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Title : Topological phases and Majorana fermions in strongly interacting quantum wires with spin-orbit coupling

Abstract :
We study one dimensional wires with spin-orbit coupling. We show that in the presence of Zeeman field and strong electron-electron interactions a clean wire may give rise to fractional helical liquid with phenomenology similar to fractional quantum Hall liquids. Direct experimental signatures including fractional (two terminal) conductance plateaus at low filling of the wire are discussed. When the system is put in proximity to a superconductor, fractional Majoranas may be stabilized. We discuss how disorder spifflicates these fractional phases. Additional possible experimental realizations of the system are discussed.