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Aharonov-Bohm-type quantum interference effects in narrow gap semiconductor heterostructures R.B. LILLIANFELD, R.L. KALLAHER, J.J. HEREMANS, Virginia Tech, HONG CHEN, University of North Florida, N. GOEL, S.J. CHUNG, M.B. SANTOS, University of Oklahoma, W. VAN ROY, G. BORGHS, IMEC (Belgium) — We present experiments on quantum interference phenomena in semiconductors with strong spin-orbit interaction, using mesoscopic parallel ring arrays fabricated on InSb/InAlSb and InAs/AlGaSb heterostructures. Both external electric field effects and temperature dependence of the ring magnetoresistance are examined. Top-gate voltage-dependent oscillations in ring resistance in the absence of an external magnetic field are suggestive of Aharonov-Casher interference. At low magnetic fields the ring magnetoresistance is dominated by oscillations with h/2e periodicity characteristic of Altshuler-Aronov-Spivak (AAS) oscillations, whereas the h/e periodicity characteristic of Aharonov-Bohm (AB) oscillations persists to high magnetic fields. Fourier spectra (FS) reveal AB amplitudes on the same order as AAS amplitudes at low fields, and in some samples reveal a splitting of the AB peaks, which has been interpreted as a signature of Berry's phase. The FS are also used to quantify the temperature dependence of the oscillation amplitudes (NSF DMR-0618235, DOE DE-FG02-08ER46532, NSF DMR-0520550).

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