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Fractional Chern insulators on finite cylinders and their bulk-edge correspondence[1] ZHAO LIU, Department of Electrical Engineering, Princeton University, Princeton, New Jersey 08544, DMITRY KOVRIZHIN, T.C.M. Group, Cavendish Laboratory, J. J. Thomson Avenue, Cambridge CB3 0HE, United Kingdom, EMIL BERGHOLTZ, Dahlem Center for Complex Quantum Systems and Institut für Theoretische Physik, Freie Universität Berlin, Arnimallee 14, 14195 Berlin, Germany, RAVINDRA BHATT, Department of Electrical Engineering, Princeton University, Princeton, New Jersey 08544 — It has been recently realized that strong interactions in topological Bloch bands give rise to the appearance of novel states of matter. Here we study these systems – fractional Chern insulators – via generalization of a gauge-fixed Wannier-Qi construction in the cylinder geometry. Our setup offers a number of important advantages compared to the earlier exact diagonalization studies on a torus. Most notably, it gives access to edge states and to a single-cut orbital entanglement spectrum, hence to the physics of bulk-edge correspondence. It is also readily implemented using density matrix renormalization group method which allows for numerical simulations of significantly larger systems. Previously [Z. Liu et al., Phys. Rev. B **88**, 081106(R) (2013)], this approach was applied to bosons on the ruby lattice model at filling $\nu = 1/2$ and $\nu = 1$, which show the signatures of (non)-Abelian phases, and we establish the correspondence between the physics of edge states and entanglement in the bulk. Here, we generalize this to other fillings such as $\nu = 2/3$.

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