Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Spin-polarized tunneling current through a thin film of a topological insulator in a parallel magnetic field VICTOR YAKOVENKO, SERGEY PERSHOGUBA, Condensed Matter Theory Center, Department of Physics, University of Maryland, College Park, Maryland 20742-4111, USA — We calculate the tunneling conductance between the surface states on the opposite sides of an ultra-thin film of a topological insulator in a parallel magnetic field B. The parallel magnetic field produces a relative shift of the in-plane momenta of the two surfaces states. An overlap between the shifted Fermi circles and spinor wave functions result in unusual non-monotonic dependence of the tunneling conductance $\sigma(B)$ on the magnetic field B. The conductance $\sigma(B)$ grows with the magnetic field B, which corresponds to a negative magnetoresistance observed in an experiment [2], until it drops down abruptly to zero at the critical magnetic field B_{cr}. Because spin orientation of the electronic surface states in topological insulators is locked to momentum, spin polarization of the tunneling current can be controlled by the magnetic field.

[1] Sergey S. Pershoguba and Victor M. Yakovenko, Phys. Rev. B **86**, 165404 (2012).
[2] H. B. Zhang et al., Adv. Mater. **24**, 132 (2012).

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Date submitted: 26 Nov 2012 Electronic form version 1.4