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Optical Coherence and Quantum Optics

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CLARA KINGSTON

Introduction to Photon

Communication Cambridge University Press

An in-depth and wide-ranging introduction to the field of quantum optics.

Selected Papers and Lectures Cambridge University Press

Describing the phase of an electromagnetic field mode or harmonic oscillator has been an obstacle since the early days of modern quantum theory. The quantum phase operator was even more problematic with the invention of the maser and laser in the 1950s and 1960s. This problem was not solved until the

Pegg-Barnett formalism was developed in the 1980s. Edited by one of the scientists who created this key solution, The Quantum Phase Operator: A Review charts the development of phase and angle operators from their first appearance to modern theory. Bringing together vital works that have been published on the subject, the book presents the ideas that led to the current theory of the phase

operator and provides a complete picture of the progress that has followed since then. With introductions by the editors to put the papers in context and unify the content of the book, each section focuses on a different aspect of phase operators. The editors also chronologically organize the papers within the sections to highlight how scientific thought has evolved, if at all, over time. A collection of important relevant material that is scattered throughout the literature, this volume chronicles the history of the various facets of the quantum phase operator, promoting a solid foundation in quantum theory. Quantum Optics VI Imperial College Press

Contrary to monographs on non-linear optics this book concentrates on problems of self-organization in various important contexts. The reader learns how patterns in non-linear optical systems are created and what theoretical methods can be applied to describe them. Next, various aspects of pattern formation such as associative memory, information processing, spatio-temporal instability, photo refraction, and so on are treated. The book addresses graduate students and researchers in physics and optical

engineering.

Proceedings of the Sixth Rochester Conference on Coherence and Quantum Optics held at the University of Rochester, June 26-28, 1989 Cambridge University Press

A unified treatment of coherence theory and polarization for graduate students and researchers in physics and engineering.

Introduction to the Theory of Coherence and Polarization of Light Cuvillier Verlag

The book gives a broad coverage of the basic elements necessary to understand and carry out research in quantum optics. It presents a variety of theoretical tools and important results for two-level and semiconductor media, many of which could only be found in the original literature of in specialized monographs up to now. The text reveals the close connection between many seemingly unrelated topics. The book "e;Quantum Optics"e; has been written to meet the requirement of the degree and post graduate students. The subject matter has been discussed in such a simple way that the students will find no difficult to understand it. Most of the examples given

in the book have been selected from various university examination papers and the book cover the syllabus of almost all the universities.

Introductory Quantum Optics Springer Science & Business Media

Principles of Laser Spectroscopy and Quantum Optics is an essential textbook for graduate students studying the interaction of optical fields with atoms. It also serves as an ideal reference text for researchers working in the fields of laser spectroscopy and quantum optics. The book provides a rigorous introduction to the prototypical problems of radiation fields interacting with two- and three-level atomic systems. It examines the interaction of radiation with both atomic vapors and condensed matter systems, the density matrix and the Bloch vector, and applications involving linear absorption and saturation spectroscopy. Other topics include hole burning, dark states, slow light, and coherent transient spectroscopy, as well as atom optics and atom interferometry. In the second half of the text, the authors consider applications in which the radiation field is quantized. Topics include spontaneous decay, optical

pumping, sub-Doppler laser cooling, the Heisenberg equations of motion for atomic and field operators, and light scattering by atoms in both weak and strong external fields. The concluding chapter offers methods for creating entangled and spin-squeezed states of matter. Instructors can create a one-semester course based on this book by combining the introductory chapters with a selection of the more advanced material. A solutions manual is available to teachers. Rigorous introduction to the interaction of optical fields with atoms Applications include linear and nonlinear spectroscopy, dark states, and slow light Extensive chapter on atom optics and atom interferometry Conclusion explores entangled and spin-squeezed states of matter Solutions manual (available only to teachers)

Fundamentals of Quantum Optics and Quantum Information Springer Science & Business Media

In recent years, progress in the generation of squeezed states of light, mainly characterized by a reduced noise property, has stimulated important work in relation to their potential use to improve the sensitivity of optical communication

systems. These notes are devoted to the detection and information processing of optical signals at very low levels of power. A survey of recent developments from the quantum and classical points of view is presented. Ultimate limits of performance under the criteria of detection and information are established. Some of the results are detailed and may be utilized for the design of practical systems of communication using present technology. The book addresses physicists and engineers interested in present and future developments in optical communications.

Quantum Optics Springer Science & Business Media

This book presents a systematic account of optical coherence theory within the framework of classical optics, as applied to such topics as radiation from sources of different states of coherence, foundations of radiometry, effects of source coherence on the spectra of radiated fields, coherence theory of laser modes, and scattering of partially coherent light by random media. The book starts with a full mathematical introduction to the subject area and each chapter concludes with a set of exercises. The authors are

renowned scientists and have made substantial contributions to many of the topics treated in the book. Much of the book is based on courses given by them at universities, scientific meetings and laboratories throughout the world. This book will undoubtedly become an indispensable aid to scientists and engineers concerned with modern optics, as well as to teachers and graduate students of physics and engineering.

Coherence and Quantum Optics VII

Springer Science & Business Media

This volume presents the written versions of papers that were delivered at the Third Rochester Conference on Coherence and Quantum Optics, held on the campus of the University of Rochester during the three days of June 21-23, 1972. The Conference was a sequel to two earlier meetings devoted to the same field of modern physics, that were also held in Rochester in 1960 and in 1966. The scope of the Conference was largely confined to basic problems in the general area of optical coherence and quantum optics, and excluded engineering applications that are well covered by other meetings. Approximately 250 scientists from 9

countries participated, most of whom are active workers in the field. Altogether 72 papers, including 26 invited papers, were presented in 17 sessions. The papers dealt mainly with the subjects of resonant pulse propagation, lasers, quantum electrodynamics and alternative theories, optical coherence, coherence effects in spontaneous emission, light scattering, optical correlation and fluctuation measurements, coherent light interactions and quantum noise. The program was organized by a committee consisting of N. Bloembergen (Harvard University) J. H. Eberly (University of Rochester) E. L. Hahn (University of California at Berkeley) H. Haken (University of Stuttgart, Germany) M. Lax (City College of New York) B. J. Thompson (University of Rochester) L. Mandel (University of Rochester) }Joint secretaries E.

With Commentary Taylor & Francis

This book presents a systematic account of optical coherence theory within the framework of classical optics, as applied to such topics as radiation from sources of different states of coherence, foundations of radiometry, effects of source coherence on the spectra of radiated fields,

coherence theory of laser modes, and scattering of partially coherent light by random media.

Proceedings of the Seventh Rochester Conference on Coherence and Quantum Optics, held at the University of Rochester, June 7-10, 1995 Springer Science & Business Media

This book grew out of a 2-semester graduate course in laser physics and quantum optics. It requires a solid understanding of elementary electromagnetism as well as at least one, but preferably two, semesters of quantum mechanics. Its present form resulted from many years of teaching and research at the University of Arizona, the Max-Planck-Institut für Quantenoptik, and the University of Munich. The contents have evolved significantly over the years, due to the fact that quantum optics is a rapidly changing field. Because the amount of material that can be covered in two semesters is finite, a number of topics had to be left out or shortened when new material was added. Important omissions include the manipulation of atomic trajectories by light, superradiance, and descriptions of experiments. Rather than treating any

given topic in great depth, this book aims to give a broad coverage of the basic elements that we consider necessary to carry out research in quantum optics. We have attempted to present a variety of theoretical tools, so that after completion of the course students should be able to understand specialized research literature and to produce original research of their own. In doing so, we have always sacrificed rigor to physical insight and have used the concept of "simplest nontrivial example" to illustrate techniques or results that can be generalized to more complicated situations.

Coherent Dynamics of Small Molecules in Rare Gas Crystals John Wiley & Sons

Optical Coherence and Quantum Optics Cambridge University Press
Elements of Quantum Optics Springer Science & Business Media

Quantum Optics gives a comprehensive coverage of developments in quantum optics over the past twenty years. In the early chapters the formalism of quantum optics is elucidated and the main techniques are introduced. These are applied in the later chapters to problems

such as squeezed states of light, resonance fluorescence, laser theory, quantum theory of four-wave mixing, quantum non-demolition measurements, Bell's inequalities, and atom optics. Experimental results are used to illustrate the theory throughout. This yields the most comprehensive and up-to-date coverage of experiment and theory in quantum optics in any textbook.

Quantum Statistics of Linear and Nonlinear Optical Phenomena Springer Science & Business Media

Compiled by 330 of the most widely respected names in the electro-optical sciences, the Encyclopedia is destined to serve as the premiere guide in the field with nearly 2000 figures, 560 photographs, 260 tables, and 3800 equations. From astronomy to x-ray optics, this reference contains more than 230 vivid entries examining the most intriguing technological advances and perspectives from distinguished professionals around the globe. The contributors have selected topics of utmost importance in areas including digital image enhancement, biological modeling, biomedical spectroscopy, and ocean optics, providing

thorough coverage of recent applications in this continually expanding field.

Optical Generation and Control of Quantum Coherence in Semiconductor Nanostructures Springer Science & Business Media

In last years increasing attention has been again devoted to interpretations of quantum theory. In the same time interesting quantum optical experiments have been performed using nonlinear optical processes, in particular frequency down conversion, which provided new information about nature of a photon on the basis of interference and correlation (coincidence) phenomena. Such single-photon and twin-photon effects of quantum optics provide new point of view of interpretations of quantum theory and new tests of its principles. The purpose of this book is to discuss these questions. To follow this goal we give brief reviews of principles of quantum theory and of quantum theory of measurement. As a fundamental theoretical tool the coherent state technique is adopted based on a general algebraic treatment, including the description of interaction of radiation and matter. Typical quantum behaviour of

physical systems is exhibited by nonclassical optical phenomena, which can be examined using photon interferences and correlations. These phenomena are closely related to violation of various classical inequalities and Bell's in equalities. The most important part of this book discusses quantum optical experiments supporting quantum theory. This book may be considered as a continuation of previous monographs by one of the authors on Coherence of Light (Van Nostrand Reinhold, London 1972, second edition D. Reidel, Dordrecht 1985) and on Quantum Statistics of Linear and Nonlinear Optical Phenomena (D. Reidel, Dordrecht 1984, second edition Kluwer, Dordrecht 1991), which may serve as a preparation for reading this book.

Modern Foundations of Quantum Optics
Optical Coherence and Quantum Optics
The fundamental concept of quantum coherence plays a central role in quantum physics, cutting across disciplines of quantum optics, atomic and condensed matter physics. Quantum coherence represents a universal property of the quantum systems that applies both to light and matter thereby tying together

materials and phenomena. Moreover, the optical coherence can be transferred to the medium through the light-matter interactions. Since the early days of quantum mechanics there has been a desire to control dynamics of quantum systems. The generation and control of quantum coherence in matter by optical means, in particular, represents a viable way to achieve this longstanding goal and semiconductor nanostructures are the most promising candidates for controllable quantum systems. Optical generation and control of coherent light-matter states in semiconductor quantum nanostructures is precisely the scope of the present book. Recently, there has been a great deal of interest in the subject of quantum coherence. We are currently witnessing parallel growth of activities in different physical systems that are all built around the central concept of manipulation of quantum coherence. The burgeoning activities in solid-state systems, and semiconductors in particular, have been strongly driven by the unprecedented

control of coherence that previously has been demonstrated in quantum optics of atoms and molecules, and is now taking advantage of the remarkable advances in semiconductor fabrication technologies. A recent impetus to exploit the coherent quantum phenomena comes from the emergence of the quantum information paradigm.

Coherence and Quantum Optics Springer Science & Business Media

Publisher Description

Quantum Optics Cambridge University Press

The conference, held at the U. of Rochester in June 1989, was a sequel to five earlier meetings in this series, held in 1960, 1966, 1972, 1977 and 1983. This volume contains abbreviated versions of most of the 252 papers presented, addressing such topics as laser spectroscopy, photon statistics, phase
The Quantum Phase Operator Oxford University Press

Nanostructures and Quantum Effects documents the most recent developments

in the field of quantum effects in semiconductor nanostructures such as quantum wires and boxes. Interrelated topics such as quantum interference, low-dimensional electron transport, single-electron and microcavity effects, electron holography, and quantum measurements together with the most recent progress in epitaxial growth of nanostructures and the manipulation of atoms using STM-related approaches are covered.

Quantum Theory of Optical Coherence Springer Science & Business Media

A summary of the pioneering work of Glauber in the field of optical coherence phenomena and photon statistics, this book describes the fundamental ideas of modern quantum optics and photonics in a tutorial style. It is thus not only intended as a reference for researchers in the field, but also to give graduate students an insight into the basic theories of the field. Written by the Nobel Laureate himself, the concepts described in this book have formed the basis for three further Nobel Prizes in Physics within the last decade.

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