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Projective construction of the Z_k Read-Rezayi fractional quantum Hall states and their excitations on the torus geometry CECILE REPELLIN, Ecole Normale Superieure, France, TITUS NEUPERT, Princeton center for theoretical science, B. ANDREI BERNEVIG, Princeton University, NICOLAS REGNAULT, Ecole Normale Superieure, France, Princeton university — Multilayer Abelian fractional quantum Hall states can reproduce the non-Abelian states of the Z_k Read-Rezayi series upon symmetrization over the layer index. This property initially shown by Cappelli et. al. (Nuclear Phys. B 2001) yields all the Z_k states on the sphere, but provides only part of the ground state manifold on the torus. We propose to remedy this issue by introducing topological defects connecting the layers before performing the symmetrization. We give a comprehensive account of this construction for bosonic states, and numerically show that the full ground state and quasihole manifolds are recovered for all computationally accessible system sizes. We analyze the neutral excitation mode above each of the states of the Read-Rezayi series on the torus through an extensive exact diagonalization study. We show numerically that our construction can be used to obtain excellent approximations of low energy neutral excitation modes above the Z_k Read-Rezayi states. We generalize the new symmetrization scheme to the sphere geometry.

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