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Inelastic electron backscattering in a generic helical edge channel
THOMAS L. SCHMIDT, Department of Physics, Yale University, 217 Prospect Street, New Haven, CT 06520, USA and Department of Physics, University of Basel, Switzerland, STEPHAN RACHEL, Department of Physics, Yale University, 217 Prospect Street, New Haven, CT 06520, USA, FELIX VON OPPEN, Dahlem Center for Complex Quantum Systems and Fachbereich Physik, Freie Universitaet Berlin, 14195 Berlin, Germany, LEONID I. GLAZMAN, Department of Physics, Yale University, 217 Prospect Street, New Haven, CT 06520, USA — We calculate the low-temperature conductance of a generic one-dimensional helical liquid which exists at the edge of a two-dimensional topological insulator (quantum spin Hall insulator). In a generic case, the S_z spin-symmetry is absent, which opens a possibility of single-particle inelastic electron backscattering. We show that although time-reversal invariance is preserved, inelastic backscattering gives rise to a temperature-dependent deviation from the quantized conductance, $\delta G \propto T^4$. In addition, δG is sensitive to the position of the Fermi level in the gap of the insulator. We present an effective model for this type of helical liquid and determine its parameters explicitly from numerical solutions of microscopic models for two-dimensional topological insulators in the presence of Rashba spin-orbit coupling.

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