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Strain-induced Fermi contour anisotropy of GaAs (311)A 2D holes JAVAD SHABANI, MANSOUR SHAYEGAN, Department of Electrical Engineering, Princeton University, ROLAND WINKLER, Department of Physics, Northern Illinois University — There is considerable current interest in electronic properties of two-dimensional (2D) carriers whose energy bands are spin-split at finite values of in-plane wave vector, thanks to the spin-orbit interaction and the lack of inversion symmetry. We report experimental and theoretical results revealing that the spin-subband Fermi contours of the heavy and light heavy-holes (HHh and HHl) can be tuned in high mobility GaAs (311)A 2D hole systems via the application of symmetry-breaking in-plane strain. Our calculations show that the HHl spin-subband Fermi contour is circular but the HHh spin-subband Fermi contour is distorted. Experimentally, we probe the Fermi contour anisotropy by measuring the magneto-resistance commensurability peaks induced by square arrays of antidots. When the spin splitting is sufficiently large, the magneto-resistance trace exhibits two peaks, providing clear evidence for spin-resolved ballistic transport. The experimental results are in good agreement with the calculations, and confirm that the majority spin-subband (HHh) has a severely distorted Fermi contour whose anisotropy can be tuned with strain while Fermi contour of the minority spin-subband (HHl) remains nearly isotropic.

Javad Shabani

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