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Fractional Charge and Topological Pumping in the Quantum Spin Hall Insulators TAYLOR HUGHES, XIAO-LIANG QI, SHOUCHENG ZHANG, Stanford University — We study the physics at the edge of a 2d topological (quantum spin Hall) insulator. This system is known to be topologically non-trivial and a profound manifestation of topologically non-trivial states of matter is the occurrence of fractional charge. In this work, we show that a magnetic domain wall at the edge of the quantum spin Hall insulator carries one half of the unit of electron charge, and we propose an experiment to directly measure this fractional charge on an individual basis. As an additional consequence, a rotating magnetic field can induce a topologically pumped dc electric current, and vice versa. Finally, we discuss an interacting version of this model in which the fractional charge is carried by the fundamental excitations. These physical phenomena can be derived from a generic topological effective action for topological insulators and are directly related to the physics of the second Chern number as will be described in another talk.

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