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Majorana bound states on a self-organizing helicalmagnetic wire on the surface of a superconductor with spin-orbit coupling MORTEN HOLM CHRISTENSEN, JENS PAASKE, BRIAN M. ANDERSEN, Niels Bohr Institute, University of Copenhagen — Recent STM experiments [1] have observed zero-energy modes consistent with Majorana bound statesat the ends of ferromagnetically aligned Fe-chains grown on the surface of lead. We consider a chain of magnetic moments on top of an s-wave superconductor with spin-orbit coupling and study their magnetic ordering self-consistently. In the absence of spin-orbit coupling we find that a topologically non-trivial helical state appears for sufficiently high values of the chemical potential, in agreement with Ref. [2], while including spin-orbit coupling and imposing ferromagnetic order we find a non-trivial phase with Majorana bound states in agreement with Ref. [3]. We report numerical results for the general case, with non-zero spin-orbit coupling and self-organized magnetic order, allowing the moments to minimize the free energy. A range of different magnetic orders are identified and topologically non-trivial regions are found to prevail in a large parameter region. [1] Yazdani et. al Science, , 6209 (2014) [2] I. Reis et. al, Phys. Rev. B. 90, (085124) 2014 [3] Brydon et. al, arXiv:1407.6345 (2014)

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