

HL 58: Invited Talk: Martin Geller

Time: Wednesday 14:30–15:00

Location: POT 251

Invited Talk

HL 58.1 Wed 14:30 POT 251

Transport spectroscopy on non-equilibrium spin and charge states in self-organized quantum dots — ●MARTIN GELLER —
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Self-organized quantum dots (QDs) are perfectly suited for fundamental studies on many-particle interactions in artificial semiconductor atoms. However, detailed investigations on the pure excited (non-equilibrium) many-particle states in self-organized QDs are still missing. Non-equilibrium charge/spin states were always studied in optical experiments, where electron-hole interactions are in addition present.

An all-electrical spectroscopy technique on an ensemble of self-

organized InAs QDs is presented in this talk. It allows to prepare and detect the pure non-equilibrium many-particle electron states with their spin-singlet, -doublet and -triplet configurations, using a time-resolved measurement detection scheme via a two-dimensional electron gas. The energy spectrum of the first three "QD elements", the QD-Hydrogen, -Helium and -Lithium, are shown and compared with a theory based on a numerical solution of a many-particle Hamiltonian of a two-dimensional parabolic potential. This all-electrical measurement scheme also enables to address the two-electron excited state of the QD Helium configuration and measure the spin-relaxation time of this "qubit" without an applied magnetic field up to 50 K. This constitutes an important step towards electrical quantum operations in self-organized QDs for temperatures well above 4 K.