

SFB 767

Colloquium

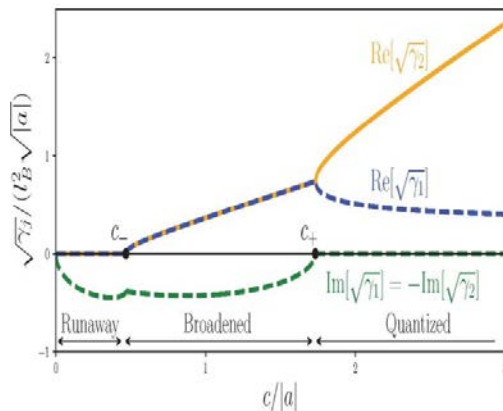
May 16, 2019
Coffee and tea 15:15
Talk 15:30
P 603



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Phase space formulations of the quantum electronic motion in a magnetic field



Physics of two-dimensional electron gases under perpendicular magnetic field often displays three distinct stages when increasing the field amplitude: a low field regime with classical magneto-transport, followed at intermediate field by a Shubnikov-de Haas phase where the transport coefficients present quantum oscillations, and, ultimately, the emergence at high field of the quantum Hall effect with perfect quantization of the Hall conductance.

One limitation of many theories of the quantum Hall effect is their inability to comprehend all regimes of magnetic field (from low to intermediate and high) in a unified way. I will convey a physical picture resting on disordered potential effects, which allows one to have a global understanding of this series of successive transport regimes.

After introducing the quantum Hall effects, I will showcase a basis of vortex states, which naturally leads to a two-dimensional phase space formulation for the guiding-center quantum motion in a disordered potential landscape. This framework is then used to get a quantitative understanding of the local density of states measurements in the quantum Hall regime. Finally, the trickier issue on the sharpness of the transitions between the successive transport regimes will be analyzed at the light of the exact solution of a simple toy model of Landau quantization breakdown.

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