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External electric field effects on AAS oscillations in narrow gap semiconductors R. B. LILLIANFELD, R. L. KALLAHER, D. E. DAVIS, 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. A front gate modulates the spin-orbit interaction, which in turn affects the oscillatory interference phenomena. The experiments investigate the low temperature resistance of the ring arrays as a function of weak perpendicularly applied magnetic fields as well as applied gate voltage. The low field magnetoresistance in the arrays has the h/2e periodicity characteristic of Altshuler-Aronov-Spivak (AAS) oscillations. Despite reduced gate action typical of narrow-gap heterostructures (characterized by Hall measurements), we note an effect on the oscillatory magnetoresistance. The AAS oscillation magnitudes acquire a quasi-periodic modulation as function of gate voltage, and the localization background broadens at higher electron densities. The nature of these influences is examined. (NSF DMR-0618235, DMR-0080054, DMR-0209371)

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