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Majorana Zero Modes Without Superconductivity at the Edge of Chiral Gapless Abelian Quantum Hall States JENNIFER CANO, University of California, Santa Barbara, MENG CHENG, MAISSAM BARKESHLI, Microsoft Research, Station Q, CHETAN NAYAK, Microsoft Research, Station Q and University of California, Santa Barbara — We show that the $\nu = 8$ integer quantum Hall state can support Majorana fermion zero modes at domain walls between its two different stable chiral edge phases, even without superconductivity. This is due to the existence of an edge phase that does not support gapless fermionic excitations – all gapless excitations are bosonic in this edge phase. Majorana fermion zero modes occur at a domain wall between this edge phase and the more conventional one that does support gapless fermions. The zero modes survive the presence of gapless fermions in the conventional edge phase. Remarkably, the topological degeneracy of these zero modes has exponential protection, as a function of the relevant length scales, in spite of the presence of gapless excitations. These results are compatible with charge conservation, but do not require it. We discuss generalizations to other integer and fractional quantum Hall states.

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