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Majorana Flat Bands and Uni-directional Majorana Edge States in Gapless Topological Superconductors[1] KAM TUEN LAW, CHRIS L.M. WONG, JIE LIU, Hong Kong University of Science and Technology, PATRICK A. LEE, Massachusetts Institute of Technology — In this work, we show that an in-plane magnetic field can drive a fully gapped $p \pm ip$ topological superconductor into a gapless phase which supports Majorana flat bands (MFBs). Unlike previous examples, the MFBs in the gapless regime are protected from disorder by a chiral symmetry. In addition, novel uni-directional Majorana edge states (MESs) which propagate in the same direction on opposite edges appear when the chiral symmetry is broken by Rashba terms. Unlike the usual chiral or helical edge states, uni-directional MESs appear only in systems with a gapless bulk. We show that the MFBs and the uni-directional MESs induce nearly quantized zero bias conductance in tunneling experiments.

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