Quantum Magnetism Lecture Notes In Physics 645 Ba

WALLS AVERY

Fundamentals of Magnonics Springer Science & Business Media
"Quantum Theory of Magnetism" is the only book that deals with the phenomenon of magnetism from the point of view of "linear response". That is, how does a magnetic material respond when excited by a magnetic field? That field may be uniform, or spatially varying, static or time dependent. Previous editions have dealt primarily with the magnetic response. This edition incorporates the resistive response of magnetic materials as well. It also includes problems to test the reader's (or student's) comprehension. The rationale for a book on magnetism is as valid today as it was when the first two editions of Quantum Theory of Magnetism were published. Magnetic phenomena continue to be discovered with deep scientific implications and novel applications. Since the Second Edition, for example, Giant Magneto Resistance (GMR) was discovered and the new field of "spintronics" is currently expanding. Not only do these phenomena rely on the concepts presented in this book, but magnetic properties are often an important clue to our understanding of new materials (e.g., high-temperature superconductors). Their magnetic properties, studied by susceptibility measurements, nuclear magnetic resonance, neutron scattering, etc. have provided insight to the superconductivity state.This updated edition offers revised emphasis on some material as a result of recent developments and includes new material, such as an entire chapter on thin film magnetic multilayers. Researchers and students once again have access to an up-to-date classic reference on magnetism, the key characteristic of many modern materials.
Quantum Theory of Magnetism Springer Science & Business Media
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.
Characterizing Ground States of Low-dimensional Quantum Magnets Springer
This advanced level textbook is devoted to the description of systems which show ordered magnetic phases. A wide selection of topics is covered, including a detailed treatment of the mean-field approximation as the main paradigm for the phenomenological description of phase transitions. The book discusses the properties of low-dimensional systems and uses Green's functions extensively after a useful mathematical introduction. A thorough presentation of the RKKY and related models of indirect exchange is also featured, and a chapter on surface magnetism, rarely found in other textbooks, adds to the uniqueness of this book.For the second edition, three new chapters have been added, namely on magnetic anisotropy, on coherent magnon states and on local moments. Additionally, the chapter on itinerant magnetism has been enlarged by including a section on paramagnons.
Transport Studies of Quantum Magnetism World Scientific Publishing Company
This volume contains the edited lectures of the fourth Mittelwihr school on "Magnetism and Synchrotron Radiation". This series of events introduces graduate students and nonspecialists from related disciplines to the field of magnetism and magnetic materials with emphasis on synchrotron radiation as an experimental tool of investigation. These lecture notes present in particular the state of the art regarding the analysis of magnetic properties of new materials.
Control of Magnetotransport in Quantum Billiards Springer Nature
The physics of strongly interacting matter in an external magnetic field is presently emerging as a topic of great cross-disciplinary interest for particle, nuclear, astro- and condensed matter physicists. It is known that strong magnetic fields are created in heavy ion collisions, an insight that has made it possible to study a variety of surprising and intriguing phenomena that emerge from the interplay of quantum anomalies, the topology of non-Abelian gauge fields, and the magnetic field. In particular, the non-trivial topological configurations of the gluon field induce a non-dissipative electric current in the presence of a magnetic field. These phenomena have led to an extended formulation of relativistic hydrodynamics, called chiral magnetohydrodynamics. Hitherto unexpected applications in condensed matter physics include graphene and topological insulators. Other fields of application include astrophysics, where strong magnetic fields exist in magnetars and pulsars. Last but not least, an important new theoretical tool that will be revisited and which made much of the progress surveyed in this book possible is the holographic principle - the correspondence between quantum field theory and gravity in extra dimensions. Edited and authored by the pioneers and leading experts in this newly emerging field, this book offers a valuable resource for a broad community of physicists and graduate students.
Quantum Magnetism in LiHoF4 World Scientific Publishing Company
The superb book describes the modern theory of the magnetic properties of solids. Starting from fundamental principles, this copiously illustrated volume outlines the theory of magnetic behaviour, describes experimental techniques, and discusses current research topics. The book is intended for final year undergraduate students and graduate students in the physical sciences.
Quantum Magnetism Springer
Ruthenate materials have come into focus recently because of their very interesting magnetic and superconducting properties. From the first international conference on this topic, the present volume has emerged as a first coherent account of the considerable body of work, both theoretical and experimental, gathered in this field within a short time span. The book has been written in the form of a set of lectures and tutorial reviews with the aim of providing the research community with both a comprehensive and modern source of reference and a tutorial introduction for postgraduate students and nonspecialists working in related areas.
High Magnetic Fields Springer
This book is addressed to all scientists interested in the use of high magnetic ?elds and in the use of high-?eld facilities around the world. In particular it will help young scientists and newcomers to the topic to gain a better understanding in areas such as condensed matter physics, in which the magnetic ?eld plays a key role either as a parameter controlling the Hamiltonian, or as an experimental tool to probe the underlying mechanism. This concerns mostly strongly correlated and (or) low dimensional systems. Rather than covering all these subjects in detail, the philosophy here is to give essential physical concepts in some of the most active ?elds, which have been quickly growing in the last ten to twenty years. Besides its role as a physical parameter in condensed matter physics, a large magnetic ?eld is essential to Electron Paramagentic Resonance (EPR) and Nuclear Magnetic Resonance (NMR) spectroscopies. The state of art of high resolution NMRin liquids and

solids and high frequency EPRapplied to ?elds like chemistry and biology are also reviewed in this volume. The ?rst series of chapters is devoted to the integer and the Fractional Qu- tum Hall E?ects (FQHE) in two-dimensional electron systems. C. Glattli brushes an historical background and a comprehensive review of transport phenomena in these systems, including recent developments on the mesoscopic electronic transport at the edges of quantum Hall samples, chiral Luttinger liquids and fractional excitations. R.

Quantum Magnetism, Spin Waves, and Optical Cavities World Scientific

Covering the theory of computation, information and communications, the physical aspects of computation, and the physical limits of computers, this text is based on the notes taken by one of its editors, Tony Hey, on a lecture course on computation given b

Classical Electrodynamics Springer Science & Business Media

This primer thoroughly covers the fundamentals needed to understand the interaction of light with magnetically ordered matter and it focuses on "cavity optomagnonics" which is a topic undergoing intense study in current research. The book is unique in combining elements of electromagnetism, quantum magnetism, and quantum optics and it is intended for advanced undergraduate or graduate students.

The Quantum Theory of Magnetism Springer

The topic of lattice quantum spin systems is a fascinating and by now well established branch of theoretical physics. Based on a set of lectures, this book has a level of detail missing from others, and guides the reader through the fundamentals of the field.

Lecture Notes on Field Theory in Condensed Matter Physics Springer Science & Business Media

This bookis based on some of the lectures duringthe Paci?c Institute of Theoretical Physics (PITP) summer school on “Quantum Magnetism”, held during June 2006 in Les Houches, in the French Alps. The school was funded jointly by NATO, the CNRS, and PITP, and entirely organized by PITP. Magnetism is a somewhat peculiar research ?eld. It clearly has a quant- mechanical basis – the microscopic exchange interactions arise entirely from the exclusion principle, in conjunction with repulsive interactions between electrons. And yet until recently the vast majority of magnetism researchersand users of m- netic phenomena around the world paid no attention to these quantum-mechanical roots. Thus, e.g., the huge ($400 billion per annum) industry which manufactures hard discs, and other components in the information technology sector, depends entirely on room-temperature properties of magnets – yet at the macroscopic or mesoscopic scales of interest to this industry, room-temperature magnets behave entirely classically.

Methods in the Quantum Theory of Magnetism Springer Science & Business Media

Readership: Graduate students and researchers in condensed matter physics.

Quantum Magnetism and Strongly Correlated Electrons in Low Dimensions Springer

The study of frustration in quantum magnetism has been the focus of extensive research in the past couple of decades. The class of materials in this category is typically strongly correlated, due to strong electron-electron repulsion. In one- and two-dimensions, quantum fluctuations dominate these systems, and often, semi-classical approximations become an oversimplification. This thesis is concerned with exploring exotic physics that can emerge in low-dimensional quantum magnets. First, we use a T = 0 projected Monte Carlo algorithm in the valence bond basis to study the entanglement scaling of two-dimensional (2d) gapless systems. In particular, we focus on the resonating-valence-bond wavefunction as well as the gapless Goldstone mode in the Heisenberg model on the square lattice. We find that, in addition to the area law, there is a subleading, shape-dependent piece to the entanglement entropy, which is reminiscent of one dimensional (1d) gapless systems. We then explore the Heisenberg model under an applied magnetic field on the quasi-1d problem of a three-leg triangular spin tube (TST), using extensive density-matrix-renormalization group calculations coupled with analytical arguments to describe the results. We find that the physics describing this model differs from some of the well-known results on the two dimensional lattice, especially near low magnetic fields and at 1/3 magnetization. Finally, further research and possibilities in numerical techniques are discussed.

Ruthenate and Rutheno-Cuprate Materials Addison-Wesley Longman

The main goal of this project was to understand novel ground states of spin systems probed by thermal and electrical transport measurements. They are well-suited to characterize the nature of low-energy excitations as unique property of the ground state. More specifically, it was aimed to study the transverse electrical conductivity in the presence of non-collinear and non-coplanar spin ordering and the effects of gauge field as well as novel spin excitations as a coherent heat transport channel in insulating quantum magnets. Most of works done during the grant period focused on these topics. As a natural extension of the project's initial goals, the scope was broadened to include transport studies on the spin systems with strong spin-orbit coupling. One particular focus was an exploration of systems with strong magnetic anisotropy combined with non-trivial spin configuration. Magnetic anisotropy is directly related to implement the non-collinear spin ordering to the existing common geometry of planar devices and thus poses a significant potential. Work in this direction includes the comparison of the topological Hall signal under hydrostatic pressure and chemical doping, as well as the angular dependence dependence of the non-collinear spin ordered phase and their evolution up on temperature and field strength. Another focus was centered around the experimental identification of spin-originated heat carrying excitation in quasi two dimensional honeycomb lattice, where Kitaev type of quantum spin liquid phase is expected to emerge. In fact, when its long range magnetic order is destroyed by the applied field, we discovered anomalously large enhancement of thermal conductivity, for which proximate Kitaev excitations in field-induced spin liquid state are responsible for. This work, combined with further investigations in materials in the similar class may help establish the experimental characterization of new quantum spin liquid and their unique low energy excitation, e.g. Majorana fermions.

Lecture Notes on Electron Correlation and Magnetism Springer

This book, a collection of works by leading figures in the field, is devoted to the latest developments of modern magnetism including micromagnetism, nanomagnetic materials, magnetic multilayers, macroscopic quantum magnetism, rare-earth intermetallic compounds, giant magnetoresistance, and their applications. Some new concepts and theories are also included for a better understanding of these novel phenomena.This book can be used as an advanced text book on magnetism and materials science for graduate students in physics and materials science departments. It is also useful as a research reference for condensed matter physicists and materials scientists.

Quantum Magnetism Springer

This book is a very comprehensive textbook covering in great depth all the electricity and magnetism. The 2nd edition includes new and revised figures and exercises in many of the chapters, and the number of problems and exercises for the student is increased. In the 1st edition, emphasis much was made of superconductivity, and this methodology will be continued in the new edition by strengthening of the E-B analogy. Many of the new exercises and problems are associated with the E-B analogy, which enables those teaching from the book to select suitable teaching methods depending on the student’s ability and courses taken, whether physics, astrophysics, or engineering. Changes in the chapters include a detailed discussion of the equivector-potential surface and its correspondence between electricity and magnetism. The shortcomings of using the magnetic scalar potential are also explained. The zero resistivity in a magnetic material showing perfect diamagnetism can be easily proved. This textbook is an ideal text for students, who are competent in calculus and are taking physics, astrophysics, or engineering at degree level. It is also useful as a reference book for the professional scientist.

Domains of Quantum Magnetism OUP Oxford

Closing a gap in the literature, this volume is intended both as an introductory text at postgraduate level and as a modern, comprehensive reference for researchers in the field. Provides a full working description of the main fundamental tools in the theorists toolbox which have proven themselves on the field of quantum magnetism in recent years. Concludes by focusing on the most important cuurent materials form an experimental viewpoint, thus linking back to the initial theoretical concepts.

Aspects Of Modern Magnetism - Lecture Notes Of The Eighth Chinese International Summer School Of Physics Springer

The field of highly frustrated magnetism has developed considerably and expanded over the last 15 years. Issuing from canonical geometric frustration of interactions, it now extends over other aspects with many degrees of freedom such as magneto-elastic couplings, orbital degrees of freedom, dilution effects, and electron doping. Its is thus shown here that the concept of frustration impacts on many other fields in physics than magnetism. This book represents a state-of-the-art review aimed at a broad audience with tutorial chapters and more topical ones, encompassing solid-state chemistry, experimental and theoretical physics.

Magnetism and Synchrotron Radiation World Scientific

Fundamentals of Magnonics is a textbook for beginning graduate students in the areas of magnetism and spintronics. The level of presentation assumes only basic knowledge of the origin of magnetism and electromagnetism, and quantum mechanics. The book utilizes elementary mathematical derivations, aimed mainly at explaining the physical concepts involved in the phenomena studied and enabling a deeper understanding of the experiments presented. Key topics include the basic phenomena of ferromagnetic resonance in bulk materials and thin films, semi-classical theory of spin waves, quantum theory of spin waves and magnons, magnons in antiferromagnets, parametric excitation of magnons, nonlinear and chaotic phenomena, Bose-Einstein condensation of magnons, and magnon spintronics. Featuring end-of-chapter problem sets accompanied by extensive contemporary and historical references, this book provides the essential tools for any graduate or advanced undergraduate-level course of studies on the emerging field of magnonics.