

Magnetization Oscillations *and* Waves



A.G. Gurevich
G.A. Melkov

Magnetization Oscillations And Waves Magnetization Oscillations And Waves

Sergej O. Demokritov



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Magnetization Oscillations and Waves Alexander G. Gurevich, Gennadii A. Melkov, 1996 Written by two well known researchers in the field this useful reference takes an applied approach to high frequency processes including oscillations and waves in ferromagnets antiferromagnets and ferrimagnets Problems evaluated include ferromagnetic and antiferromagnetic resonances spin waves nonlinear processes and high frequency manifestations of interactions between the magnetic system and other systems of magnetically ordered substances as elastic waves and charge carriers Unlike previous monographs on this subject which are highly theoretical and written for very advanced readers this book requires only an average college background in mathematics and experimental physics It will be a valuable addition to the library of engineers and scientists in research and development for communications applications and scientists interested in nonlinear magnetic phenomena It also serves as an excellent introduction to the topic for newcomers in the field *Magnetization Oscillations and Waves* not only presents results but also shows readers how to obtain them most formulas are derived with so many details that readers can reproduce them The book includes many summaries and tables and detailed references to significant work in the area by European researchers **Magnetization Oscillations And Waves** A.G. Gurevich, 1996

Modern Nonlinear Optics, Volume 119, Part 2 Myron W. Evans, 2004-08-04 The new edition will provide the sole comprehensive resource available for non linear optics including detailed descriptions of the advances over the last decade from world renowned experts *Spin Dynamics in Confined Magnetic Structures II* Burkard Hillebrands, Kamel Ounadjela, 2003-03-12 This second volume of the book on spin dynamics in confined magnetic structures covers central aspects of spin dynamic phenomena so that researchers can find a comprehensive compilation of the current work in the field Introductory chapters help newcomers to understand the basic concepts and the more advanced chapters give the current state of the art for most spin dynamic issues in the milliseconds to femtoseconds range Both experimental techniques and theoretical work are discussed The comprehensive presentation of these developments makes this volume very timely and valuable for every researcher working in the field of magnetism It describes the new experimental techniques which have advanced this field very rapidly Among the techniques covered particular attention is given to those involving high temporal elemental and spatial resolution as well as to techniques involving magnetic field pulses with very short rise times and durations **Spintronics Handbook, Second Edition: Spin Transport and Magnetism** Evgeny Y. Tsymbal, Igor Žutić, 2019-05-09 Spintronics Handbook Second Edition offers an update on the single most comprehensive survey of the two intertwined fields of spintronics and magnetism covering the diverse array of materials and structures including silicon organic semiconductors carbon nanotubes graphene and engineered nanostructures It focuses on seminal pioneering work together with the latest in cutting edge advances notably extended discussion of two dimensional materials beyond graphene topological insulators skyrmions and molecular spintronics The main sections cover physical phenomena spin dependent

tunneling control of spin and magnetism in semiconductors and spin based applications

Nonlinear Magnetization

Dynamics in Nanosystems Isaak D. Mayergoyz, Giorgio Bertotti, Claudio Serpico, 2009-04-20 As data transfer rates increase within the magnetic recording industry improvements in device performance and reliability crucially depend on the thorough understanding of nonlinear magnetization dynamics at a sub nanoscale level This book offers a modern stimulating approach to the subject of nonlinear magnetization dynamics by discussing important aspects such as the Landau Lifshitz Gilbert LLG equation analytical solutions and the connection between the general topological and structural aspects of dynamics An advanced reference for the study and understanding of nonlinear magnetization dynamics it addresses situations such as the understanding of spin dynamics in short time scales and device performance and reliability in magnetic recording Topics covered include nonlinear magnetization dynamics and the Landau Lifshitz Gilbert equation nonlinear dynamical systems spin waves ferromagnetic resonance and pulsed magnetization switching The book explains how to derive exact analytical solutions for the complete nonlinear problem and emphasises the connection between the general topological and structural aspects of nonlinear magnetization dynamics and the discretization schemes better suited to its numerical study It is an exceptional research tool providing an advanced understanding of the study of magnetization dynamics in situations of fundamental and technological interest

Magnetism of Surfaces, Interfaces, and Nanoscale Materials

Robert E. Camley, Zbigniew Celinski, Robert L. Stamps, 2015-10-27 In the past 30 years magnetic research has been dominated by the question of how surfaces and interfaces influence the magnetic and transport properties of nanostructures thin films and multilayers The research has been particularly important in the magnetic recording industry where the giant magnetoresistance effect led to a new generation of storage devices including hand held memories such as those found in the ipod More recently transfer of spin angular momentum across interfaces has opened a new field for high frequency applications This book gives a comprehensive view of research at the forefront of these fields The frontier is expanding through dynamic exchange between theory and experiment Contributions have been chosen to reflect this giving the reader a unified overview of the topic Addresses both theory and experiment that are vital for gaining an essential understanding of topics at the interface between magnetism and materials science Chapters written by experts provide great insights into complex material Discusses fundamental background material and state of the art applications serving as an indispensable guide for students and professionals at all levels of expertise Stresses interdisciplinary aspects of the field including physics chemistry nanocharacterization and materials science Combines basic materials with applications thus widening the scope of the book and its readership

Magnetism and Synchrotron Radiation: Towards the Fourth Generation Light Sources Eric Beaurepaire, Hervé Bulou, Loïc Joly, Fabrice Scheurer, 2013-11-26 Advances in the synthesis of new materials with often complex nano scaled structures require increasingly sophisticated experimental techniques that can probe the electronic states the atomic magnetic moments and the magnetic microstructures responsible for the properties of these materials At

the same time progress in synchrotron radiation techniques has ensured that these light sources remain a key tool of investigation e g synchrotron radiation sources of the third generation are able to support magnetic imaging on a sub micrometer scale With the Sixth Mittelwihr School on Magnetism and Synchrotron Radiation the tradition of teaching the state of the art on modern research developments continues and is expressed through the present set of extensive lectures provided in this volume While primarily aimed at postgraduate students and newcomers to the field this volume will also benefit researchers and lecturers actively working in the field

Magnonics Sergej O. Demokritov, Andrei N.

Slavin, 2012-08-15 Spin waves and their quanta magnons can effectively carry and process information in magnetic nanostructures By analogy to photonics this research field is labelled magnonics It comprises the study of excitation detection and manipulation of magnons From the practical point of view the most attractive feature of magnonic devices is the controllability of their functioning by an external magnetic field This book has been designed for students and researchers working in magnetism Here the readers will find review articles written by leading experts working on realization of magnonic devices

Magnetism Etienne du Trémolet de Lacheisserie, Damien Gignoux, Michel

Schlenker, 2012-12-06 This book deals with the basic phenomena that govern the magnetic properties of matter with magnetic materials and with the applications of magnetism in science technology and medicine It is the collective work of twenty one scientists most of them from Laboratoire Louis Neel du CNRS in Grenoble France The original version in French was edited by Etienne du Trémolet de Lacheisserie and published in 1999 The present version involves beyond the translation many corrections and complements

Spin Wave Confinement Sergej O. Demokritov, 2017-09-07 Since the publication of

the first edition of Spin Wave Confinement the magnetic community's interest in dynamic excitations in magnetic systems of reduced dimensions has been increasing Although the concept of spin waves and their quanta magnons as propagating excitation of magnetic media was introduced more than 80 years ago this field has been repeatedly bringing us fascinating new physical phenomena The successful development of magnonics as an emerging subfield of spintronics which considers confined spin waves as a basis for smaller faster more robust and more power efficient electronic devices inevitably demands reduction in the sizes and dimensions of the magnetic systems being studied The unique features of magnons including the possibility of carrying spin information over relatively long distances the possibility of achieving submicrometer wavelength at microwave frequencies and controllability by electronic signal via magnetic fields make magnonic devices distinctively suited for implementation of novel integrated electronic schemes characterized by high speed low power consumption and extended functionalities Edited by S O Demokritov a prominent magnonics researcher who has successfully collected the results of cutting edge research by almost all main players in the field this book is for everyone involved in nanotechnology spintronics magnonics and nanomagnetism

Three-Dimensional Magnonics Gianluca Gubbiotti, 2019-07-10 Magnonics

a research field that uses spin waves collective excitations of ordered magnetic materials or magnons their quanta as a tool

for signal processing communication and computation has rapidly grown during the past decade because of the low energy consumption and potential compatibility with next generation circuits beyond CMOS electronics The interest in 3D magnonic nanostructures follows the latest trend in conventional electronics based on expansion from 2D planar to 3D vertically integrated structures To remain on the same technological level a similar expansion should be realized in magnonics Following this trend this book provides an overview of recent developments in the exploitation of the third dimension in magnonics with special focus on the propagation of spin waves in layered magnonic crystals spin textures curved surfaces 3D nano objects and cavity magnonics

Fundamentals of Magnonics Sergio M. Rezende, 2020-07-31 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

Handbook of Nanomagnetism Rosa A. Lukaszew, 2015-10-06 This unique handbook compiles and details cutting edge research in nanomagnetism and its applications in spintronics magnetoplasmonics and nonlinear magneto optics Fundamental aspects of magnetism relevant to nanodevices and new spin transfer torque random access memory STT RAM current induced domain wall motion memory and spin torque oscill

Optomagnonic Structures: Novel Architectures For Simultaneous Control Of Light And Spin Waves Evangelos Almpanis, 2021-01-18 Understanding controlling and more importantly enhancing the interaction between light photons and spin waves magnons can be among others a step towards the realization of magnon mediated microwave to optical transducers for quantum computing applications or hybrid solid state spintronic photonic interconnections In this respect the development of novel composite multifunctional micro nanostructures so called optomagnonic which simultaneously control optical and spin waves and enhance their interaction is particularly attractive This book constitutes a collective work comprising seven chapters from leading researchers in the field of optomagnonics and related areas Apart from exciting recent developments it provides the necessary fundamental knowledge in an explanatory manner and therefore it is accessible to non experts It is suitable for PhD students post docs and researchers who are willing to get engaged in optomagnonics while selected parts could also serve as lecture material for advanced courses With increasing demand for miniaturized optomagnonic devices this book will be an important resource to researchers working on optomagnonics

magneto optics spintronics as well as on hybrid micro nano devices for information processing

Magnetic Nanoparticles in Nanomedicine Kai Wu, Jian-Ping Wang, 2024-06-04 Magnetic Nanoparticles in Nanomedicine provides readers with the fundamental theories and principles of magnetic materials the synthesis and surface functionalization strategies of MNPs and the standard techniques for characterizing physicochemical properties of MNPs Other sections review MNP based therapies such as magnetic hyperthermia therapy drug gene delivery and magnetic neurostimulation and cover MNP based in vitro and in vivo disease diagnosis respectively including techniques such as magnetoresistive MR nuclear magnetic resonance NMR magnetic particle spectroscopy MPS biosensing platforms magnetic resonance imaging MRI and magnetic particle imaging MPI Final chapters address biocompatibility and safety issues in applying MNPs to in vivo biomedical applications including coverage of the toxicity of MNPs to human tissues the immune responses of the human body to these particles as well as blood circulation time of MNPs Provides a valuable tool for academics and clinicians pushing the frontiers of magnetic based early stage disease diagnosis and screening Clearly explains the synthesis functionalization and biocompatibility of magnetic nanoparticles Describes micromagnetic simulation a valuable tool for predicting the properties of magnetic nanomaterials

Inorganic and Organic Thin Films Yujun Song, 2021-04-21 Learn more about foundational and advanced topics in polymer thin films and coatings besides species with this powerful two volume resource The two volume Inorganic and Organic Thin Films Fundamentals Fabrication and Applications delivers a foundational resource for current researchers and commercial users involved in the design and fabrication of thin films The book offers newcomers to the field a thorough description of new design theory fabrication methods and applications of advanced thin films Readers will discover the physics and chemistry underlying the manufacture of new thin films and coatings in this leading new resource that promises to become a handbook for future applications of the technology This one stop reference brings together all important aspects of inorganic and polymeric thin films and coatings including construction assembly deposition functionality patterning and characterization Explorations of their applications in industries as diverse as information technology new energy biomedical engineering aerospace and oceanographic engineering round out this fulsome exploration of one of the most exciting and rapidly developing areas of scientific and industrial research today Readers will also learn from A comprehensive introduction to the progress of thin films and coatings as well as fundamentals in functional thin films and coatings An exploration of multi layered magnetic thin films for electron transport control and signal sensing including giant magnetoresistance colossal magnetoresistance tunneling magnetoresistance and the quantum anomalous Holzer effect An in time summary of high quality magneto optics nanophotonics spin waves and spintronics using bismuth substituted iron garnet thin films as examples A thorough discussion of template assisted fabrication of nanostructure thin films for ultrasensitive detection of chemicals and biomolecules A treatment of biomass derived functional films and coatings Perfect for materials scientists and inorganic chemists Inorganic and Organic Thin Films will also earn a place in the libraries of solid

state physicists and physical chemists working in private industry as well as polymer and surface chemists who seek to improve their understanding of thin films and coatings **Ferromagnetic Resonance** S. V. Von Sovskii, 2016-06-06

Ferromagnetic Resonance The Phenomenon of Resonant Absorption of a High Frequency Magnetic Field in Ferromagnetic Substances is a collection of papers on the basic theory of ferromagnetic resonance The book discusses the theory of ferromagnetic resonance in detail and the investigations and treatments of problems in this theory The text consists of nine chapters covering such topics as the linear approximation of ferromagnetic resonance non linear processes occurring during ferromagnetic resonance in ferromagnetic semiconductor the spin wave theory of ferro and antiferromagnetism and its application to the problem of ferromagnetic resonance and the theory of the line width of the resonance absorption of the energy of a UHF field in ferromagnetics Physicists will find the book very useful **Modern Ferrites, Volume 2** Vincent G. Harris, 2022-11-14

MODERN FERRITES Volume 2 A robust exploration of the basic principles of ferrimagnetic and their applications In **Modern Ferrites Volume 2** renowned researcher and educator Vincent G Harris delivers a comprehensive overview of ferrimagnetic phenomena and discussions of select applications of modern ferrite materials in emerging technologies and applications Volume 2 explores fundamental properties of ferrite systems including their structure chemistry and magnetism as well as practical applications such as permanent magnets inductors inverters and filters and their use in emerging applications as metamaterials multiferroics and biomedical technologies In addition to the properties of ferrites the included resources explore the processing structure and property relationships in ferrites as nanoparticles thin and thick films compacts and crystals The authors discuss how these relationships are key to realizing practical device applications laying the foundation for next generation communications radar sensing and biomedical technologies This volume includes A comprehensive review of ferrite discoveries and impacts upon ancient cultures their scientific evolution and societal benefits Discussion of the origins of magnetism in ferrimagnetic oxides including superexchange theory GKA rules and recent developments in density functional theory In depth examination of ferrite power conversion and conditioning components and their processing as low temperature co fired ceramics Ferrite based electromagnetic interference suppression and electromagnetic absorption Nonlinear microwave devices multiferroic and emerging magnetoelectric devices Biomedical applications of ferrite nanoparticles Perfect for RF engineers and magneticians working in the fields of RF electronics radar communications and spintronics as well as other emerging technologies **Modern Ferrites** will earn a place on the bookshelves of engineers and scientists interested in the ever expanding technologies reliant upon ferrite materials and new processing methodologies **Modern Ferrites Volume 1 Basic Principles Processing and Properties** is also available ISBN 9781118971468 **Electromagnetic Metamaterials** Kazuaki Sakoda, 2019-09-09 This book presents novel and fundamental aspects of metamaterials which have been overlooked in most previous publications including chirality non reciprocity and the Dirac cone formation It also describes the cutting edge achievements of experimental studies in the last

several years the development of high regularity metasurfaces in optical frequencies high performance components in the terahertz range and active chiral nonlinear and non reciprocal metamaterials in the microwave range Presented here are unique features such as tunable metamaterials based on the discharge plasma selective thermal emission from plasmonic metasurfaces and the classical analogue of the electromagnetically induced transparency These most advanced research achievements are explained in understandable terms by experts in each topic The descriptions with many practical examples facilitate learning and not only researchers and experts in this field but also graduate students can read the book without difficulty The reader finds how these new concepts and new developments are being utilized for practical applications

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Magnetization Oscillations And Waves Magnetization Oscillations And Waves Introduction

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