gap. The mobility gap tends to collapse as the disorder grows, suggesting a disorder-driven transition from the FQH states to the insulator. We further demonstrate the characteristic features of the ground state of the 5/2 FQH system and Pfaffian states using reduced density matrices.

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