

Sergei B. Leble

Nonlinear Waves in Waveguides

with Stratification



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Nonlinear Waves In Waveguides With Str

Claudio Nucera



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Nonlinear Waves: Classical and Quantum Aspects Fatkhulla Abdullaev, Vladimir V. Konotop, 2006-03-02 Leading scientists discuss the most recent physical and experimental results in the physics of Bose Einstein condensate theory the theory of nonlinear lattices including quantum and nonlinear lattices and nonlinear optics and photonics Classical and quantum aspects of the dynamics of nonlinear waves are considered The contributions focus on the Gross Pitaevskii equation and on the quantum nonlinear Schrödinger equation Recent experimental results on atomic condensates and hydrogen bonded systems are reviewed Particular attention is given to nonlinear matter waves in periodic potential

Nonlinear Waves in Waveguides Sergei B. Leble, 2013-11-11 S B Leble's book deals with nonlinear waves and their propagation in metallic and dielectric waveguides and media with stratification The underlying nonlinear evolution equations NEEs are derived giving also their solutions for specific situations The reader will find new elements to the traditional approach Various dispersion and relaxation laws for different guides are considered as well as the explicit form of projection operators NEEs quasi solitons and of Darboux transforms Special points relate to 1 the development of a universal asymptotic method of deriving NEEs for guide propagation 2 applications to the cases of stratified liquids gases solids and plasmas with various nonlinearities and dispersion laws 3 connections between the basic problem and soliton like solutions of the corresponding NEEs 4 discussion of details of simple solutions in higher order nonsingular perturbation theory

Nonlinear Guided Waves and Their Applications, 2002 **Nonlinear Waves in Complex Systems** J.-G. Caputo, Mads Peter Sørensen, 2007

Wave Motion, Intelligent Structures And Nonlinear Mechanics Ardeshir Guran, Daniel J Inman, 1995-06-09 This book is a collection of papers on the subject of applied system dynamics and control written by experts in this field It offers the reader a sampling of exciting research areas in three fast growing branches i Wave Motion ii Intelligent Structures iii Nonlinear Mechanics The topics covered include flow instability nonlinear mode localization autoparametric systems with pendula and geometric stiffening in multibody dynamics Mathematical methods include perturbation methods modern control theory nonlinear neural nets and resonance scattering theory of Berall Ripoche Maze Applications include sound induced structural vibrations fiber acoustic waveguides vibration suppression of structures linear control of gyroscopic systems and nonlinear control of distributed systems This book shows how applied system dynamics and control is currently being utilized and investigated It will be of interest to engineers applied mathematicians and physicists

Optical Waveguides María L. Calvo, Vasudevan Lakshminarayanan, 2018-10-03 Although the theory and principles of optical waveguides have been established for more than a century the technologies have only been realized in recent decades **Optical Waveguides From Theory to Applied Technologies** combines the most relevant aspects of waveguide theory with the study of current detailed waveguiding technologies in particular photonic devices telecommunication applications and biomedical optics With self contained chapters written by well known specialists the book features both fundamentals and

applications The first three chapters examine the theoretical foundations and bases of planar optical waveguides as well as critical optical properties such as birefringence and nonlinear optical phenomena The next several chapters focus on contemporary waveguiding technologies that include photonic devices and telecommunications The book concludes with discussions on additional technological applications including biomedical optical waveguides and the potential of neutron waveguides As optical waveguides play an increasing part in modern technology photonics will become to the 21st century what electronics were to the 20th century Offering both novel insights for experienced professionals and introductory material for novices this book facilitates a better understanding of the new information era the photonics century

Inverse Problems and Large-Scale Computations Larisa Beilina, Yury V. Shestopalov, 2013-10-01 This volume is a result of two international workshops namely the Second Annual Workshop on Inverse Problems and the Workshop on Large Scale Modeling held jointly in Sunne Sweden from May 1 6 2012 The subject of the inverse problems workshop was to present new analytical developments and new numerical methods for solutions of inverse problems The objective of the large scale modeling workshop was to identify large scale problems arising in various fields of science and technology and covering all possible applications with a particular focus on urgent problems in theoretical and applied electromagnetics The workshops brought together scholars professionals mathematicians and programmers and specialists working in large scale modeling problems The contributions in this volume are reflective of these themes and will be beneficial to researchers in this area

Nonlinearity with Disorder Fatkulla Abdullaev, Alan R. Bishop, Stephanos Pnevmatikos, 2012-12-06 In the past three decades there has been enormous progress in identifying the essential role that nonlinearity plays in physical systems including supporting soliton like solutions and self trapped excitations such as polarons during the same period similarly impressive progress has occurred in understanding the effects of disorder in linear quantum problems especially regarding Anderson localization arising from impurities random spatial structures stochastic applied fields and so forth These striking consequences of disorder noise and nonlinearity frequently occur together in physical systems Yet there have been only limited attempts to develop systematic techniques which can include all of these ingredients which may reinforce complement or frustrate each other This book contains a range of articles which provide important steps toward the goal of systematic understanding and classification of phenomenology Experts from Australia Europe Japan USA and the USSR describe both mathematical and numerical techniques especially from soliton and statistical physics disciplines and applications to a number of important physical systems and devices including optical and electronic transmission lines liquid crystals biophysics and magnetism

Nonlinear Optics and Applications II Mario Bertolotti, 2007 Proceedings of SPIE present the original research papers presented at SPIE conferences and other high quality conferences in the broad ranging fields of optics and photonics These books provide prompt access to the latest innovations in research and technology in their respective fields Proceedings of SPIE are among the most cited references in patent literature *Scientific and Technical*

Aerospace Reports, 1993 **Metamaterials II** Vladimír Kuzmiak, Tomasz Szoplik, Peter Markos, 2007 Proceedings of SPIE present the original research papers presented at SPIE conferences and other high quality conferences in the broad ranging fields of optics and photonics These books provide prompt access to the latest innovations in research and technology in their respective fields Proceedings of SPIE are among the most cited references in patent literature *Terahertz and Gigahertz Electronics and Photonics II* R. Jennifer Hwu, Ke Wu, 2000 **Advances In Nonlinear Acoustics - Proceedings Of The 13th International Symposium On Nonlinear Acoustics** H Hoback, 1993-06-18 The large range of applications of acoustical methods and techniques in modern society demands a thorough exploration of the nonlinear properties of sound wave propagation in different media and environments and of the effects caused by nonlinear interaction of sound and medium The great range of interesting physical phenomena which occur in nonlinear acoustics helps stimulate the extensive research in the field *Electrical & Electronics Abstracts*, 1997 *Saratov Fall Meeting '98* Valerii Viktorovich Tuchin, Vladimir P. Ryabukho, Dmitry A. Zimnyakov, 1999 These 76 papers on the use of light scattering technologies in the fields of mechanics biomedicine and material science originate from the 1998 Saratov Fall Meeting *Nonlinear Optics*, 2002 *Conference on Lasers and Electro-optics Europe*, 2005 *Bell Laboratories Talks and Papers* Bell Telephone Laboratories. Libraries and Information Systems Center, 1978 *Documentation of Plasma Physics. Pt. 1, Experimental Plasma Physics [and] Theoretical Plasma Physics*, 1969 *Propagation of Nonlinear Waves in Waveguides and Application to Nondestructive Stress Measurement* Claudio Nucera, 2012 Propagation of nonlinear waves in waveguides is a field that has received an ever increasing interest in the last few decades Nonlinear guided waves are excellent candidates for interrogating long waveguide like structures because they combine high sensitivity to structural conditions typical of nonlinear parameters with large inspection ranges characteristic of wave propagation in bounded media

DISS_para
 DISS_paraThe primary topic of this dissertation is the analysis of ultrasonic waves including ultrasonic guided waves propagating in their nonlinear regime and their application to structural health monitoring problems particularly the measurement of thermal stress in Continuous Welded Rail CWR Following an overview of basic physical principles generating nonlinearities in ultrasonic wave propagation the case of higher harmonic generation in multi mode and dispersive guided waves is examined in more detail A numerical framework is developed in order to predict favorable higher order generation conditions i e specific guided modes and frequencies for waveguides of arbitrary cross sections This model is applied to various benchmark cases of complex structures The nonlinear wave propagation model is then applied to the case of a constrained railroad track CWR subjected to thermal variations This study is a direct response to the key need within the railroad transportation community to develop a technique able to measure thermal stresses in CWR or determine the rail temperature corresponding to a null thermal stress Neutral Temperature NT The numerical simulation phase concludes with a numerical study performed using ABAQUS commercial finite element package These analyses were crucial

in predicting the evolution of the nonlinear parameter β with thermal stress level acting in the rail A novel physical model based on interatomic potential was developed to explain the origin of nonlinear wave propagation under constrained thermal expansion In fact where the classical physics of nonlinear wave propagation assumes finite strains the case at hand of constrained thermal expansion is instead characterized by infinitesimal ideally zero strains Hand in hand with the theoretical analyses a comprehensive program of experimental testing has been conducted at UCSD s Large Scale Rail NT Test bed a unique 70 ft track with controlled temperature excursions constructed at UCSD s Powell Laboratories with government and industry funding A prototype has been constructed for wayside determination of the rail NT based on the measurement of wave nonlinearities The experimental results obtained with the prototype in the Large Scale Test bed are extremely encouraging showing an accuracy of only a few degrees for the determination of the rail NT If confirmed in the field this result could revolutionize the way CWR are maintained to prevent rail buckling with respect to the thermal stress management problem

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