

Soliton Management in Periodic Systems

Boris A. Malomed

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D Siedentop

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Soliton Management In Periodic Systems:

Soliton Management in Periodic Systems Boris A. Malomed, 2006-07-06 During the past ten years there has been intensive development in theoretical and experimental research of solitons in periodic media This book provides a unique and informative account of the state of the art in the field The volume opens with a review of the existence of robust solitary pulses in systems built as a periodic concatenation of very different elements Among the most famous examples of this type of systems are the dispersion management in fiber optic telecommunication links and more recently photonic crystals A number of other systems belonging to the same broad class of spatially periodic strongly inhomogeneous media such as the split step and tandem models have recently been identified in nonlinear optics and transmission of solitary pulses in them was investigated in detail Similar soliton dynamics occurs in temporal domain counterparts of such systems where they are subject to strong time periodic modulation for instance the Feshbach resonance management in Bose Einstein condensates Basis results obtained for all these systems are reviewed in the book This timely work will serve as a useful resource for the soliton community

Soliton Management in Periodic Systems Boris A. Malomed, 2008-11-01 During the past ten years there has been intensive development in theoretical and experimental research of solitons in periodic media This book provides a unique and informative account of the state of the art in the field The volume opens with a review of the existence of robust solitary pulses in systems built as a periodic concatenation of very different elements Among the most famous examples of this type of systems are the dispersion management in fiber optic telecommunication links and more recently photonic crystals A number of other systems belonging to the same broad class of spatially periodic strongly inhomogeneous media such as the split step and tandem models have recently been identified in nonlinear optics and transmission of solitary pulses in them was investigated in detail Similar soliton dynamics occurs in temporal domain counterparts of such systems where they are subject to strong time periodic modulation for instance the Feshbach resonance management in Bose Einstein condensates Basis results obtained for all these systems are reviewed in the book This timely work will serve as a useful resource for the soliton community

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Vortex Structures in Fluid Dynamic Problems Hector Perez-De-Tejada, 2017-03-01 The contents of the book cover topics on vortex dynamics in a variety of flow problems and describe observational measurements and their interpretation The book contains 13 chapters that first include vortices in the earth and planetary sciences related to vortices in the Venus plasma wake and also on tropical cyclones and on rotating shallow water in the earth's atmosphere Vortices in fluid problems

include airplane wake vortices vorticity evolution in free shear flows together with axisymmetric flows with swirl as well as thermal conductivities in fluid layers Vortices in relativistic fluids in magnetic disks solitons and vortices and relaxation for point vortices were also examined Other chapters describe conditions in a vortex bioreactor and in vortex yarn structures

Generalized Models and Non-classical Approaches in Complex Materials 2 Holm Altenbach,Joël Pouget,Martine Rousseau,Bernard Collet,Thomas Michelitsch,2018-06-26 This book is the 2nd special volume dedicated to the memory of G rard Maugin Over 30 leading scientists present their contribution to reflect the vast field of scientific activity of G rard Maugin The topics of contributions employing often non standard methods generalized model in this volume show the wide range of subjects that were covered by this exceptional scientific leader The topics range from micromechanical basics to engineering applications focusing on new models and applications of well known models to new problems They include micro macro aspects computational efforts possibilities to identify the constitutive equations and old problems with incorrect or non satisfying solutions based on the classical continua assumptions Handbook of Applications of Chaos Theory Christos H. Skiadas,Charilaos Skiadas,2017-12-19 In addition to explaining and modeling unexplored phenomena in nature and society chaos uses vital parts of nonlinear dynamical systems theory and established chaotic theory to open new frontiers and fields of study Handbook of Applications of Chaos Theory covers the main parts of chaos theory along with various applications to diverse areas Expert contributors from around the world show how chaos theory is used to model unexplored cases and stimulate new applications Accessible to scientists engineers and practitioners in a variety of fields the book discusses the intermittency route to chaos evolutionary dynamics and deterministic chaos and the transition to phase synchronization chaos It presents important contributions on strange attractors self exciting and hidden attractors stability theory Lyapunov exponents and chaotic analysis It explores the state of the art of chaos in plasma physics plasma harmonics and overtone coupling It also describes flows and turbulence chaotic interference versus decoherence and an application of microwave networks to the simulation of quantum graphs The book proceeds to give a detailed presentation of the chaotic rogue and noisy optical dissipative solitons parhelic like circle and chaotic light scattering and interesting forms of the hyperbolic prism the Poincaré disc and foams It also covers numerous application areas from the analysis of blood pressure data and clinical digital pathology to chaotic pattern recognition to economics to musical arts and research **Nonlinear Optical Cavity Dynamics** Philippe Grelu,2015-12-23 By recirculating light in a nonlinear propagation medium the nonlinear optical cavity allows for countless options of light transformation and manipulation In passive media optical bistability and frequency conversion are central figures In active media laser light can be generated with versatile underlying dynamics Emphasizing on ultrafast dynamics the vital arena for the information technology the soliton is a common conceptual keyword thriving into its modern developments with the closely related denominations of dissipative solitons and cavity solitons Recent technological breakthroughs in optical cavities from micro resonators to ultra long fiber cavities have entitled the exploration

of nonlinear optical dynamics over unprecedented spatial and temporal orders of magnitude By gathering key contributions by renowned experts this book aims at bridging the gap between recent research topics with a view to foster cross fertilization between research areas and stimulating creative optical engineering design **Nonlinear Waves** Emmanuel Kengne, WuMing Liu, 2023-02-23 This book highlights the methods to engineer dissipative and magnetic nonlinear waves propagating in nonlinear systems In the first part of the book the authors present methodologically mathematical models of nonlinear waves propagating in one and two dimensional nonlinear transmission networks without with dissipative elements Based on these models the authors investigate the generation and the transmission of nonlinear modulated waves in general and solitary waves in particular in networks under consideration In the second part of the book the authors develop basic theoretical results for the dynamics matter wave and magnetic wave solitons of nonlinear systems and of Bose Einstein condensates trapped in external potentials combined with the time modulated nonlinearity The models treated here are based on one two and three component non autonomous Gross Pitaevskii equations Based on the Heisenberg model of spin spin interactions the authors also investigate the dynamics of magnetization in ferromagnet with or without spin transfer torque This research book is suitable for physicists mathematicians engineers and graduate students in physics mathematics and network and information engineering **Progress in Optics** Emil Wolf, 2009-07-20 In the forty eight years that have gone by since the first volume of Progress in Optics was published optics has become one of the most dynamic fields of science The volumes in this series which have appeared up to now contain more than 300 review articles by distinguished research workers which have become permanent records for many important developments 3D optical microscopy Transformation optics and geometry of light Photorefractive solitons Stimulated scattering effects Optical vortices and polarization singularities Quantum feedforward control of light **Advances in Precision Laser Spectroscopy** Kelin Gao, Wuming Liu, Jianping Yin, Jin Wang, Mingsheng Zhan, 2022-06-21 Provides extensive and thoroughly exhaustive coverage of precision laser spectroscopy Presents chapters written by recognized experts in their individual fields Topics covered include cold atoms cold molecules methods and techniques for production of cold molecules optical frequency standards based on trapped single ions etc Applicable for researchers and graduate students of optical physics and precision laser spectroscopy **The Defocusing Nonlinear Schrödinger Equation** Panayotis G. Kevrekidis, Dimitri J. Frantzeskakis, Ricardo Carretero-González, 2015-08-04 Bose Einstein condensation is a phase transition in which a fraction of particles of a boson gas condenses into the same quantum state known as the Bose Einstein condensate BEC The aim of this book is to present a wide array of findings in the realm of BECs and on the nonlinear Schrödinger type models that arise therein The Defocusing Nonlinear Schrödinger Equation is a broad study of nonlinear excitations in self defocusing nonlinear media It summarizes state of the art knowledge on the defocusing nonlinear Schrödinger type models in a single volume and contains a wealth of resources including over 800 references to relevant articles and monographs and a meticulous index for ease of navigation

Optical Solitons in Fibers Akira Hasegawa, Masayuki Matsumoto, 2012-11-02 Optical solitons in fibers are a beautiful example of how an abstract mathematical concept has had an impact on new information transmission technologies. The concept of all optical data transmission with optical soliton systems is now setting the standard for the most advanced transmission systems. The book deals with the motion of light waves in optical fibers, the evolution of light wavepackets, optical information transfer, all optical soliton transmission systems, the control of optical solitons, polarization effects, dispersion managed solitons, WDM transmission, soliton lasers, all optical switching, and other applications. This book is a must for all researchers and graduate students active in the field of optical data transmission. *New Trends in Optical Soliton Transmission Systems* Akira Hasegawa, 2012-12-06 This book summarizes the proceedings of the invited talks presented at the International Symposium on New Trends in Optical Soliton Transmission Systems held in Kyoto during November 18-21, 1997. As a result of worldwide demand for ultra-high bitrate transmissions and increased scientific interest from the soliton community, research on optical solitons in fibres has made remarkable progress in recent years. In view of these trends, the Research Group for Optical Soliton Communications (ROSC), chaired by Akira Hasegawa, was established in Japan in April 1995 to promote collaboration and information exchange among communication service companies, industries, and academic circles in the theory and application of optical solitons. This symposium was organized as a part of the ROSC activities. As with the 1st ROSC symposium, this symposium attracted enthusiastic response from worldwide researchers involved in the subject of soliton-based communications, and intensive discussions were held throughout the symposium. Particular emphases were made to dispersion management of soliton transmission. I would like to note that in the 2nd symposium, the adiabatic dispersion management just began to appear in reducing radiation at amplifiers and reducing collision effects in WDM systems. These have become standard this time, but in addition, new non-adiabatic dispersion management has been introduced independently by various scientists all over the world.

Continuous Symmetries and Integrability of Discrete Equations Decio Levi, Pavel Winternitz, Ravil I. Yamilov, 2023-01-23 This book on integrable systems and symmetries presents new results on applications of symmetries and integrability techniques to the case of equations defined on the lattice. This relatively new field has many applications, for example, in describing the evolution of crystals and molecular systems defined on lattices and in finding numerical approximations for differential equations preserving their symmetries. The book contains three chapters and five appendices. The first chapter is an introduction to the general ideas about symmetries, lattices, differential difference and partial difference equations, and Lie point symmetries defined on them. Chapter 2 deals with integrable and linearizable systems in two dimensions. The authors start from the prototype of integrable and linearizable partial differential equations, the Korteweg-de Vries and the Burgers equations. Then they consider the best-known integrable differential difference and partial difference equations. Chapter 3 considers generalized symmetries and conserved densities as integrability criteria. The appendices provide details which may help the readers' understanding of the subjects presented.

in Chapters 2 and 3 This book is written for PhD students and early researchers both in theoretical physics and in applied mathematics who are interested in the study of symmetries and integrability of difference equations

Optical Solitons: Theoretical Challenges and Industrial Perspectives Vladimir E. Zakharov, Stefan Wabnitz, 2013-04-17 1 2 V E Zakharov and S Wabnitz 1 L D Landau Institute for Theoretical Physics 2 Kosygin Str 117334 Moscow Russia 2 Laboratoire de Physique University of Bourgogne 9 avenue A Savary 21078 Dijon France After about a quarter of a century since the first theoretical predictions of optical solitons the industrial application of the optical soliton concept is near to reality in the booming field of modern telecommunications where the demand for high speed data transmission and routing is of ever growing This book contains a set of lectures that were presented at a Les Houches school on optical solitons in September 1998 The school was successful in gathering among the lecturers most of the well recognized world leaders in the field of optical solitons A variety of different aspects of research into optical solitons was exposed in the lectures ranging from the mathematical foundations of integrability theory to the rapidly evolving technological advances of fiber soliton based telecommunication systems The overall impression that the participants and the students received from the school is that this field of research is an excellent example of the rapid transfer that occurs nowadays from basic science to the technological implementations of the first principles The subjects that were covered by the lectures can be broadly grouped into four main categories optical soliton theory fiber soliton telecommunications optical soliton generation methods and all optical information processing via spatial solitons

Massive WDM and TDM Soliton Transmission Systems Akira Hasegawa, 2006-04-11 This book summarizes the proceedings of the invited talks presented at the International Symposium on Massive TDM and WDM Optical Soliton Transmission Systems held in Kyoto during November 9-12 1999 The symposium is the third of the series organized by Research Group for Optical Soliton Communications ROSC chaired by Akira Hasegawa The research group ROSC was established in Japan in April 1995 with a support of the Japanese Ministry of Post and Telecommunications to promote collaboration and information exchange among communication service companies communication industries and academic circles in the theory and application of optical solitons The symposium attracted enthusiastic response from worldwide researchers in the field of soliton based communications and intensive discussions were made In the symposium held in 1997 new concept of soliton transmission based on dispersion management of optical fibers were presented This new soliton is now called the dispersion managed soliton The present symposium mainly focuses the theoretical and experimental developments of dispersion managed solitons It is remarkable that the concept of the dispersion managed soliton which was just born two years ago when the naming was not even given yet has become the center of soliton research in two years The dispersion managed soliton has an enhanced power in maintaining reasonable signal to noise ratio yet has reduced Gordon Haus timing jitter by reduced averaged dispersion The dispersion managed soliton also has demonstrated its power in soliton based WDM transmissions

The Discrete Nonlinear Schrödinger Equation

Panayotis G. Kevrekidis, 2009-07-07 This book constitutes the first effort to summarize a large volume of results obtained over the past 20 years in the context of the Discrete Nonlinear Schrödinger equation and the physical settings that it describes *Emergent Nonlinear Phenomena in Bose-Einstein Condensates* Panayotis G. Kevrekidis, Dimitri J.

Frantzeskakis, Ricardo Carretero-González, 2007-12-29 This book written by experts in the fields of atomic physics and nonlinear science covers the important developments in a special aspect of Bose-Einstein condensation namely nonlinear phenomena in condensates Topics covered include bright dark gap and multidimensional solitons vortices vortex lattices optical lattices multicomponent condensates mathematical methods rigorous results and the beyond the mean field approach

Nonlinear Science and Complexity J.A. Tenreiro Machado, Albert C. J. Luo, Ramiro S. Barbosa, Manuel F. Silva, Lino B. Figueiredo, 2010-11-03 This book contains selected papers of NSC08 the 2nd Conference on Nonlinear Science and Complexity held 28-31 July 2008 Porto Portugal It focuses on fundamental theories and principles analytical and symbolic approaches computational techniques in nonlinear physics and mathematics Topics treated include Chaotic Dynamics and Transport in Classic and Quantum Systems Complexity and Nonlinearity in Molecular Dynamics and Nano Science Complexity and Fractals in Nonlinear Biological Physics and Social Systems Lie Group Analysis and Applications in Nonlinear Science Nonlinear Hydrodynamics and Turbulence Bifurcation and Stability in Nonlinear Dynamic Systems Nonlinear Oscillations and Control with Applications Celestial Physics and Deep Space Exploration Nonlinear Mechanics and Nonlinear Structural Dynamics Non-smooth Systems and Hybrid Systems Fractional dynamical systems **Emerging Frontiers in**

Nonlinear Science Panayotis G. Kevrekidis, Jesús Cuevas-Maraver, Avadh Saxena, 2020-05-29 This book explores the impact of nonlinearity on a broad range of areas including time honored fields such as biology geometry and topology but also modern ones such as quantum mechanics networks metamaterials and artificial intelligence The concept of nonlinearity is a universal feature in mathematics physics chemistry and biology and is used to characterize systems whose behavior does not amount to a superposition of simple building blocks but rather features complex and often chaotic patterns and phenomena Each chapter of the book features a synopsis that not only recaps the recent progress in each field but also charts the challenges that lie ahead This interdisciplinary book presents contributions from a diverse group of experts from various fields to provide an overview of each field's past present and future It will appeal to both beginners and seasoned researchers in nonlinear science numerous areas of physics optics quantum physics biophysics and applied mathematics ODEs PDEs dynamical systems machine learning as well as engineering

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