Session 25bD

Imaging Coherent Electron Flow in a Two-Dimensional Electron Gas **25bD1**

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Images of coherent electron flow through a two-dimensional electron gas from a quantum point contact (QPC) were obtained at liquid He temperatures by using a scanning probe microscope with a charged tip that backscatters electrons. Near the QPC at distances less than 1 micron, the images show angular lobes of electron flow in patterns determined by the quantum modes of the QPC. At greater distances, narrow branches of electron flow are observed, formed by the cumulative effects of small angle scattering. These observations are in agreement with theoretical simulations. In addition, the images show interference fringes spaced by half the Fermi wavelength, evidence that the electron flow is coherent.

Spin-dependent transport in a two-dimensional GaAs electron gas in a parallel magnetic field **25bD2**

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We report low-temperature magnetoresistivity measurements of a high-quality gated two-dimensional electron gas (2DEG). In the dilute electron density limit, we show evidence for spin polarisation in an in-plane magnetic field. Using a simple model, we estimate the Landé g-factor in this dilute 2DEG to be about 3.32. This enhanced Landé g-factor compared with that of a bulk GaAs 2D electron system (0.44) is ascribed to electron-electron interaction effects at ultra-low electron densities and the fact that over the whole measurement range r_s does not vary significantly.

25bD3 Anisotropic Transport of Unidirectional Lateral Superlattice in High Landau Levels

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We report anisotropic transport observed in unidirectional lateral superlattices (LSL) with period a=92 nm, at high ($6 \geq N \geq 1$) Landau levels (LL). Near the half filling of the LLs (up to filling factor ν=25/2), sharp peaks are observed in the resistance traces when current is along the grating that defines the superlattice, which are not present (sometimes dips appear) for current across the grating. The peaks show alternating intensities with magnetic field: higher-magnetic-field branch spin sublevels in each LL tend to display more distinct peaks. Since the period a of LSL is close to the theoretically predicted period of the stripe phase in half-filled high LLs, the observed peaks probably represent the response of the stripe to the external periodic modulation.

25bD4 Observation of dynamical ordering in a confined Wigner crystal

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We present measurements of the conduction of nondegenerate free electrons along a low-dimensional channel at low temperatures, using surface-state electrons on liquid helium in novel microelectronic devices. Below 1 K, Coulomb interactions produce electronic spatial order, leading to strong non-Ohmic effects and negative differential conductivity. Evidence is presented for self-organized current filaments in the channel, created by a nonequilibrium phase transition. Periodic conductance oscillations suggest an anisotropic spatial order (Wigner wires) with lines of electrons along the channel edges

25bD5 Transport Property of Surface State Electrons on the Rotating Superfluid ^{4}He

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A transport property of the surface state electrons (SSE) on the rotating superfluid Helium-4 has been investigated in the angular velocity range $\Omega \leq 1.0$ rad/sec. We observed that the surface deformation induced by the vortices acts as one of the scattering factors in the liquid phase, and as the pinning center for the Wigner solid phase.