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Fermion Parity Flips and Majorana Defects in Superconducting Fractional Topological Phases MAYUKH KHAN, University of Illinois at Urbana-Champaign, JEFFREY TEO, University of Virginia, TAYLOR HUGHES, SMITHA VISHVESHWARA, University of Illinois at Urbana-Champaign — We consider layered heterojunctions of s-wave superconductors and Abelian topologically ordered (TO) phases. We derive the emergent theories for a wide variety of fractional quantum Hall states promoted by a Z_2 gauge theory. The theory always carries an anyonic symmetry (AS) which effects a fermion parity flip. The associated twist defects, which flip the parities of some types of orbiting quasiparticles, trap ordinary zero energy Majorana bound states (MBS), and can bind fractional charge. For example, an $h/2e$ flux vortex of the superconductor that circulates around the MBS undergoes a fermion parity flip and is accompanied by a level crossing in the vortex energy spectrum. We show numerical evidence of the level crossing in the simplest examples: a Chern insulator and a normal insulator/topological insulator/superconductor junction. Finally, we briefly describe the resulting twist liquid theory after gauging the AS where the twist defects become deconfined anyonic excitations.

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