Abstract Submitted
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Spin-transfer torque and spin-polarization in topological-insulator-based magnetic tunnel junctions[1] FARZAD MAHFOUZI, Department of Physics and Astronomy, University of Delaware, Newark, DE 19716-2570, USA, NAOTO NAGAOSA, Department of Applied Physics, University of Tokyo, Tokyo 113-8656, Japan, BRANISLAV NIKOLIĆ, Department of Physics and Astronomy, University of Delaware, Newark, DE 19716-2570, USA, QUANTUM TRANSPORT THEORY GROUP COLLABORATION — We derive a nonequilibrium Green function-based formula for spin-transfer torque (STT) exerted by the conduction electrons on the magnetization of a free ferromagnetic (F) layer where *strong* spin-orbit coupling (SOC) is present either in the bulk or at the interface of the F layer. This nonequilibrium Born-Oppenheimer approximation-type formula is employed to predict unconventional STT in N|TI|F semi- magnetic tunnel junction (MTJ) containing a three-dimensional topological insulator (TI). The STT is driven by the SOC on the surface of TI, as well as by the charge current becoming spin-polarized in the direction of transport as it flows from the normal metal (N) through the bulk of the TI layer. The in- plane and perpendicular STT components in N|TI|F semi-MTJ are an order of magnitude larger than in conventional F′|I|F MTJ, or N|I|F semi-MTJ with the strong Rashba SOC at the I|F interface, assuming comparable resistance of all three junctions.

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