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Quantum coherence phenomena in bismuth thin film nanostructures MARTIN RUDOLPH, J. J. HEREMANS, Virginia Tech — We present low temperature quantum magnetotransport measurements on bismuth nanostructures. The large spin-orbit interaction and prominent surface states in Bi films are expected to produce non trivial mesoscopic quantum transport. Bi thin films are grown by thermal evaporation onto SiO_2 with a two-step process to optimize the film mobility and ensure oriented growth along the [111] direction. The optimization leads to a minimum thickness of 25 nm for continuous films. Structures as small as 100 nm are subsequently patterned into the film via lithographic techniques. Phase and spin coherence lengths are obtained by analyzing electron interference phenomena in mesoscopic wires and rings. We show that the phase coherence shows a decreasing trend with decreasing channel width. The decrease in phase coherence in Bi wires ranging in width from 1200 nm to 100 nm cannot readily be accounted for by increased boundary scattering. A width dependence of the spin coherence is also detected. The observed confinement dependence of the phase and spin coherence in Bi nanostructures will be discussed (DOE DE-FG02-08ER46532).

Martin Rudolph
Virginia Tech

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