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The Aharonov-Bohm Effect in a 3D topological insulator nanowire SUNGJAE CHO, BRIAN DELLABETTA, Univ of Illinois - Urbana, ALINA YANG, JOHN SCHNEELOCH, ZHIJUN XU, GENDA GU, Brookhaven National Lab, MATTHEW GILBERT, NADYA MASON, Univ of Illinois - Urbana
— The three dimensional topological insulator (3D TI) is a new class of material having metallic surface states characterized by gapless Dirac dispersions and novel properties such as momentum-spin locking. A TI nanowire with an insulating bulk can be described as a hollow metallic cylinder, showing Aharonov-Bohm oscillations when a magnetic flux is threaded through the axis. The magneto-conductance of a TI nanowire near the Dirac point is expected to have a minimum at zero magnetic field and an oscillation period of one magnetic flux quantum, Φ (due to a Berry phase of π acquired by electron waves upon 2π rotation of electron spin around the surface of the nanowire) [1]. In this talk, we discuss magneto-conductance measurements of TI (Bi_2Se_3) nanowires, measured as the gate voltage is tuned through the Dirac point. The Aharonov-Bohm oscillations switch from a conductance maximum to a minimum at zero field as the Dirac point is approached, consistent with the existence of a Berry phase in the nanowire.

[1] J.H. Bardarson, P.W. Brouwer, and J. E. Moore, Phys. Rev. Lett. 105, 156803 (2010).

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