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Hanna · Yuratich · Cotter

**Nonlinear Optics
of Free Atoms
and Molecules**



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Nonlinear Optics Of Free Atoms And Molecules

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Nonlinear Optics Of Free Atoms And Molecules:

Nonlinear Optics of Free Atoms and Molecules David C. Hanna, Michael A. Yuratich, David Cotter, 1979 Nonlinear Optics of Free Atoms and Molecules D.C. Hanna, M.A. Yuratich, D. Cotter, 1979-12-01 Laser physics and nonlinear optics are fields which have been intimately connected from their beginning Nonlinear optical effects such as second harmonic generation fulfil vital functions in many laser systems Conversely advances in laser development quickly lead to progress in nonlinear optics Of particular importance has been the development of tunable visible and uv lasers With the ability to tune the laser frequency into close resonance with atomic transition frequencies one can produce a large resonance enhancement of the nonlinearity This permits the observation of a great variety of nonlinear optical processes in dilute media such as atomic vapours In recent years much of the research effort in nonlinear optics has been directed towards the use of such media and it is this area which forms the subject of the present book We review a wide range of nonlinear optical processes in atomic vapours molecular gases and cryogenic liquids At the same time we have tried to treat the subject in sufficient depth to be useful to research workers in the field To achieve this a measure of selectivity has been introduced by emphasising those nonlinear processes which are seen to have applications as sources of tunable coherent radiation Thus we have not discussed in any detail those nonlinear processes whose main applications are in spectroscopy such as Doppler free two photon absorption Nonlinear Optics Of Free Atoms Molecules D.C. Hanna, Laser Spectroscopy Wolfgang Demtröder, 2013-06-29 Laser Spectroscopy in this second enlarged edition provides an introduction to modern techniques and instrumentation in laser spectroscopy The first part which discusses the basic concepts of absorption and emission of light the spectroscopic instrumentation for wavelength measurements and detection of light and the spectroscopic properties of lasers is a textbook for graduate students The second part gives a survey on different techniques of laser spectroscopy and their applications with ample references to the original literature This book helps close the gap between classical works on optics and spectroscopy and more specialized publications on modern research in this field It is addressed to graduate students in physics and chemistry as well as scientists just entering this field on research **Proceedings of the International Conference of Computational Methods in Sciences and Engineering 2003 (ICCMSE 2003)** T. E. Simos, 2003 In the past few decades many significant insights have been gained into several areas of computational methods in sciences and engineering New problems and methodologies have appeared in some areas of sciences and engineering There is always a need in these fields for the advancement of information exchange The aim of this book is to facilitate the sharing of ideas problems and methodologies between computational scientists and engineers in several disciplines Extended abstracts of papers on the recent advances regarding computational methods in sciences and engineering are provided The book briefly describes new methods in numerical analysis computational mathematics computational and theoretical physics computational and theoretical chemistry computational biology computational mechanics computational engineering

computational medicine high performance computing etc *Atoms, Molecules and Clusters in Electric Fields* George Maroulis, 2006 With the central importance of electric polarizability and hyperpolarizability for a wide spectrum of activities this book charts the trends in the accurate theoretical determination of these properties in specialized fields The contributions include reviews and original papers that extend from methodology to applications in specific areas of primary importance such as cluster science and organic synthesis of molecules with specific properties **Introduction to Laser Physics** Koichi Shimoda, 2013-04-17 Most of the texts available on lasers deal with laser engineering and laser applications only a few of them treating theoretical aspects of the laser at an advanced level Introduction to Laser Physics provides an introduction to the essential physics of quantum electronics and lasers Fundamental topics in modern optics the applicability of various theoretical approaches and the physical meaning of laser related phenomena are carefully described Experimental results and properties of practical lasers are interwoven thereby allowing an explicit demonstration of the rate equation approach and the semiclassical treatment The basic concepts of nonlinear optical devices and laser spectroscopy are introduced The second edition includes additional information on optical resonators minor improvements of the text and several new problems completed with solutions *Scanning Electron Microscopy* Ludwig Reimer, 2013-11-11 Scanning Electron Microscopy provides a description of the physics of electron probe formation and of electron specimen interactions The different imaging and analytical modes using secondary and backscattered electrons electron beam induced currents X ray and Auger electrons electron channelling effects and cathodoluminescence are discussed to evaluate specific contrasts and to obtain quantitative information **Transmission Electron Microscopy** Ludwig Reimer, 2013-11-11 Transmission Electron Microscopy presents the theory of image and contrast formation and the analytical modes in transmission electron microscopy The principles of particle and wave optics of electrons are described Electron specimen interactions are discussed for evaluating the theory of scattering and phase contrast Also discussed are the kinematic and dynamical theories of electron diffraction and their applications for crystal structure analysis and imaging of lattices and their defects X ray microanalysis and electron energy loss spectroscopy are treated as analytical methods This fourth edition includes discussions of recent progress especially in the area of Schottky emission guns convergent beam electron diffraction electron tomography holography and the high resolution of crystal lattices **Laser Crystals** Alexander A. Kaminskii, 2013-06-29 It was a greatest pleasure for me to learn that Springer Verlag wished to produce a second edition of my book In this connection Dr H Lotsch asked me to send him a list of misprints mistakes and inaccuracies that had been noticed in the first edition and to make corresponding corrections without disturbing the layout or the typography too much I accepted this opportunity with alacrity and moreover found some free places in the text where I was able to insert some concise up to date information about new lasing compounds and stimulated emission channels It was also possible to increase the number of reference citations The reader of the second edition hence has access to more complete data on insulating laser crystals

However sections on laser crystal physics have not been updated because a satisfactory description of the progress made in the last ten years in this field would have required the sections to be extended enormously or even a new book to be written

Moscow July 1989 ALEXANDER A KAMINSKII Preface to the First Edition The greatest reward for an author is the feeling of satisfaction he gets when it becomes clear to him that readers find his work useful After my book appeared in the USSR in 1975 I received many letters from fellow physicists including colleagues from Western European countries and the USA

Principles of Phase Conjugation B.Y. Zel'Dovich, N.F. Pilipetsky, V.V. Shkunov, 2013-06-29 This book has been prompted by our desire to share with others our appreciation of the harmony and beauty in a particular sphere of modern optics known as optical phase conjugation Practical applications of the phase conjugated wave are likely to be far reaching Optical phase conjugation OPC combines in itself aesthetic and pragmatic attractiveness a synthesis that has made OPC a subject of general attention The figure presents the approximate rate of publications number of articles per year on OPC in the world literature for recent years the lower curve denoting the work carried out in the USSR The efforts of a large unofficial international collective have yielded an impressive result 150 100 50 1975 1980 At present the physical processes underlying various OPC methods are quite understandable and it is the physics of OPC to which our book is devoted Practical and scientific applications of phase conjugated waves which are of no less interest have been touched upon in short as major achievements in this sphere are a matter of the future Today there are two main methods of OPC i by backward stimulated light scattering ii by four wave mixing Naturally much attention is given to these methods in our book which after the introductory Chap 1 can be divided into two almost independent parts Chaps 2 5 and Chaps 6 8

X-Ray Microscopy G. Schmahl, D. Rudolph, 2013-04-17 X ray microscopy fills a gap between optical and electron microscopy Using soft x rays a resolution higher than with visible light can be obtained In comparison to electron microscopy thick wet unstained specimens can be examined This is especially advantageous for biological applications The intense synchrotron radiation of electron storage rings and the development of optical elements for soft x rays render x ray microscopy feasible for basic research Wider applications will be possible in the future with the development of laboratory x ray sources and microscopes In 1979 a conference on x ray microscopy was organized by the New York Academy of Sciences and in 1981 a symposium on high resolution soft x ray optics was held at Brookhaven The present volume contains the contributions to the symposium X Ray Microscopy organized by the Akademie der Wissenschaften in Göttingen in September 1983 In their capacity as conference chairmen the editors would like to thank the Akademie der Wissenschaften especially Prof H G Wagner Secretary of the Academy and Mr J Pfahler for organizing the symposium We are indebted to the Stiftung Volkswagenwerk for financial support The symposium was held at the Max Planck Institut für Stromungsforschung We are grateful for their hospitality and assistance during the symposium Thanks are due to all authors and to the Springer Verlag for their combined efforts We thank Dipl Phys P Guttman Dr B Niemann and Mrs A Marienhagen for their assistance during the final

preparation of the manuscripts Holography and Deformation Analysis W. Schumann, J.-P. Zürcher, D. Cuche, 2013-04-17 In this book series on Optical Sciences holography has been the subject of three previous volumes In particular Vol 16 written by one of us W S and Dr M Dubas treated holographic interferometry of opaque bodies from the standpoint of deformation analysis However the fundamental principles of holography are developed there only briefly in preparation for a discussion of interference fringe modifications This new volume in the series is intended to consider in detail many topics which were previously omitted such as the deformation or distortion of holographic images the theory of volume holograms composite or multiplex holography holographic interferometry of transparent media time dependent effects holographic contouring and applications of fringe modifications to the deformation of opaque bodies In addition these and other subjects will be treated with the same unifying concept developed in Vol 16 but with an additional emphasis on those features that have their origins in classical optics especially the small wavelength approach the coupled wave theory and the Seidel aberrations Since the field of holography and its various applications is growing rapidly it is impossible to be comprehensive in a single book Every effort has been made to avoid unnecessary duplication of Vol 16 For example displacement and fringe localization problems are only briefly discussed while some modification techniques e g sandwich holography are not included When needed however the reader is directly referred to complementary publications Color Measurement David L.

MacAdam, 2013-06-05 Reviews and use of the first edition as the textbook for a senior division university course indicated the need for a number of corrections and clarifications Although no new topics have been introduced the new edition should be more clear and useful A novelty in the Notes and Sources Appendix should facilitate reference from the notes back to the text For that purpose the page number of the text to which each note refers is indicated in square brackets following the serial number of the note The FMC1 color difference formula has been substituted everywhere for the Friele MacAdam formula including the reference to the sources in Note 52 The FMC1 formula was actually used in the investigations reviewed in Sects 8 3 and 8 4 The Friele MacAdam formula given on page 151 of the first edition which I thought was equivalent to the FMC1 was erroneous and should not be used The formulas for the geodesic chromaticity diagram on p 153 of the first edition were based on observations by 14 normal observers last reference in Note 51 They have been replaced by the formulas based on the observations of PON for consistency with all other formulas and discussions in the book Figure 8 29 in the first edition was based on the PON data and on the formulas printed below it in the new edition Therefore Fig 8 29 is unchanged

Tunable Solid State Lasers P. Hammerling, A.B. Budgor, A. Pinto, 2013-04-17 In recent years there has been renewed interest in the scientific and industrial communities in tunable solid state vibronic lasers Much of this has been spurred by the user desirous of obtaining compact primary laser sources independent of nonlinear optical frequency shifts throughout the visible and near infra red spectral regions To further motivate and stimulate research and development in this area workshops sponsored by the Laser Division of the US Army Night Vision Electro Optics Laboratory NVEOL at Fort Belvoir

Virginia were held during 13 April 1981 and 16-17 June 1983 at Keystone and NVEOL respectively. The consensus of opinion of the participants at these workshops was that any successful program leading to the identification and development of vibronic tunable laser materials in the visible and IR must include coordinated activity between crystal growers, theoretical and experimental investigators into the fundamental processes of vibronic lasing and laser device engineers. Continued interaction between government, industry and academia was encouraged in order to establish a unified approach to these areas and when necessary, redefine and redirect programmatic activity. The organization of this 1st Annual Conference on Tunable Solid State Lasers held at the La Jolla Institute 13-15 June 1984 was based around the latest results in tunable vibronic materials and laser development but structured in a manner consistent with the recommendations of the NVEOL workshops.

Silver-Halide Recording Materials Hans I. Bjelkhagen, 2013-04-17 Silver Halide Recording Materials gives a detailed analysis of the theory, the characteristics, the manufacturing and the processing methods of silver halide materials used for the recording of holograms. Emphasis is placed on the selection of suitable silver halide materials for conventional as well as special holographic applications. A detailed account of current developing and bleaching methods used in the production of silver halide holograms is given. The author also supplies a large number of recipes for different types of processing baths. The text is complemented by a comprehensive list of references which will facilitate any further study. The monograph will be suitable for courses in holography where the student possesses some background knowledge as regards the general holographic process and the holographic technique.

Lasers, Spectroscopy and New Ideas William M. Yen, Marc D. Levenson, 2013-11-11 This volume originated in a happy event honoring Arthur Schawlow on his 65th birthday. As a research physicist, Schawlow has been a major influence on the present nature of physics and of high technology. He has also had a role through the American Physical Society and other organizations in shaping policy for the world of physicists. Important as these professional activities have been, the contributions to this volume were not prepared just for these reasons but more for Art Schawlow, the friend, colleague and teacher. I am one who has had the privilege of knowing and collaborating with Art probably over a longer period of time than others participating in this volume and in a number of different enterprises. His friendship and stimulating scientific abilities are a very significant part of my own life. It is hence a pleasure to take part in this volume celebrating his contributions to science and to scientists. Schawlow's career has been geographically centered at the University of Toronto, Columbia University, the Bell Telephone Laboratories and Stanford University. But as is illustrated by the papers of this volume, its effects and his personal influence have diffused widely. In his own work, Art Schawlow is noted for thoughtful imagination, keen physical intuition and what might be thought an interest in gadgets, not just any gadgets but beautiful and innovative mechanisms or new techniques in which he characteristically recognizes important potentials.

X-Ray Microscopy II David Sayre, Malcolm Howells, Janos Kirz, Harvey Rarback, 2013-06-05 This volume is based on papers presented at the International Symposium on X-Ray Microscopy held at Brookhaven National

Laboratory Upton NY August 31 September 4 1987 Previous recent symposia on the subject were held in New York in 1979 Gottingen in 1983 and Taipei in 1986 Developments in x ray microscopy continue at a rapid pace with important advances in all major areas x ray sources optics and components and microscopes and imaging systems Taken as a whole the work presented here emphasizes three major directions a improvements in the capability and image quality of x ray microscopy expressed principally in systems attached to large high brightness x ray sources b greater access to x ray microscopy expressed chiefly in systems employing small often pulsed x ray sources and c increased rate of exploration of applications of x ray microscopy The number of papers presented at the symposium has roughly doubled compared with that of its predecessors While we are delighted at this growth as a manifestation of vitality and rapid growth of the field we did have to ask the authors to limit the length of their papers and to submit them in camera ready form We thank the authors for their contributions and for their efforts in adhering to the guidelines on manuscript preparation

Photorefractive Crystals in Coherent Optical Systems Mikhail P. Petrov, Sergei I. Stepanov, Anatoly V. Khomenko, 2013-11-11 This book describes the processes of optical information recording in photorefractive crystals and applications of these materials in phase conjugating devices holographic interferometry optical computers and sensors It is in essence an extensive introduction to this new and rapidly developing area of quantum electronics It presents physical concepts fundamentals of theory and important experimental data A rigorous treatment of basic phenomena is accompanied by a quantitative analysis which makes the book interesting to experts and accessible for newcomers to the field Of particular interest to researchers is an extensive summary of basic physical and holographic parameters of all presently known photorefractive crystals and structures and also a detailed critical analysis of their applications

X-Ray Spectroscopy Bipin K. Agarwal, 2013-06-29 X ray spectroscopy has emerged as a powerful tool in research and in industrial laboratories It is used in the study of metals semiconductors amorphous solids liquids and gases This comprehensive presentation develops the subject from its basic principles and relates the theory to experimental observations The new edition includes topics that have recently become important for example the X ray laser appearance potential spectroscopy synchrotron radiation and EXAFS of high Tc superconducting materials A thorough introduction up to research level is provided to EXAFS which has seen rapid development in the past few years This textbook conveniently presents the principles applications and current techniques of X ray spectroscopy which makes it ideal for graduate students beginning research involving x ray spectroscopy

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