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Spin–Orbit Coupling Effects in Two-Dimensional Electron and Hole Systems



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Sachio Ishioka



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Spin-orbit Coupling Effects in Two-Dimensional Electron and Hole Systems Roland Winkler,2003-10-10 The first part provides a general introduction to the electronic structure of quasi two dimensional systems with a particular focus on group theoretical methods The main part of the monograph is devoted to spin orbit coupling phenomena at zero and nonzero magnetic fields Throughout the book the main focus is on a thorough discussion of the physical ideas and a detailed interpretation of the results Accurate numerical calculations are complemented by simple and transparent analytical models that capture the important physics *Spin-orbit Coupling Effects in Two-Dimensional Electron and Hole Systems* Roland Winkler,2003-10-06 The first part provides a general introduction to the electronic structure of quasi two dimensional systems with a particular focus on group theoretical methods The main part of the monograph is devoted to spin orbit coupling phenomena at zero and nonzero magnetic fields Throughout the book the main focus is on a thorough discussion of the physical ideas and a detailed interpretation of the results Accurate numerical calculations are complemented by simple and transparent analytical models that capture the important physics **Electroweak Symmetry Breaking** Wolfgang Kilian,2003-09-02 The systematic bottom up approach provides the appropriate framework for interpreting measurements that will be performed to better understand the physics of mass generation in the universe No knowledge of quantum field theory is required other than familiarity with effective Lagrangians and Feynmann diagrams **Handbook of Spintronic Semiconductors** Weimin Chen,Irina Buyanova,2019-05-08 This book provides an in depth review of the rapidly developing field of spintronic semiconductors It covers a broad range of topics including growth and basic physical properties of diluted magnetic semiconductors based on II VI III V and IV semiconductors recent developments in theory and experimental techniques and potential device applications its aim is to provide postgraduate students researchers and engineers a comprehensive overview of our present knowledge and future perspectives of spintronic semiconductors Spin Physics in Semiconductors Mikhail I. Dyakonov,2017-10-04 This book offers an extensive introduction to the extremely rich and intriguing field of spin related phenomena in semiconductors In this second edition all chapters have been updated to include the latest experimental and theoretical research Furthermore it covers the entire field bulk semiconductors two dimensional semiconductor structures quantum dots optical and electric effects spin related effects electron nuclei spin interactions Spin Hall effect spin torques etc Thanks to its self contained style the book is ideally suited for graduate students and researchers new to the field 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 *Foundations Of Quantum Mechanics In The Light*

Of New Technology: Isqm-tokyo '05 - Proceedings Of The 8th International Symposium Sachio Ishioka, Kazuo Fujikawa, 2006-06-27 The goal of the 8th International Symposium on Foundations of Quantum Mechanics in the Light of New Technology was to link recent advances in technology with fundamental problems and issues in quantum mechanics with an emphasis on quantum coherence decoherence and geometrical phase The papers collected in this volume cover a wide range of quantum physics including quantum information and entanglement quantum computing quantum dot systems the anomalous Hall effect and the spin Hall effect spin related phenomena superconductivity in nano systems precise measurements and fundamental problems The volume serves both as an excellent reference for experts and a useful introduction for newcomers to the field of quantum coherence and decoherence **Evaluating Feynman Integrals**

Vladimir A. Smirnov, 2005-02-28 The problem of evaluating Feynman integrals over loop momenta has existed from the early days of perturbative quantum field theory Although a great variety of methods for evaluating Feynman integrals has been developed over a span of more than fifty years this book is a first attempt to summarize them Evaluating Feynman Integrals characterizes the most powerful methods in particular those used for recent quite sophisticated calculations and then illustrates them with numerous examples starting from very simple ones and progressing to nontrivial examples

Handbook of Spin Transport and Magnetism Evgeny Y. Tsymbal, Igor Zutic, 2016-04-19 In the past several decades the research on spin transport and magnetism has led to remarkable scientific and technological breakthroughs including Albert Fert and Peter Grunberg's Nobel Prize winning discovery of giant magnetoresistance GMR in magnetic metallic multilayers Handbook of Spin Transport and Magnetism provides a comprehensive bal **Proceedings of the 9th International**

Symposium on Foundations of Quantum Mechanics in the Light of New Technology Sachio Ishioka, 2009 This book is the proceedings of the 9th International Symposium on Foundations of Quantum Mechanics in the Light of New Technology ISQM TOKYO 08 which aims to link the recent advances in technology with fundamental problems in quantum mechanics It also discusses fundamental problems and issues in quantum physics and places a special emphasis on Quantum Coherence and Decoherence The proceedings included a special lecture by Prof C N Yang Pseudopotential Method in Cold Atom Research and 75 refereed papers covering the wide range of quantum physics cold atoms and molecules spin Hall effect and anomalous Hall effect magnetic domain wall dynamics and spin related phenomena Dirac fermions in condensed matter quantum dot systems entanglement and quantum information processing qubit manipulations mechanical properties of confined geometry precise measurements novel properties of nano systems and fundamental problems in quantum physics The book will not only serve as a good reference for experts on quantum coherence and decoherence but also as an introduction for newcomers to this field *Quantum Dot Molecules* Jiang Wu, Zhiming M. Wang, 2013-10-28 A quantum dot molecule QDM is composed of two or more closely spaced quantum dots or artificial atoms In recent years QDMs have received much attention as an emerging new artificial quantum system The interesting and unique coupling and energy

transfer processes between the artificial atoms could substantially extend the range of possible applications of quantum nanostructures This book reviews recent advances in the exciting and rapidly growing field of QDMs via contributions from some of the most prominent researchers in this scientific community The book explores many interesting topics such as the epitaxial growth of QDMs spectroscopic characterization and QDM transistors and bridges between the fundamental physics of novel materials and device applications for future information technology Both theoretical and experimental approaches are considered Quantum Dot Molecules can be recommended for electrical engineering and materials science department courses on the science and design of advanced and future electronic and optoelectronic devices

Contemporary Topics In Spintronics Supriyo Bandyopadhyay, Marc Cahay, Jean-pierre Leburton, 2017-02-02 The success of spintronics the science and technology of storing processing sensing and communicating information using the quantum mechanical spin degree of freedom of an electron is critically dependent on the ability to inject detect and manipulate spins in semiconductors either by incorporating ferromagnetic materials into device architectures or by using external magnetic and electric fields In spintronics the controlled generation and manipulation of spin polarization in nonmagnetic semiconductors is required for the design of spin sensitive devices ranging from spin qubit hosts quantum memory and gates quantum teleporters spin polarizers and filters spin field effect transistors and spin splitters among others One of the major challenges of spintronics is to control the creation manipulation and detection of spin polarized currents by purely electrical means Another challenge is to preserve spin coherence in a device for the longest time or over the longest distance in order to produce reliable spintronic processors These challenges remain daunting but some progress has been made recently in overcoming some of the steepest obstacles This book covers some of the recent advances in the field of spintronics using semiconductors

Control Theory in Physics and Other Fields of Science Michael Schulz, 2006-01-13 This book covers systematically and in a simple language the mathematical and physical foundations of controlling deterministic and stochastic evolutionary processes in systems with a high degree of complexity Strong emphasis is placed on concepts methods and techniques for modelling assessment and the solution or estimation of control problems in an attempt to understand the large variability of these problems in several branches of physics chemistry and biology as well as in technology and economics The main focus of the book is on a clear physical and mathematical understanding of the dynamics and kinetics behind several kinds of control problems and their relation to self organizing principles in complex systems The book is a modern introduction and a helpful tool for researchers engineers as well as post docs and graduate students interested in an application oriented control theory and related topics

Handbook of Nanophysics Klaus D. Sattler, 2010-09-17 Intensive research on fullerenes nanoparticles and quantum dots in the 1990s led to interest in nanotubes and nanowires in subsequent years Handbook of Nanophysics Nanotubes and Nanowires focuses on the fundamental physics and latest applications of these important nanoscale materials and structures Each peer reviewed chapter contains a broad

Quantum Materials,

Lateral Semiconductor Nanostructures, Hybrid Systems and Nanocrystals Detlef Heitmann, 2010-08-20

Semiconductor nanostructures are ideal systems to tailor the physical properties via quantum effects utilizing special growth techniques self assembling wet chemical processes or lithographic tools in combination with tuneable external electric and magnetic fields Such systems are called Quantum Materials The electronic photonic and phononic properties of these systems are governed by size quantization and discrete energy levels The charging is controlled by the Coulomb blockade The spin can be manipulated by the geometrical structure external gates and by integrating hybrid ferromagnetic emitters This book reviews sophisticated preparation methods for quantum materials based on III V and II VI semiconductors and a wide variety of experimental techniques for the investigation of these interesting systems It highlights selected experiments and theoretical concepts and gives such a state of the art overview about the wide field of physics and chemistry that can be studied in these systems

Parametric X-Ray Radiation in Crystals Vladimir G. Baryshevsky, Ilya D.

Feranchuk, Alexander P. Ulyanenko, 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

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 nuclear magnetic 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

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

Electronic Quantum Transport in Mesoscopic Semiconductor Structures Thomas Ihn, 2004-09-09 The physics of semiconductors has seen an enormous evolution within the last fifty years. Countless achievements have been made in scientific research and device applications have revolutionized everyday life. We have learned how to customize materials in order to tailor their optical as well as electronic properties. The ongoing trend toward device miniaturization has been the driving force on the application side and it has fertilized fundamental research. Nowadays advanced processing techniques allow the fabrication of sub-micron semiconductor structures in many university research laboratories. At the same time experiments down to millikelvin temperatures allow researchers to anticipate the observation of quantum phenomena so far hidden at room temperature by the large thermal energy and strong dephasing. The field of mesoscopic physics deals with systems under experimental conditions where several quantum length scales for electrons such as system size and phase coherence length or phase coherence length and elastic mean free path are comparable. Intense research over the last twenty years has revealed an enormous richness of quantum effects in mesoscopic semiconductor physics which is typically characterized by an interplay of quantum interference and many-body interactions. The most famous phenomena are probably the integer and fractional quantum Hall effects, the quantization of conductance through a quantum point contact, the Aharonov-Bohm effect and single electron charging of quantum dots.

X-Ray Diffuse Scattering from Self-Organized Mesoscopic Semiconductor Structures Martin Schmidbauer, 2004-01-09 This monograph represents a critical survey of the outstanding capabilities of X-ray diffuse scattering for the structural characterization of mesoscopic material systems. The mesoscopic regime comprises length scales ranging from a few up to some hundreds of nanometers. It is of particular relevance at semiconductor layer systems where, for example, interface roughness or low-dimensional objects such as quantum dots and quantum wires have attracted much interest. An extensive overview of the present state of the art theory of X-ray diffuse scattering at mesoscopic structures is given, followed by a valuable description of various experimental techniques. Selected up-to-date examples are discussed. The aim of the present book is to combine aspects of self-organized growth of mesoscopic structures with corresponding X-ray diffuse scattering experiments.

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