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Hole Spin Filtering by quantum point contacts TAISUKE MINAGAWA, YULI LYANDA-GELLER, Department of Physics, Purdue University —
We calculate the charge carrier spectra in two-dimensional hole systems (2DHS) and in quantum point contacts (QPC) formed in the 2DHS in an in-plane magnetic field B. The origin of the spin splitting for holes differs significantly from that for electrons. For bulk holes, the g-factor is defined not only by the constant of coupling of the angular momentum 3/2 to magnetic field, but also by the Luttinger constants γ_1, γ_2 and γ_3 defining the heavy and light hole masses. In the high mobility 2DHS, the width of the quantum well (QW) L becomes comparable to the magnetic length λ for the in-plane $B > 3$T. We find that the spin splitting for 2D holes and for holes in QPC is strongly affected by the orbital motion in the presence of the in-plane B. We developed the new approach to spectra based on confluent hypergeometric functions. We take into account the anisotropy of the Hamiltonian and calculate the spin splitting for [113] orientation of the 2DHS. For QPC spectra, configurations of in-plane B along and perpendicular to the direction of the current are studied. Our results explain many of the features of spin-resolved QPC conductance observed by Rokhinson group (PRL, **100**, 126401) and by Hamilton group (PRL, **97**, 026403). Our analysis also resolves the puzzling red shift of the Fermi energy discovered in optical spectra for QW in-plane magnetic field by Crooker group (Physica E, **22**:624).

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