Charge and spin fractionalisation in helical edge states

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We give a brief introduction to two dimensional topological insulators and helical edge states. We propose a three-terminal spin polarized scanning tunneling microscope setup for probing the helical nature of the edge states and show that the three-terminal tunneling conductance depends on the magnetic anisotropy, i.e., the angle between the magnetization of the tip and the local orientation of the electron spin on the edge. We show that chiral injection of an electron into the helical Luttinger liquid is associated with fractionalization of the spin and charge of the injected electron.

We also study two terminal transport in helical edge states in the presence of a magnetic field and show the existence of Fabry-Perot like resonances in charge transport, which can be tuned by changing the direction of the magnetic field.

References :

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