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Effects of magnetic impurities on transport in 2D topological insulators XIAOQIAN DANG, J.D. BURTON, EVGENY TSYMBAL, University of Nebraska-Lincoln — Understanding the transport properties of topological insulators could bring such materials from fundamental research to potential applications. Here we report on the theoretical investigations of the effects of magnetic impurities on transport properties of model two-dimensional (2D) topological insulators (TIs). We utilize the tight-binding form of the Bernevig-Hughes-Zhang model and investigate the transport properties by employing the Landauer-Büttiker formalism. We explore the current distribution in 2D TIs resulting from scattering by a magnetic impurity which breaks time-reversal symmetry. We find that a magnetic impurity could drive anti-resonant behavior of the conductance, as revealed from full backscattering of the electron current flowing at one of the edges of the TI. This phenomenon occurs due to spin-flip scattering when the Fermi energy matches the impurity state and the magnetic moment of the impurity is aligned along the TI edge. Additionally, we explore the effect of an external magnetic gate attached to the system and show that changing the magnetization orientation within the gate allows the control of conductance. This geometric setup could be realized experimentally providing the opportunity to tune transport properties of 2D TIs by a magnetic gate.

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