Abstract Submitted
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A Field-effect Transistor based on Two-dimensional Topological Insulators[1] WILLIAM VANDENBERGHE, MASSIMO FISCHETTI, The University of Texas at Dallas — Monolayer tin functionalized with iodine (iodostannanane) is a two-dimensional topological insulator and iodostannanane ribbons have a very high mobility when the Fermi level is in the bandgap. For wide ribbons, the mobility and the conductivity decrease by several orders of magnitude when the Fermi level is in the conduction or valence band[1]. We show how this property can be exploited to make a topological-insulator field-effect transistor (TIFET) by gating the iodostannanane. We simulate the TIFETs electrical characteristics invoking a drift-diffusion like approximation and introducing a simplified model for the conductivity of the topological insulator. The TIFET is shown to have input and output characteristics similar to those of conventional field-effect transistors with an on/off ratio exceeding three orders of magnitude. Furthermore, the on-current is very high enabling high-speed operation and the amount charge in the channel is small making TIFETs interesting for low-power applications.

[1] W. G. Vandenberghe and M. V. Fischetti, Journal of Applied Physics 116, 173707 (2014).

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