Abstract Submitted
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Finite-size studies of the $\nu = 5/2$ quantum Hall state in wide quantum wells: the effect of subband mixing and breaking of particle-hole symmetry[1] Z. PAPIC, F.D.M. HALDANE, Princeton University, E.H. REZAYI, California State University, Los Angeles — A number of theoretical studies have argued that the quantized plateau at half filling of the second Landau level is described by the Pfaffian wavefunction of Moore and Read, or by its particle-hole conjugate, the anti-Pfaffian. The two wavefunctions are difficult to compare in finite-size systems due to their different shifts in the spherical geometry, or because of their high mutual overlap on the torus. Here we propose a way to circumvent these problems by envisioning systems with periodic boundary conditions, for which the Pfaffian and anti-Pfaffian become orthogonal to each other due to their different symmetry properties under discrete rotations. Furthermore, we show that periodic boundary conditions can be used to study the Moore-Read ground state, as well as the collective excitation spectrum, in finite systems in a "quartered" Brillouin zone scheme. To demonstrate the utility of this method, we provide a realistic, two-component model of a wide quantum well that can unambiguously distinguish between the Pfaffian and anti-Pfaffian state in finite-sized systems. These results describe the recent experiments that probed the stability of the $\nu = 5/2$ state by tuning the mixing between electronic subbands and Landau levels in a wide quantum well.

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Z. Papic
Princeton University

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