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Helical Quantum Edge Gears in 2D Topological Insulators YANG-ZHI CHOU, Rice University, ALEX LEVCHENKO, University of Wisconsin - Madison, MATTHEW FOSTER, Rice University — A remarkable and as-yet-unexploited aspect of topological insulator (TI) physics is the topology of the edge states, i.e. the fact that the edge liquid of a 2D TI forms a closed, unbreakable loop in the absence of electrical contacts or magnetic fields. We propose a novel experimental setup in which edge loops rotate as interlocking gears through Coulomb drag, in TIs with Rashba spin-orbit coupling. We show that two-terminal transport can measure the Luttinger liquid parameter K, a quantity that is otherwise notoriously difficult to measure. In the low-temperature ($T \to 0$) perfect drag regime, the conductance is $(e^2/h)(2K+1)/(K+1)$. At higher T we predict a conductivity $\sim T^{-4K+3}$. Our results should trigger new experiments and may open a new venue for edge gear-based electronic devices.
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Yang-Zhi Chou
Rice University

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