

HL 99: Invited Talk Werner Wegscheider

Time: Friday 9:30–10:00

Location: EW 202

Invited Talk

HL 99.1 Fri 9:30 EW 202

Fractional quantum Hall effect states in ultrahigh mobility two-dimensional electron systems — •WERNER WEGSCHEIDER¹, CHRISTIAN REICHL¹, JUN CHEN², WERNER DIETSCH^{1,2}, STEPHAN BAER¹, LARS TIEMANN¹, SZYMON HENNEL¹, CLEMENS RÖSSLER¹, THOMAS IHN¹, and KLAUS ENSSLIN¹ — ¹Solid State Physics Laboratory, ETH Zürich, CH-8093 Zürich, Switzerland — ²Max-Planck-Institute for Solid State Research, D-70569 Stuttgart, Germany

We report on the fabrication as well as on low-temperature transport investigations of AlGaAs/GaAs heterostructures hosting exotic fractional quantum Hall (FQH) systems. The FQH state which can be observed at the filling factor $\nu = 5/2$ is a very exceptional one as it is predicted that its quasiparticle excitations are of anyonic character

and obey non-Abelian statistics. Although this property, in principle, paves the way for fault-tolerant quantum computing, the extreme fragility of this state undermines this endeavour. Molecular beam epitaxial growth strategies will be discussed that allow the realization of samples with enhanced $5/2$ gap energies. By identifying the most suitable growth and doping schemes, we demonstrate how quantum point contacts (QPCs) can be defined without destroying this fragile FQH state. The investigation of quasiparticle tunnel properties using such structures represents a crucial step towards future interference experiments. Time-resolved measurements performed with the QPC filling factor tuned to $\nu = 2/3$ show periodic oscillations with a period of several minutes. These can be described as a consequence of dynamic nuclear polarization around the corresponding spin phase transition.