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Majorana states in helical Shiba chains and ladders¹ TEEMU OJANEN, KIM POYHONEN, ALEX WESTSRÖM, JOEL RONTYNNEN, Aalto University, NANOTHEORY TEAM — Motivated by recent proposals to realize Majorana bound states in chains and arrays of magnetic atoms deposited on top of a superconductor, we study the topological properties of various chain structures, ladders and two-dimensional arrangements exhibiting magnetic helices. We show that magnetic domain walls where the chirality of a magnetic helix is inverted support two protected Majorana states giving rise to a tunneling conductance peak twice the height of a single Majorana state. Multiple overlapping Majorana states are protected by chiral symmetry which is present in systems exhibiting planar magnetic textures. Thus the topological properties of coupled chains exhibit nontrivial behaviour as a function of the number of chains beyond the even-odd dichotomy expected from Z_2 classification. In addition, it is possible that a ladder of two or more coupled chains exhibit Majorana edge states even when decoupled chains are trivial.

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