HL 28 Transport in high magnetic field/Quantum Hall-effect

Time: Wednesday 16:30–17:00 Room: HSZ 01

HL 28.1 Wed 16:30 HSZ 01

Electron interference and single electron charging in electronic Mach-Zehnder interferometer — •Leonid Litvin, Thomas Geiger, Peter Tranitz, Werner Wegscheider, and Cristoph Strunk — Institute for Experimental and Applied Physics; University of Regensburg, D-93040 Regensburg, Germany

Mach-Zehnder interferometer is promising device for two beam experiments with electrons in the integer quantum Hall regime where the electron flow is confined to a few edge states [1]. The effective path length and thus the phase accumulated along the edge states can be tuned by external magnetic field and a gate electrode. We have prepared Mach-Zehnder interferometers using high mobility GaAs/AlGaAs heterostructures and found two types of oscillation in current through the device as function of gate voltage: Aharonov-Bohm oscillations and smaller oscillation with six times smaller period. The small period oscillation show a beating pattern indicating two underlying frequencies, which correspond to the presence of two edge states (v=2) in the interferometer. From the temperature dependence of the small oscillation amplitude we infer a characteristic energy scale of 17*10ˆ(-6) eV, which is in reasonable agreement with the charging energy of the interferometer. This points towards single electron charging as the origin of the additional small period oscillation. [1] Yang Ji et al., Nature 422, 415 (2003)

HL 28.2 Wed 16:45 HSZ 01

Surface-Acoustic-Wave study of the spin phase transition at ν=2/3 in narrow quantum wells — •Dimitri Dini[1], Werner Dietsche[1], Klaus von Klitzing[1], Chris Mellor[2], and Maik Hauser[1] — [1]Max-Planck-Institut für Festkörperforschung, Stuttgart, Germany — [2]School of Physics and Astronomy, Nottingham University, Nottingham, Great Britain

We measure the conductivity σ_{xx} at filling factor ν=2/3 using DC as well as surface acoustic wave (SAW) techniques. Surprisingly, we detect features related to the spin phase transition in DC measurement but *not* in SAW ones. Within the composite fermion picture, ν=2/3 corresponds to two fully occupied Landau levels (LLs). With increasing magnetic field a transition from unpolarized electrons (the two LLs have different spin polarization) to spin-polarized electrons (Zeeman energy so large, that only one spin-polarization dominates) is observed. At the transition point, where two LLs cross each other, the electronic system may consist of domains with different spin polarization. We present experimental results which show that the spin phase transition is visible in DC experiments caused by the disappearing of the gap at the crossing point between LLs, whereas the SAW-damping (which depends on the conductivity) with surface acoustic waves with frequencies from 100 MHz up to 1 GHz does not show any significant signal due to the phase transition. Even at large current, where we measure an increase of more than 300% in σ_{xx} with DC techniques due to the hyperfine interection with the nuclei, the σ_{xx} measured with SAWs shows no increase.