Electron waveguide interferometers for spin-dependent transport experiments
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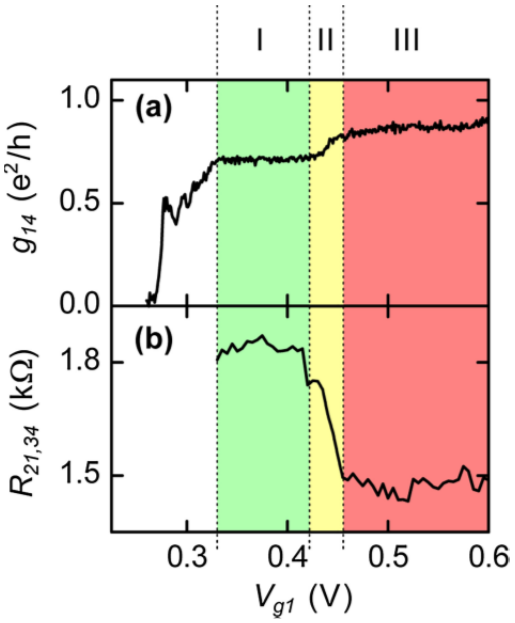
Short Abstract

Semiconductor nanostructures are of interest to the field of spintronics because they allow us to use special features of low-dimensional transport for spin polarisation, manipulation, and detection. We present the state-of-the-art of low-dimensional extended electron waveguides (EWGs) and Aharonov–Bohm (AB) interferometers. Low-temperature measurements in etched quantum point contacts (QPCs) show large subband spacing. Multiterminal asymmetric quantum wire rings (QRs) have been fabricated and AB conductance oscillations are used to detect electrostatically induced continuous phase shifts and π-phase jumps. By embedding a QPC into the leads of a QR, the coherent mode-filtered injection of electrons into a few-mode AB interferometer is demonstrated.



Above. Transport in a QR with QPCs embedded in the leads: (a) Two-terminal conductance g14 as a function of V_{g1} at T = 23 mK and V_{g2} = 650 mV. (b) Four-terminal, non-local resistance R21,34 as a function of Vg1 at T = 23 mK and Vg2 = 650 mV. The regions I and III indicate transport in the first and second subbands of QPC1, respectively. Region II indicates the transition between the two subbands.