PAPER

Conductance quantisation in patterned gate $In_{0.75}Ga_{0.25}As$ structures up to 6 × $(2e^2/h)$

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Abstract

We present electrical measurements from $In_{0.75}Ga_{0.25}As$ 1D channel devices with Rashba-type, spin–orbit coupling present in the 2D contact regions. Suppressed backscattering as a result of the time-reversal asymmetry at the 1D channel entrance results in enhanced ballistic transport characteristics with clear quantised conductance plateaus up to 6 × $(2e^2/h)$. Applying DC voltages between the source and drain ohmic contacts and an in-plane magnetic field confirms a ballistic transport picture. For asymmetric patterned gate biasing, a lateral spin–orbit coupling effect is weak. However, the Rashba-type spin–orbit coupling leads to a *g*-factor in the 1D channel that is reduced in magnitude from the 2D value of 9 to ~6.5 in the lowest subband when the effective Rashba field and the applied magnetic field are perpendicular.