Electronic and Topological Properties of a Topological Insulator Thin Film Sandwiched between Ferromagnetic Insulators

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We consider a thin film of a topological insulator (TI) sandwiched between two ferromagnetic (FM) layers under external gate voltage. The surface electron states are magnetized due to the magnetic proximity effect to the ferromagnetic layers. The magnetization of ferromagnetic layers can be changed by applying an external magnetic field or varying thickness of the topological insulator (due to the interlayer exchange coupling). The change of magnetic configuration in the system affects the transport properties of surface electronic states.

Using the Green function formalism, we calculated spin polarization, anomalous Hall effect and magnetoresistance of the system. We will show, among others, that by tuning gate voltage and magnetizations of the top and bottom FM layers, one can observe the topological transition to the anomalous quantum Hall state.

References:

[1] A. G. Moghaddam, A. Qaiumzadeh, A. Dyrdał, and J. Berakdar, Highly Tunable Spin-Orbit Torque and Anisotropic Magnetoresistance in a Topological Insulator Thin Film Attached to Ferromagnetic Layer, Phys. Rev. Lett. 125, 196801 (2020)

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