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Antilocalization in low dimensional InSb/InAlSb systems R.L. KALLAHER, J.J. HEREMANS, Virginia Tech, N. GOEL, S.J. CHUNG, M.B. SANTOS, University of Oklahoma — Boundaries and a restricted phase space influence the spin coherence length in mesoscopic structures with strong spin-orbit coupling. We present mesoscopic transport experiments on the strongly spin-orbit coupled narrow gap semiconductor InSb. Low temperature magnetotransport measurements were performed on high mobility InSb/InAlSb two dimensional electron system (2DES) and quasi-1D wires fabricated from the 2DES. Antilocalization dominates the magnetoresistance in low applied magnetic fields; hence the magnetoresistance is sensitive to the electron spin and phase coherence lengths in the structures. Measurements of the low field magnetoresistance over temperature demonstrate that the antilocalization phenomena persists to temperatures above $\sim$20 K in the quasi-1D wires, whereas antilocalization is not observed above $\sim$15 K in the unpatterned 2DES. The extracted spin coherence lengths, obtained from fitting the magnetoresistance curves to localization theory, show only weak temperature dependence. Therefore, phase coherence appears to dominate the temperature dependence of antilocalization in the low dimensional InSb/InAlSb systems. (NSF DMR-0618235, DOE DE-FG02-08ER46532, NSF DMR-0520550)

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