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Advantages of studying the fractional quantum Hall effect in a cylindrical geometry[1] SONIKA JOHRI, Z. PAPIC, Department of Electrical Engineering, Princeton University, Princeton, New Jersey 08544, USA, ZI-XIANG HU, Department of Physics, Chongqing University, Chongqing 400044, China, R.N. BHATT, Department of Electrical Engineering, Princeton University, Princeton, New Jersey 08544, USA, PETER SCHMITTECKERT, Institut für Nanotechnologie, Forschungszentrum Karlsruhe, D-76021 Karlsruhe, Germany — We report results of numerical studies of the fractional quantum Hall effect in the cylindrical geometry using exact diagonalization as well as density-matrix renormalization group techniques. We provide convergence benchmarks that illustrate the advantage of the cylinder over the sphere, based on the number of sweeps and basis elements that need to be kept in order to achieve the desired accuracy for the ground state at $\nu = 5/2$ filling [1]. Further, we address several issues of interest that can be studied more directly using the cylindrical geometry. These include (i) transitions between the hierarchy of fractional quantum Hall states as a function of the confining potential; (ii) quasiparticle tunneling between the two edges of the cylinder; and (iii) generalized off-diagonal long-range order as a probe of the local geometry fluctuations in fractional quantum Hall liquids due to confinement potential or mass anisotropy.

[1] Zi-Xiang Hu, Z. Papic, S. Johri, R. N. Bhatt, Peter Schmitteckert, Phys. Lett. A **376**, 2157 (2012)

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