

## Gate-voltage Tunable Surface Conductance in $\text{Bi}_2\text{Se}_3$

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$\text{Bi}_2\text{Se}_3$  films can be epitaxially grown on  $\text{SrTiO}_3$  substrate. This allows the chemical potential tuned into the bulk gap with back-gates. We study the weak antilocalization effect in diffusive electron transport and find it can serve as a convenient method for detecting decoupled surface transport. In the high density regime where a bulk Fermi surface coexists with the surface states, the low field magnetoconductivity can be described well by the Hikami-Larkin-Nagaoka equation<sup>1</sup> for single component transport of non-interacting electrons. When the electron density is lowered, the magnetotransport behavior deviates from the single component description and strong evidence is found for independent conducting channels at the bottom and top surface.

<sup>1</sup> S. Hikami, A. I. Larkin, and Y. Nagaoka, Prog. Theor. Phys. 63, 707 (1980).