Hans-Peter Tranitz, Werner Wegscheider, and Christoph Strunk — Intitut für experimentelle und angewandte Physik, Universität Regensburg, D-93040 Regensburg, Deutschland

We study the visibility of Aharonov-Bohm interference in an electronic Mach-Zehnder interferometer (MZI) in the integer quantum Hall regime. The visibility is controlled by the filling factor ν and is observed only between $\nu \approx 2.0$ and 1.0, with an unexpected maximum near $\nu = 1.5$. Three energy scales extracted from the temperature and voltage dependences of the visibility change in a very similar way with the filling factor, indicating that the different aspects of the interference depend sensitively on the local structure of the compressible and incompressible strips forming the quantum Hall edge channels. The superposition of confining potentials, produced by gate of quantum point contact (QPC) and disorder potential from doping impurities, results in the formation of inadvertent quantum dot (QD) in one arm of interferometer. The phase of the QD transmission amplitude was directly observed in the MZI. This implies, that charge state of QD can be measured by detecting its transmission (reflection) phase with the interferometer, and may be used as more sensitive detectors for QD state, than the currently used QPCs.

HL 23.5 Tue 15:00 BEY 154

Optical manipulation of edge state transport in HgTe quantum wells — •Manuel Schmidt[1], Markus Kindermann[2], Alena Novik[3], and Björn Trauzettel[3] — [1]Department of Physics, University of Basel, Klingelbergstrasse 82, CH-4056 Basel, Switzerland — [2]School of Physics, Georgia Institute of Technology, Atlanta, Georgia 30332, USA — [3]Fakultät für Physik und Astronomie, University of Würzburg, 97074 Würzburg, Germany

We investigate the influence of electromagnetic radiation on edge state transport within an effective model for the band structure of a HgTe quantum well. This effective model describes the quantum well especially well near its mass inversion thickness [1], where it is sufficient to take the first pair of hole- and electron-like bands into account.

We show that, in an experimentally accessible regime, the motion of an electron which traverses one edge can be reversed. The mechanism behind this current direction inversion is the optical scattering of electrons in hole-like, counterclockwise moving states to electron-like, clockwise moving states.

[1] B. A. Bernevig, T. L. Huges, and S. Zhang, Science 314, 1757 (2006).

HL 24: Invited Talk Neumaier

Time: Tuesday 14:45–15:30 Location: HSZ 01

Invited Talk HL 24.1 Tue 14:45 HSZ 01

Phase coherent transport in (Ga,Mn)As — •D. Neumaier[1], K. Wagner[1], U. Wurstbauer[1,2], M. Reinwald[1], W. Wegscheider[1], and D. Weiss[1] — [1]Universität Regensburg — [2]Universität Hamburg

The low temperature conductance of mesoscopic samples is altered by quantum interference effects, caused by the electron's wave nature. Information on the relevant quantum mechanical transport properties is needed to understand charge transport in general and to design more sophisticated structures in particular. In this talk I will review our investigations on universal conductance fluctuations [1,2], Aharonov-Bohm oscillations [2] and weak localization [2,3] in the diluted magnetic semiconductor (Ga,Mn)As. Analyzing universal conductance fluctuations in (Ga,Mn)As nanowires results in a phase coherence length of $\approx$ 100 nm at 20 mK with a $1/\sqrt{T}$ temperature dependency. This agrees well with values extracted from the amplitude of periodic Aharonov-Bohm oscillations observed in (Ga,Mn)As nanorings. To investigate weak localization in (Ga,Mn)As, arrays of wires were fabricated to suppress universal conductance fluctuations by ensemble averaging. The magnetoconductance of the (Ga,Mn)As wire arrays displays a pronounced low temperature anomaly ascribed to weak localization. A comparison of phase coherent transport in (Ga,Mn)As with nonmagnetic materials and conventional ferromagnets will be given.

[1] K. Wagner *et al* PRL 97, 056803 (2006).
[2] D. Neumaier *et al.* NJP 10 055016 (2008).
[3] D. Neumaier *et al* PRL 99, 116803 (2007).

HL 25: C/diamond II

Time: Tuesday 16:00–16:30 Location: POT 51

HL 25.1 Tue 16:00 POT 51

Functionalizing graphene by embedded boron clusters — Alexander Quandt[1], Cem Özdogan[2], •Jens Kunstmann[3,4], and Holger Fehske[1] — [1]Institut für Physik der Universität Greifswald, Felix–Hausdorff-Str. 6, 17489 Greifswald, Germany — [2]Department of Computer Engineering, Çankaya University, Balgat, 06530 Ankara, Turkey — [3]Max-Planck-Institut für Festkörperforschung, Heisenbergstr. 1, 70569 Stuttgart, Germany — [4]Institute for Materials Science, Dresden University of Technology, 01062 Dresden, Germany

We present results from an ab initio study of B_7 clusters implanted into graphene [1,2]. Our model system consists of an alternating chain of quasiplanar B_7 clusters. We show that graphene easily accepts these alternating B_7-C_6 chains and that the implanted boron components may dramatically modify the electronic properties. This suggests that our model system might serve as a blueprint for the controlled layout of graphene based nanodevices, where the semiconducting properties are supplemented by parts of the graphene matrix itself, and the basic metallic wiring is provided by alternating chains of implanted boron clusters. [1] A. Quandt, C. Özdoğan, J. Kunstmann, and H. Fehske, Nanotechnology **19**, 335707 (2008). [2] A. Quandt, C. Özdoğan, J. Kunstmann, and H. Fehske, phys. stat. solidi (b) **245**, 2077 (2008).

HL 25.2 Tue 16:15 POT 51

Theoretical studies of electronic transport and giant magnetoresistance in ferromagnetically contacted graphene nanoribbons — •Stefan Krompiewski — Institute of Molecular Physics, PAS, Poznan, Poland

Graphene – a monolayer of graphite – is believed to be even more promising for the emerging molecular electronics than carbon nanotubes. This contribution reports on a possible application potential of graphene nanoribbons also in magnetoelectronics (spintronics). The present methodology is based on the tight-binding model combined with the Green function recursive technique, within the ballistic transport regime. In contrast to hitherto existing theories, external magnetic contacts are here 3-dimensional and semi-infinite in the transport direction. The basic transport characteristics: conductance, shot noise and giant magnetoresistance (GMR) are studied for different aspect (width/length) ratios and the most common chiralities, i.e. zigzag and armchair ones. It turns out that typically the GMR effect at elevated gate voltages can exceed 10-20%, morover interestingly enough its value in armchair-edge ribbons is clearly higher than in those with zigzag edges.