HL 19 Hauptvortrag Zrenner

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Hauptvortrag HL 19.1 Sa 09:45 TU P270

Manipulations of a qubit in a semiconductor quantum dot — •Artur Zrenner[1], Stefan Stufler[1], Patrick Ester[1] und Max Bichler[2] — [1]Universität Paderborn, Warburger Str. 100, D-33098 Paderborn — [2]Walter Schottky Institut, Technische Universität München, Am Coulombwall, D-85748 Garching

Semiconductor quantum dots are zero-dimensional model systems with excellent optic and electric properties. In optical experiments on single self-assembled InGaAs quantum dots the excitonic ground state transition appears as an extremely narrow resonance of only a few μeV width. The resonant interaction with cw laser fields can be studied in detail by photocurrent spectroscopy, revealing the effects of nonlinear absorption and power broadening of the line width, as expected for a genuine two-level system. For the case of pulsed laser fields and in the absence of decoherence, the two-level system represents a qubit. Excitations with ps laser pulses result in qubit rotations, which can be evidenced in a quantitative way as Rabi oscillations in photocurrent experiments. Double pulse experiments further allow us to infer important system parameters like the decoherence time and the excitonic fine structure of the underlying two level system.