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Lattice Monte Carlo Study of Composite Fermion Liquid (CFL) State Berry Phase on Torus[1] JIE WANG, SCOTT GERAEDTS, Princeton University, E. H. REZAYI, California State University, Los Angeles, F. D. M. HALDANE, Princeton University — The CFL state is a gapless state that can occur at Landau-level filling $1/m$ when m is even, and an emergent Fermi surface for composite fermions forms. The Berry phase associated with moving one composite fermion around Fermi surface is predicted from the theory of the anomalous quantum Hall effect in two-dimensional metals to determine the Hall conductivity. We examine this quantity in the CFL state using a model wavefunction (on the torus) that explicitly exhibits a Fermi surface, and has been show to give very good agreement with states found in exact diagonalization (ED) studies. We have implemented a many-body analog of the k-space Berry curvature formalism that generalized the one-body form based on the periodic part of a single-particle Bloch wavefunction. This model wavefunction is studied by the Monte Carlo method for much larger sizes than can be studied using ED, based on a new mathematically-exact discretized formulation of holomorphic states on the torus which greatly simplifies the Monte-Carlo studies.

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