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Topological-insulator based field-effect transistors¹

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The edge states of topological insulators (TIs) have two attributes which are very desirable for classical computing field-effect transistor (FET) channel materials: a high electron mobility and robustness against defects and impurities. However, room temperature operation is required for practical FET applications and a mechanism to turn the device off is needed. We discuss how new hexagonal monolayer materials can provide us with room-temperature operation. We show how ribbons of these 2D TIs can be used to make a FET with a high on-current and a ratio between the on- and the off-state current exceeding three orders of magnitude. The high on-current enables high-speed operation while the small charge in the TI makes TI FETs interesting for low-power applications.

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