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Topological gapped edge states in fractional quantum Hall-superconductor heterostructures ASHLEY COOK, University of Zurich, Department of Physics, Winterthurerstrasse 190, CH-8057 Zurich, Switzerland, CÉCILE REPELLIN, Max-Planck-Institut fr Physik komplexer Systeme, 01187 Dresden, Germany, NICOLAS REGNAULT, Laboratoire Pierre Aigrain, Ecole Normale Suprieure-PSL Research University, CNRS, Universit Pierre et Marie Curie-Sorbonne Universits, Universit, TITUS NEUPERT, University of Zurich, Department of Physics, Winterthurerstrasse 190, CH-8057 Zurich, Switzerland — We propose and implement a numerical setup for studying edge states of fractional quantum Hall droplets with a superconducting instability. We focus on a time-reversal symmetric bilayer fractional quantum Hall system of Laughlin $\nu = 1/3$ states. The fully gapped edges carry a topological parafermionic degree of freedom that can encode quantum information protected against local perturbations. We numerically simulate such a system using exact diagonalization by restricting the calculation to the Laughlin quasihole subspace. We study the quantization of the total charge on each edge and show that the ground states are permuted by spin flux insertion and the parafermionic Josephson effect, evidencing their topological nature and the Cooper pairing of fractionalized quasiparticles.

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