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Exotic non-Abelian anyons from conventional fractional quantum Hall states[1]

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Non-Abelian anyons are widely sought after for the exotic fundamental physics they harbor as well as for quantum computing applications. There now exist numerous blueprints for stabilizing the simplest type of non-Abelian anyon, defects binding Majorana fermion zero modes, by judiciously interfacing widely available materials. Following this line of attack, we introduce a device fabricated from conventional fractional quantum Hall states and s-wave superconductors. We show that a new type of zero mode is bound at the interface between the quantum Hall state and the superconductor. These zero mode operators have parafermionic rather than fermionic commutation relations, implying a topologically protected ground state degeneracy larger than that of Majorana fermions. We discuss how these modes might be experimentally identified (and distinguished from Majoranas) using Josephson measurements.

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