



# Single Quantum Dots Single Quantum Dots

**Matthias Scholz**

## **Single Quantum Dots Single Quantum Dots:**

*Single Semiconductor Quantum Dots* Peter Michler, 2009-06-13 This book reviews recent advances in the field of semiconductor quantum dots via contributions from prominent researchers in the scientific community. Special focus is given to optical quantum optical and spin properties of single quantum dots

**Single Quantum Dots** Peter Michler, 2003-12-09 Special focus is given to the optical and electronic properties of single quantum dots due to their potential applications in devices operating with single electrons and or single photons. This includes quantum dots in electric and magnetic fields cavity quantum electrodynamics nonclassical light generation and coherent optical control of excitons

**Single Quantum Dots** Peter Michler, 2014-10-08 Special focus is given to the optical and electronic properties of single quantum dots due to their potential applications in devices operating with single electrons and or single photons. This includes quantum dots in electric and magnetic fields cavity quantum electrodynamics nonclassical light generation and coherent optical control of excitons

**An Efficient Source of Single Photons : a Single Quantum Dot in a Micropost Microcavity** Matthew Pelton, 2002 *Quantum Dots for Quantum Information Technologies* Peter Michler, 2017-06-01 This book highlights the most recent developments in quantum dot spin physics and the generation of deterministic superior non classical light states with quantum dots. In particular it addresses single quantum dot spin manipulation spin photon entanglement and the generation of single photon and entangled photon pair states with nearly ideal properties. The role of semiconductor microcavities nanophotonic interfaces as well as quantum photonic integrated circuits is emphasized. The latest theoretical and experimental studies of phonon dressed light matter interaction single dot lasing and resonance fluorescence in QD cavity systems are also provided. The book is written by the leading experts in the field

**Quantum Dots** Alexander Tartakovskii, 2012-07-19 A comprehensive review of cutting edge solid state research focusing on quantum dot nanostructures for graduate students and researchers

**Coherent Quantum Coupling of Excitons in Single Quantum Dots and Quantum Dot Molecules** Hubert Johannes Krenner, 2006

**New Light Sources for Quantum Information Processing -- Single Photons from Single Quantum Dots and Cavity-Enhanced Parametric Down-Conversion** Matthias Scholz, 2009

The outstanding research efforts in quantum information processing over the past two decades reflect the promise this field of physics provides for practical applications in information science as well as for new approaches towards a better understanding of fundamental questions in quantum mechanics. This thesis focuses on the photon as a principal resource to perform quantum information tasks and on schemes to imprint quantum bits onto its various degrees of freedom. Its weak coupling to the environment makes the photon an ideal carrier to securely transmit information by quantum cryptographic protocols. Moreover efficient implementations of quantum computing using solely linear optics have been proven. Unfortunately scalability is not easily achieved by a purely photonic approach since the generation of indistinguishable single photons from multiple emitters remains a difficult task. Thus proposals for more complex quantum networks suggest an

architecture with single photons as information carriers between atomic ensembles that act as storage and processing nodes Computations including a limited number of qubits however may be performed by the linear optics scheme The thesis starts with the generation and characterization of single photon states using a source based on a single optically pumped quantum dot The capability of these states to implement a quantum algorithm using linear optics and single photon interference is experimentally demonstrated for the first time Error correction makes the interferometric setup robust against phase noise After successful realization of this proof of principle experiment attention is drawn to the need of plug and play single photon sources Especially quantum key distribution the most advanced quantum information technology to date which has even found its way into commercial devices requires compact and low cost non classical light sources Therefore a single photon source based on electrically pumped quantum dots is presented that exhibits unmatched spectral purity and single photon statistics Results towards the realization of quantum networks are presented in the following chapters covering the generation of narrow band single photons which can efficiently couple to atomic resonances Photons with a spectral width of less than 3 MHz are created by ultra bright cavity enhanced spontaneous parametric down conversion and their quantum statistics is studied in detail A setup for time bin encoding is demonstrated capable of imprinting quantum information onto these narrow band single photons This thesis concludes with slow light experiments in atomic ensembles as a model system for atom photon interaction on the single photon level The described experiments demonstrate striking features that make the single photon one of the most remarkable physical systems for the field of quantum information

### **Electrically Driven**

**Quantum Dot Based Single-Photon Sources** Markus Kantner,2020-01-25 Semiconductor quantum optics is on the verge of moving from the lab to real world applications When stepping from basic research to new technologies device engineers will need new simulation tools for the design and optimization of quantum light sources which combine classical device physics with cavity quantum electrodynamics This thesis aims to provide a holistic description of single photon emitting diodes by bridging the gap between microscopic and macroscopic modeling approaches The central result is a novel hybrid quantum classical model system that self consistently couples semi classical carrier transport theory with open quantum many body systems This allows for a comprehensive description of quantum light emitting diodes on multiple scales It enables the calculation of the quantum optical figures of merit together with the simulation of the spatially resolved current flow in complex multi dimensional semiconductor device geometries out of one box The hybrid system is shown to be consistent with fundamental laws of non equilibrium thermodynamics and is demonstrated by numerical simulations of realistic devices

### **Spin Storage in Quantum Dot Ensembles and Single Quantum Dots** Dominik Heiss,2009

*Optical Studies and Applications of Single Quantum Dots* Valéry Zwiller,2001 [Single-photon Devices and Applications](#)  
Charles Santori,David Fattal,Yoshihisa Yamamoto,2010-11-01 Die Autoren erkl ren die Erzeugung einzelner Photonen und deren Anwendung unter anderem im Bereich der Quantencomputer Entwicklung *Optical Studies of Single Quantum Dots*

Jonas Persson,2004 **High Resolution Optical Spectroscopy of Single Quantum Dots and Cavity-QED Effects and Lasing in Quantum Dot Microdisk Resonator Structures**,2000 This project was initiated to study quantum electrodynamic effects QED on the interaction between quantum dots and the electromagnetic field Investigations of quantized matter field interactions involving self assembled quantum dots required an advance in the understanding of the electronic structure and optical properties of strained quantum dots Consequently much of the research carried out under this grant centered on clarifying these issues Problems investigated included optimization of the growth process by which the quantum dots were formed physical characterization of the microstructure of the quantum dots so as to identify their symmetries and to enable the creation of appropriate electronic structure models the use of these results to calculate electronic structure and spectroscopic tests of the models

**Optical Properties of Single Quantum Dots in High Magnetic Field** Martin Vachon,2008 Transient Nonlinear Spectroscopy of Single Quantum Dots Todd H. Stievater,2001

Single Quantum Dot Imaging Eva Arnspang Christensen,Syddansk Universitet. Institut for Fysik og Kemi, MEMPHYS. Center for Biomembrane Physics,2010 Optical Characterisation of Single Quantum Dots Emitting at 1300 Nm Carl Zinoni,2007 **Coherent Spectroscopy of Single Quantum Dots** John Howard Quilter,2014 Optoelectronic and Photonic Control of Single Quantum Dots Samuel James Dewhurst,2010 The area of quantum information promises to deliver a range of new technologies in the fields of quantum computing and quantum communication Devices based on semiconductor quantum dots hold great potential for the practical realisation of many of the components required in the proposed schemes This thesis describes the development of several quantum dot devices By integrating a quantum dot into a p i n diode it was possible to control the dominant emission lines in its photoluminescence spectrum and to maximise the degree of polarisation correlation between the two photons emitted in the biexciton decay With the same device under a magnetic field a digital memory was demonstrated The polarisation information of a single photon was stored as the spin of an electron inside the quantum dot and was deterministically recovered some time later by the application of an electrical trigger A fabrication process was developed in order to produce high quality two dimensional slab photonic crystals operating with a photonic band gap at 900 nm By placing a quantum dot into an appropriately designed H1 photonic crystal cavity strong coupling was achieved between the dot and the monopole mode of the cavity The vacuum Rabi splitting was found to be constant for all linear polarisations due to the unpolarised nature of the far field of the mode Finally a new kind of cavity based on photonic crystal waveguides was developed A Purcell enhancement of the in plane spontaneous emission from a quantum dot coupled to a unidirectional photonic crystal waveguide was demonstrated

## Decoding **Single Quantum Dots Single Quantum Dots**: Revealing the Captivating Potential of Verbal Expression

In a time characterized by interconnectedness and an insatiable thirst for knowledge, the captivating potential of verbal expression has emerged as a formidable force. Its capability to evoke sentiments, stimulate introspection, and incite profound transformations is genuinely awe-inspiring. Within the pages of "**Single Quantum Dots Single Quantum Dots**," a mesmerizing literary creation penned with a celebrated wordsmith, readers attempt an enlightening odyssey, unraveling the intricate significance of language and its enduring affect on our lives. In this appraisal, we shall explore the book's central themes, evaluate its distinctive writing style, and gauge its pervasive influence on the hearts and minds of its readership.

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