Session 23aD

Spintronics in Quantum Hall Ferromagnets **23aD1**

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Bilayer quantum Hall systems have broken symmetry ground states that can be regarded either as excitonic condensates of electrons in one layer and holes in the other layer or, when top layer electrons are regarded as having pseudospin up and bottom layer electrons pseudospin down, as easy-plane ferromagnets. Recent experiments by Jim Eisenstein and collaborators that involve pseudospin selective contacting have demonstrated transport anomalies in these systems that appear to be collective in nature. I will discuss the relationship between transport with pseudospin selective contacts in bilayer quantum Hall systems and transport with spin selective contacts in thin film ferromagnets that have dominant easy-plane magnetic anisotropy. I will also address the possibility, suggested by the dual description that has been used for quantum Hall ferromagnets, of superfluid spin transport in ordinary thin film ferromagnets.

Resistively Monitoring Electron-Nuclear Spin Interactions in a 2D-System **23aD2**

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At a critical density the 2D-electron system at fractional filling 2/3 condenses in a ground state with ferromagnetic order as visible from a drastic change in the magnetoresistance. It exhibits hysteretic and temporal behaviour below 150 mK indicative of a non-equilibrium situation. The hyperfine interaction with the nuclear lattice apparently plays a prominent role to reach equilibrium and the degree of nuclear spin polarisation gradually changes. The critical density is sensitive to the nuclear spin polarisation and this can be exploited more generally to construe a spectroscopy tool that detects gapless excitation modes at other filling factors. The technique is applied for the study of skyrmion related spin wave modes, held responsible for rapid nuclear spin relaxation rates previously reported in NMR experiments.

[1] in collaboration with J.H. Smet, R.A. Deutschmann, F. Ertl, W. Wegscheider, G. Abstreiter

23aD3 Charge Excitation and Transport in Pseudospin Quantum Hall Ferromagnets

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Activation measurements of charge excitation gap in pseudospin quantum Hall ferromagnets realized in double and single quantum wells are presented. It is shown that the charge gap is finite even when two Landau levels originating from different subbands coincide at the Fermi energy, indicating the existence of ferromagnetic order which suppresses pseudospin flip and hence dissipative current. Two different types of ferromagnets, easy-axis and easy-plane, are shown to appear as a result of the interplay between exchange and Hartree energies. Transport along domain boundaries in easy-axis ferromagnet and possibilities to tune the easy-axis system to easy-plane by modifying the confinement potential will be discussed.

23aD4 Angular dependent measurements of the $\nu = 5/2$ fractional quantum Hall effect state at ultra-low temperatures

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The spin polarization of the obscure even-denominator FQHE state at $\nu = 5/2$ remains an open, but important question to answer. One method to address this question is to measure the angular dependence of its energy gap. Since the energy gap at $\nu = 5/2$ is rather small, this kind of experiments is technically extraordinary challenging, due to the requirement of *in situ* rotation of the sample at ultra-low temperatures. We constructed a rotator, made from polycarbonate and operated hydraulically using liquid ^{3}He. A sequence of experiments at $\nu = 5/2$ clearly demonstrated the possibility of performing angular-dependent measurements at temperatures below 10mK.