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Majorana Fermions in Disordered Quasi-One-Dimensional Topological Superconductors ANDREW POTTER, PATRICK LEE, MIT — Majorana fermions have long been predicted to emerge in certain quantum Hall states and other naturally occurring p-wave superconductors. However, these materials are quite delicate and consequently the experimental realization of Majorana fermions remains elusive. The possibility of engineering 1D networks of topological superconducting wires from conventional materials offers a promising alternative route to realize Majorana fermions and probe their predicted non-Abelian statistics. In practice, it is impossible to fabricate perfectly clean and strictly one-dimensional structures; how do these non-idealities affect the proposed Majorana states? This talk will show that Majorana end states are robust away from the strict 1D limit, so long as the sample width is not much larger than the superconducting coherence length. The effects of disorder are potentially more severe, as impurity scattering is generally pair-breaking and tends to suppress the gap protecting the Majorana modes. Finally, we propose new candidate materials and geometries that greatly simplify the experimental setup and mitigate the harmful effects of disorder.

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