Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Spin and phase coherence times in lithographically defined bismuth wires MARTIN RUDOLPH, J.J. HEREMANS, Virginia Tech — We performed low temperature magnetotransport measurements on lithographically defined semimetal thin film bismuth wires and used the weak-antilocalization effect to determine spin and phase coherence times. Purpose-made Bi mesoscopic structures have not been extensively studied, yet are of interest due to the strong spin-orbit coupling in the material and its surface states. The spin and phase coherence times in mesoscopic Bi wires are here studied as function of temperature and wire width. The phase coherence time saturates at temperatures below 2 K, and appears limited by electron-phonon interactions above 2 K. The spin coherence time shows a dependence on width unexpected in Bi thin films. The spin coherence time increases as the width is reduced, similar to the dependence observed in wires fabricated on spin-orbit coupled semiconductor two-dimensional systems. The similarity may be an indication that the weak-antilocalization signature is dominated by two-dimensional strongly spin-orbit coupled Bi surface states (DOE DE-FG02-08ER46532).

Martin Rudolph
Virginia Tech

Date submitted: 22 Dec 2010 Electronic form version 1.4