



Sonderforschungsbereich 631
Festkörperbasierte Quanteninformationsverarbeitung



Im Mai 2005

SEMINARANKÜNDIGUNG

Dienstag, 24. Mai 2005

17.15 Uhr

WSI, Seminarraum S 101

„ Coherent control of a quantum dot two-level system “

Coherent optical manipulations of single quantum systems are currently receiving a lot of attention, not only for their fundamental interest but also in view of possible applications in quantum information technology. We present quantum optical investigations on a two-level system, defined by the ground state exciton of a single InGaAs quantum dot. Saturation spectroscopy combined with ultra high spectral resolution gives us a complete description of the system in the steady state limit. Rabi oscillations and quantum interference experiments on the other hand provide a detailed insight into the coherent high excitation regime. All fundamental properties of the two-level system show an excellent quantitative agreement in both domains, even though obtained under entirely different experimental conditions. We thus are able to demonstrate control over a two-level system which behaves almost exactly as expected from textbook quantum mechanics.

By placing the QD in a diode structure we essentially obtain a single quantum system with electrical contacts. Photocurrent measurements provide a convenient but also very sensitive detection scheme. By varying the bias voltage we are further able to tune the QD energy levels and dephasing times and therefore obtain an additional control mechanism, not available e.g. in atomic systems.

Stefan Stufler

Universität Paderborn