192 SPRINGER TRACTS IN MODERN PHYSICS

Thomas Ihn

Electronic Quantum Transport in Mesoscopic Semiconductor Structures

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Electronic Quantum Transport In Mesoscopic Semiconductor Structures

Julia Schneider

Electronic Quantum Transport In Mesoscopic Semiconductor Structures:

Electronic Quantum Transport in Mesoscopic Semiconductor Structures Thomas Ihn,2014-09-01 **Electronic Quantum Transport in Mesoscopic Semiconductor Structures** Thomas Ihn,2004-01-08 Opening with a brief historical account of electron transport from Ohm s law through transport in semiconductor nanostructures this book discusses topics related to electronic quantum transport The book is written for graduate students and researchers in the field of mesoscopic semiconductors or in semiconductor nanostructures Highlights include review of the cryogenic scanning probe techniques applied to semiconductor nanostructures **Electronic Quantum Transport in Mesoscopic Semiconductors Structures** Thomas Ihn,2004 Infrared Ellipsometry on Semiconductor Layer Structures Mathias Schubert,2004-11-26 The study of semiconductor layer structures using infrared ellipsometry is a rapidly growing field within optical spectroscopy This book offers basic insights into the concepts of phonons plasmons and polaritons and the infrared dielectric function of semiconductors in layered structures It describes how strain composition and the state of the atomic order within complex layer structures of multinary alloys can be determined from an infrared ellipsometry examination Special emphasis is given to free charge carrier properties and magneto optical effects A broad range of experimental examples are described including multinary alloys of zincblende and wurtzite structure semiconductor materials and future applications such as organic layer structures and highly correlated electron systems are proposed **Handbook of Nanophysics** Klaus D. Sattler,2010-09-17 Providing the framework for breakthroughs in nanotechnology this landmark publication is the first comprehensive reference to cover both fundamental and applied physics at the nanoscale After discussing the theoretical principles and measurements of nanoscale systems the organization of the set follows the historical development of nanoscience Each peer reviewed chapter presents a didactic treatment of the physics underlying the nanoscale materials applications and detailed experimental results State of the art scientific content is enriched with fundamental equations and illustrations many in color **Physics In The 21st Century - Proceedings Of The 11th Nishinomiya-yukawa Memorial Symposium** Keiji Kikkawa,H Kunitomo,Hisao Ohtsubo,1997-10-22 Towards the close of the 20th century the world s leading experts in theoretical and experimental physics review the major developments in their respective research areas and present the prospects for the coming 21st century The subjects covered in this volume are field theory string theory quantum cosmology solid state physics physics of complex systems high energy physics quark gluon plasma nuclear physics and observational cosmology **Unconventional Superconductors** Gernot Goll,2006 This book offers a comprehensive summary of experiments that are especially suited to reveal the order parameter symmetry of unconventional superconductors It briefly introduces readers to the basic theoretical concepts and terms of unconventional superconductivity followed by a detailed overview of experimental techniques and results investigating the superconducting energy gap and phase plus the pairing symmetry This review includes measurements of specific heat thermal conductivity

penetration depth and nuclearmagnetic resonance and muon spin rotation experiments Further point contact and tunnelling spectroscopy and Josephson experiments are addressed Current understanding is reviewed from the experimental point of view With an appendix offering five tables with almost 200 references that summarize the present results from ambient pressure heavy fermion and noncopper oxide superconductors the monograph provides a valuable resource for further studies in this field Comprehensive Semiconductor Science and Technology ,2011-01-28 Semiconductors are at the heart of modern living Almost everything we do be it work travel communication or entertainment all depend on some feature of semiconductor technology Comprehensive Semiconductor Science and Technology Six Volume Set captures the breadth of this important field and presents it in a single source to the large audience who study make and exploit semiconductors Previous attempts at this achievement have been abbreviated and have omitted important topics Written and Edited by a truly international team of experts this work delivers an objective yet cohesive global review of the semiconductor world The work is divided into three sections The first section is concerned with the fundamental physics of semiconductors showing how the electronic features and the lattice dynamics change drastically when systems vary from bulk to a low dimensional structure and further to a nanometer size Throughout this section there is an emphasis on the full understanding of the underlying physics The second section deals largely with the transformation of the conceptual framework of solid state physics into devices and systems which require the growth of extremely high purity nearly defect free bulk and epitaxial materials The last section is devoted to exploitation of the knowledge described in the previous sections to highlight the spectrum of devices we see all around us Provides a comprehensive global picture of the semiconductor world Each of the work s three sections presents a complete description of one aspect of the whole Written and Edited by a truly international team of experts **Nonequilibrium Quantum Transport Physics In Nanosystems: Foundation Of Computational Nonequilibrium Physics In Nanoscience And Nanotechnology** Felix A Buot,2009-08-05 This book presents the first comprehensive treatment of discrete phase space quantum mechanics and the lattice Weyl Wigner formulation of energy band dynamics by the originator of these theoretical techniques The author s quantum superfield theoretical formulation of nonequilibrium quantum physics is given in real time without the awkward use of artificial time contour employed in previous formulations These two main quantum theoretical techniques combine to yield general including quasiparticle pairing dynamics and exact quantum transport equations in phase space appropriate for nanodevices The derivation of transport formulas in mesoscopic physics from the general quantum transport equations is also treated Pioneering nanodevices are discussed in the light of the quantum transport physics equations and an in depth treatment of the physics of resonant tunneling devices is given Operator Hilbert space methods and quantum tomography are discussed Discrete phase space quantum mechanics on finite fields is treated for completeness and by virtue of its relevance to quantum computing The phenomenological treatment of evolution superoperator and measurements is given to help clarify the general quantum

transport theory Quantum computing and information theory is covered to demonstrate the foundational aspects of discrete quantum dynamics particularly in deriving a complete set of multiparticle entangled basis states **Quantum Tunneling in Complex Systems** Joachim Ankerhold,2007-02-15 In the last two decades remarkable progress has been made in understanding and describing tunneling processes in complex systems in terms of classical trajectories This book introduces recent concepts and achievements with particular emphasis on a dynamical formulation and relations to specific systems in mesoscopic molecular and atomic physics Advanced instanton techniques e g for decay rates and tunnel splittings are discussed in the first part The second part covers current developments for wave packet tunneling in real time and the third part describes thermodynamics and dynamical approaches for barrier transmission in statistical particularly dissipative systems *Inelastic Light Scattering of Semiconductor Nanostructures* Christian Schüller,2006-09-13 The field of semiconductor nanostructures is of enormous and still growing research interest On one hand they are already realized in mass products such as high electron mobility field effect transistors and quantum well lasers On the other hand they allow in specially tailored systems the investigation of fundamental properties such as many particle interactions of electrons in reduced dimensions This book bridges the gap between general semiconductor textbooks and research articles **Compton Scattering** Frank Wissmann,2003-12-03 A comprehensive summary of experiments on Compton scattering from the proton and neutron performed at the electron accelerator MAMI The experiments cover a photon energy range from 30 MeV to 500 MeV The reader is introduced to the theoretical concepts of Compton scattering followed by a description of the experiments on the proton their analysis and results **Parametric X-Ray Radiation in Crystals** Vladimir G. Baryshevsky,Ilya D. Feranchuk,Alexander P. Ulyanenkov,2005-12-20 This systematic and comprehensive monograph is devoted to parametric X ray radiation PXR This radiation is generated by the motion of electrons inside a crystal whereby the emitted photons are diffracted by the crystal and the radiation intensity critically depends on the parameters of the crystal structure Nowadays PXR is the subject of numerous theoretical and experimental studies throughout the world The first part of the book is a theoretical treatment of PXR which includes a new approach to describe the radiation process in crystals The second part is a survey of PXR experimental results and the possible applications of PXR as a tool for crystal structure analysis and a source of tunable X ray radiation **The Flow Equation Approach to Many-Particle Systems** Stefan Kehrein,2007-01-09 Overthepastdecade the owequationmethodhasdevelopedintoanewv satile theoretical approach to quantum many body physics Its basic concept was conceived independently by Wegner 1 and by G lazek and Wilson 2 3 the derivation of a unitary ow that makes a many particle Hamiltonian creasingly energy diagonal This concept can be seen as a generalization of theconventionalscalingapproachesinmany bodyphysics wheresomeult violet energy scale is lowered down to the experimentally relevant low energy scale 4 The main di erence between the conventional scaling approach and the ow equation approach can then be traced back to the fact that the ow equation approach retains all degrees of freedom i e the

full Hilbert space while the conventional scaling approach focusses on some low energy subspace One useful feature of the ow equation approach is therefore that it allows the calculation of dynamical quantities on all energy scales in one uni ed framework Since its introduction a substantial body of work using the ow eq tion approach has accumulated It was used to study a number of very d ferent quantum many body problems from dissipative quantum systems to correlated electron physics Recently it also became apparent that the ow equation approach is very suitable for studying quantum many body n equilibrium problems which form one of the current frontiers of modern theoretical physics Therefore the time seems ready to compile the research literature on ow equations in a consistent and accessible way which was my goal in writing this book

Control of Magnetotransport in Quantum Billiards Christian V. Morfonios,Peter Schmelcher,2016-11-16 In this book the coherent quantum transport of electrons through two dimensional mesoscopic structures is explored in dependence of the interplay between the confining geometry and the impact of applied magnetic fields aiming at conductance controllability After a top down insightful presentation of the elements of mesoscopic devices and transport theory a computational technique which treats multiterminal structures of arbitrary geometry and topology is developed The method relies on the modular assembly of the electronic propagators of subsystems which are inter or intra connected providing large flexibility in system setups combined with high computational efficiency Conductance control is first demonstrated for elongated quantum billiards and arrays thereof where a weak magnetic field tunes the current by phase modulation of interfering lead coupled states geometrically separated from confined states Soft wall potentials are then employed for efficient and robust conductance switching by isolating energy persistent collimated or magnetically deflected electron paths from Fano resonances In a multiterminal configuration the guiding and focusing property of curved boundary sections enables magnetically controlled directional transport with input electron waves flowing exclusively to selected outputs Together with a comprehensive analysis of characteristic transport features and spatial distributions of scattering states the results demonstrate the geometrically assisted design of magnetoconductance control elements in the linear response regime

Characterization of Semiconductor Heterostructures and Nanostructures Lorenzo Rigutti,Maria Tchernycheva,2013-04-11 *Three-Dimensional X-Ray Diffraction Microscopy* Henning Friis Poulsen,2004-08-31 Three dimensional x ray diffraction 3DXRD microscopy is a novel experimental method for structural characterisation of polycrystalline materials The position morphology phase strain and crystallographic orientation of hundreds of grains or sub grain embedded within mm cm thick specimens can be determined simultaneously Furthermore the dynamics of the individual structural elements can be monitored during typical processes such as deformation or annealing The book gives a comprehensive account of the methodology followed by a summary of selected applications The method is presented from a mathematical crystallographic point of view but with sufficient hands on details to enable the reader to plan his or her own experiments The scope of applications includes work in materials science and engineering geophysics geology chemistry and

pharmaceutical science **Heavy Quark Effective Theory** Andrey G. Grozin,2004-04-07 This up to date review also serves as an introduction to Heavy Quark Effective Theory HQET a new approach to heavy quark physics problems in Quantum Chromodynamics QCD The book also contains a detailed discussion of the methods of calculation used in HQET along with numerous illustrations **Effective Field Theories in Flavour Physics** Thomas Mannel,2004-11-26 The book constitutes a compact review of the applications of effective field theory methods in flavour physics with emphasis on heavy quark physics Some of the relevant applications are discussed to illustrate the method It covers the full range of theoretical tools related to the application of the effective field theory idea Starting from the weak interactions as an effective theory derived from the standard model well established methods such as heavy quark effective theory the heavy quark mass expansion and chiral perturbation theory are addressed Also more recent ideas such as QCD factorization and soft collinear effective theory are outlined Finally the standard model itself is viewed as an effective theory allowing a model independent look at the results of the new physics The book should be useful for the advanced graduate student as well as for scientists who are interested in the theoretical toolkit used in the context of flavour physics It is not meant as a complete review of the subject rather it should be useful as an introduction to the basic ideas *Quantum Transport in Ultrasmall Devices* David K. Ferry,Harold L. Grubin,Carlo Jacoboni,A.-P. Jauho,2012-12-06 The operation of semiconductor devices depends upon the use of electrical potential barriers such as gate depletion in controlling the carrier densities electrons and holes and their transport Although a successful device design is quite complicated and involves many aspects the device engineering is mostly to devise a best device design by defIning optimal device structures and manipulating impurity profIles to obtain optimal control of the carrier flow through the device This becomes increasingly diffIcult as the device scale becomes smaller and smaller Since the introduction of integrated circuits the number of individual transistors on a single chip has doubled approximately every three years As the number of devices has grown the critical dimension of the smallest feature such as a gate length which is related to the transport length defIning the channel has consequently declined The reduction of this design rule proceeds approximately by a factor of 1 4 each generation which means we will be using 0 1 0 15 lm rules for the 4 Gb chips a decade from now If we continue this extrapolation current technology will require 30 nm design rules and a cell 3 2 size

The Enigmatic Realm of **Electronic Quantum Transport In Mesoscopic Semiconductor Structures**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing short of extraordinary. Within the captivating pages of **Electronic Quantum Transport In Mesoscopic Semiconductor Structures** a literary masterpiece penned by way of a renowned author, readers attempt a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book is core themes, assess its distinct writing style, and delve into its lasting impact on the hearts and minds of people who partake in its reading experience.

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Electronic Quantum Transport In Mesoscopic Semiconductor Structures Introduction

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