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Quantum Monte Carlo Study of Composite-Fermions in Quantum Dots[1] ALEV DEVRIM GUCLU, Cornell University, GUN SANG JEON, Pennsylvania State University, CYRUS UMRIGAR, Cornell University, JAINENDRA JAIN, Pennsylvania State University — Composite-fermion wave functions, projected onto the lowest Landau level, provide accurate wave functions for quantum dots in the limit of strong magnetic fields. We show that the range of validity of these wave functions can be greatly extended to smaller magnetic fields by incorporating Landau level mixing effects by multiplying them with a Jastrow factor, optimized using the variance minimization method. The energy and other expectation values can be further improved by projecting the wave functions onto the ground state using diffusion Monte Carlo within the fixed-phase approximation. Energies for 6-electron system are compared to energies obtained by exact diagonalization within 3 Landau levels. Excellent agreement between the two methods is obtained. We then apply our method to a 15-electron system, far beyond the capabilities of the exact diagonalization method, to study ground state properties as the magnetic field is varied.

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