

HL 8 Invited Talk Leturcq

Time: Monday 14:30–15:15

Room: HSZ 01

Invited Talk

HL 8.1 Mon 14:30 HSZ 01

Counting statistics of single electron transport in a quantum dot — •RENAUD LETURCQ¹, SIMON GUSTAVSSON¹, BARBARA SIMOVIC¹, ROLAND SCHLESER¹, THOMAS IHN¹, PAUL STUDERUS¹, KLAUS ENSSLIN¹, DAN C. DRISCOLL², and ART C. GOSSARD² — ¹Solid State Physics Laboratory, ETH Zürich, CH-8093 Zürich, Switzerland — ²Materials Department, University of California, Santa Barbara, CA-93106, USA

We demonstrate the measurement of current fluctuations in a semiconductor quantum dot by using a quantum point contact as a charge detector. Electrons traveling through the quantum dot are counted one by one. In addition to the shot noise, this method gives access to the full distribution of current fluctuations, known as full counting statistics. We demonstrate experimentally the suppression of the second moment (variance, related to the shot noise) and the third moment (asymmetry) in a tunable semiconductor quantum dot, in agreement with theoretical predictions.

Current fluctuations in a conductor give additional information compared to average current measurements, in particular for interacting systems. In semiconductor quantum dot systems it is envisioned that shot noise measurement provide a way to demonstrate entanglement of electrons. However, this measurement is difficult with conventional methods, due to the very low current levels in quantum dots of the order of 10 fA. Our experimental technique allows to measure currents in the aA regime. Also the experimental resolution of the noise signal is 5-6 order of magnitude better than in previous experiments.