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Gate controlled Rotating Spin Wave and chiral FFLO Superconducting phases in Quantum Spin Hall edge QINGLEI MENG, TAYLOR HUGHES, MATTHEW GILBERT, SMITHA VISHVESHWARA, UIUC — We explore the phases exhibited by an interacting quantum spin Hall edge state in the presence of finite chemical potential (applied gate voltage) and spin imbalance (applied magnetic field). We find that the helical nature of the edge state gives rise to orders that are expected to be absent in non-chiral one-dimensional electronic systems. For repulsive interactions, the ordered state has an oscillatory spin texture whose ordering wavevector is controlled by the chemical potential. We analyze the manner in which a magnetic impurity provides signatures of such oscillations. For attractive interactions, finite spin-imbalance, which acts to set up a finite current in unordered QSH edges, results in superconducting order that is characterized by FFLO-type oscillations.

Qinglei Meng
UIUC

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