
Spontaneous Emission and Laser Oscillation in Microcavities

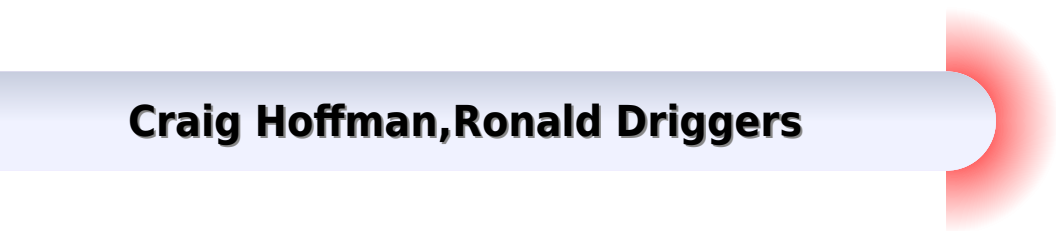
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Spontaneous Emission And Laser Oscillation In Microcavities

Craig Hoffman, Ronald Driggers



Spontaneous Emission And Laser Oscillation In Microcavities:

Spontaneous Emission and Laser Oscillation in Microcavities Hiroyuki Yokoyama, Kikuo Ujihara, 2020-07-09 In spite of the increasing importance of microcavities device physics or the observable phenomena in optical microcavities such as enhanced or inhibited spontaneous emission and its relation with the laser oscillation has not been systematically well described until now Spontaneous Emission and Laser Oscillation in Microcavities presents the basics of optical microcavities The volume is divided into ten chapters each written by respected authorities in their areas The book surveys several methods describing free space spontaneous emission and discusses changes in the feature due to the presence of a cavity The effect of dephasing of vacuum fields on spontaneous emission in a microcavity and the effects of atomic broadening on spontaneous emission in an optical microcavity are examined The book details the splitting in transmission peaks of planar microcavities containing semiconductor quantum wells A simple but useful way to consider the change in the spontaneous emission rate from the viewpoint of mode density alteration by wavelength sized cavities is provided Authors also discuss the spontaneous emission in dielectric planar microcavities Spontaneous emission in microcavity surface emitting lasers is covered as are the effects of electron confinement in semiconductor quantum wells wires and boxes also given The volume extends the controlling spontaneous emission phenomenon to laser oscillation Starting from the Fermi golden rule the microcavity laser rate equations are derived and the oscillation characteristics are analyzed Recent progress in optical microcavity experiments is summarized and the applicability in massively optical parallel processing systems and demands for the device performance are explored This volume is extremely useful as a textbook for graduate and postgraduate students and works well as a unique reference for researchers beginning to study in the field **Spontaneous Emission**

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Microcavities and Photonic Bandgaps: Physics and Applications J.G. Rarity, Claude Weisbuch, 2012-12-06 The control of optical modes in microcavities or in photonic bandgap PBG materials is coming of age Although these ideas could have been developed some time ago it is only recently that they have emerged due to advances in both atomic physics and in fabrication techniques be it on the high quality dielectric mirrors required for high finesse Fabry Perot resonators or in semiconductor multilayer deposition methods Initially the principles of quantum electro dynamics QED were demonstrated in elegant atomic physics experiments Now solid state implementations are being investigated with several subtle differences from the atomic case such as those due to their continuum of electronic states or the near Boson nature of their elementary excitations the exciton Research into quantum optics brings us ever newer concepts with potential to improve system performance such as photon squeezing quantum cryptography reversible taps photonic de Broglie waves and quantum computers The possibility of implementing these ideas with solid state systems gives us hope that some could indeed find their way to the market demonstrating the continuing importance of basic research for applications be it in a somewhat more focused way than in earlier times for funding

Confined Electrons and Photons Elias Burstein, Claude Weisbuch, 2012-12-06 The optical properties of semiconductors have played an important role since the identification of semiconductors as small bandgap materials in the thinies due both to their fundamental interest as a class of solids baving specific optical propenies and to their many important applications On the former aspect we can cite the fundamental edge absorption and its assignment to direct or indirect transitions many body effects as revealed by exciton formation and photoconductivity On the latter aspect large scale applications such as LEDs and lasers photovoltaic converters photodetectors electro optics and non linear optic devices come to mind The eighties saw a revitalization of the whole field due to the advent of heterostructures of lower dimensionality mainly two dimensional quantum wells which through their enhanced photon matter interaction yielded new devices with unsurpassed performance Although many of the basic phenomena were evidenced through the seventies it was this impact on applications which in turn led to such a massive investment in fabrication tools thanks to which many new structures and materials were studied yielding funher advances in fundamental physics

Semiconductor Interfaces, Microstructures and Devices Zhe Chuan Feng, 1993-01-01 A semiconductor interface is the contact between the semiconductor itself and a metal The interface is a site of change and it is imperative to ensure that the semiconducting material is sealed at this point to maintain its reliability This book examines various aspects of interfaces showing how they can affect microstructures and devices such as infrared

photodetectors as used in nightsights and blue diode lasers It presents various techniques for examining different types of semiconductor material and suggests future potential commercial applications for different semiconductor devices Written by experts in their fields and focusing on metallic semiconductors Cadmium Telluride and related compounds this comprehensive overview of recent developments is an essential reference for those working in the semiconductor industry and provides a concise and comprehensive introduction to those new to the field

Advances in Information Optics and Photonics René Dändliker, 2008 In this age of the photon information optics and photonics represent the key technologies to sustain our knowledge based society New concepts in classical and quantum entangled light coherent interaction with matter and novel materials and processes have led to remarkable advances in today's information science and technology The ICO is closely involved with information optics as exemplified by the ICO topical meeting on Optoinformatics Information Photonics St Petersburg Russia 2006 the ICO ICTP Winter College on Quantum and Classical Aspects of Information Optics Trieste Italy 2006 and the many ICO Prizes recently awarded on outstanding contributions on these topics This book is in part based on these ICO activities

Nonlinear Optics S. Miyata, 2012-12-02 The field of nonlinear optics developed gradually with the invention of lasers After the discovery of second harmonic generation in quartz many other interesting nonlinear optical processes were rapidly discovered Simultaneously theoretical programmes for the understanding of nonlinear optical phenomena were stimulated in accordance to develop structure property relationships In the beginning research advances were made on inorganic ferroelectric materials followed by semiconductors In the 1970's the importance of organic materials was realised because of their nonlinear optical responses fast optical response high laser damage thresholds architectural flexibility and ease of fabrication At present materials can be classified into three categories inorganic ferroelectrics semiconductors and organic materials Advances have also been made in quantum chemistry approaches to investigate nonlinear optical susceptibilities and in the development of novel nonlinear optical devices Generally inorganic and organic nonlinear optical materials and their related optical processes are reported in separate meetings This book collects for the first time papers covering the recent developments and areas of present research in the field of nonlinear optical materials

Encyclopedia of Optical and Photonic Engineering (Print) - Five Volume Set Craig Hoffman, Ronald Driggers, 2015-09-22 The first edition of the Encyclopedia of Optical and Photonic Engineering provided a valuable reference concerning devices or systems that generate transmit measure or detect light and to a lesser degree the basic interaction of light and matter This Second Edition not only reflects the changes in optical and photonic engineering that have occurred since the first edition was published but also Boasts a wealth of new material expanding the encyclopedia's length by 25 percent Contains extensive updates with significant revisions made throughout the text Features contributions from engineers and scientists leading the fields of optics and photonics today With the addition of a second editor the Encyclopedia of Optical and Photonic Engineering Second Edition offers a balanced and up to date look at the fundamentals of a diverse portfolio of technologies

and discoveries in areas ranging from x ray optics to photon entanglement and beyond This edition s release corresponds nicely with the United Nations General Assembly s declaration of 2015 as the International Year of Light working in tandem to raise awareness about light s important role in the modern world Also Available Online This Taylor E mail e reference taylorandfrancis com International Tel 44 0 20 7017 6062 E mail online sales tandf co uk *Photonic Crystals* Jean-Michel Lourtioz, Henri Benisty, Vincent Berger, Jean-Michel Gerard, Daniel Maystre, Alexei Tchebnokov, 2008-03-19 Just like the periodical crystalline potential in solid state crystals determines their properties for the conduction of electrons the periodical structuring of photonic crystals leads to envisioning the possibility of achieving a control of the photon flux in dielectric and metallic materials The use of photonic crystals as a cage for storing filtering or guiding light at the wavelength scale thus paves the way to the realisation of optical and optoelectronic devices with ultimate properties and dimensions This should contribute toward meeting the demands for a greater miniaturisation that the processing of an ever increasing number of data requires Photonic Crystals intends to provide students and researchers from different fields with the theoretical background needed for modelling photonic crystals and their optical properties while at the same time presenting the large variety of devices from optics to microwaves where photonic crystals have found applications As such it aims at building bridges between optics electromagnetism and solid state physics This book was written by six specialists of nanophotonics and was coordinated by Jean Michel Lourtioz head of the Institut d electronique Fondamentale in Orsay and coordinator of the French Research Network in Nanophotonics Ultrafast Spectroscopy of Semiconductors and Semiconductor Nanostructures Jagdeep Shah, 2013-11-21 The field of ultrafast spectroscopy of semiconductors and their nanostructures continues to be an active field of research Exciting new developments have taken place since the first edition of this book was completed in 1995 This revised edition includes a discussion of many of these recent developments in the field This is accomplished by adding a chapter on Recent Developments at the end of the book This approach was selected to provide a discussion of results while they are still relatively recent Results published before the end of May 1998 were considered for inclusion in this book The objective of this revised edition remains the same as before to provide a cohesive discussion of the many diverse contributions of ultrafast spectroscopy to the field of semiconductors Extensive cross references are made to earlier chapters in order to accomplish this goal The chapter on Recent Developments begins with a brief discussion of new lasers new techniques of ultrafast spectroscopy and novel nanostructures This is followed by a section on Coherent Spectroscopy where some of the most interesting recent developments have taken place These include observation of quantum kinetic effects effects that require going beyond the mean field approach of the semiconductor Bloch equations coherent control of populations and current in semiconductors exciton continuum interactions and many diverse aspects of coherent spectroscopy including studies of microcavities Bragg structures quantum dots and quantum wires

Spontaneous Emission And Laser Oscillation In Microcavities Book Review: Unveiling the Magic of Language

In an electronic era where connections and knowledge reign supreme, the enchanting power of language has become more apparent than ever. Its capability to stir emotions, provoke thought, and instigate transformation is really remarkable. This extraordinary book, aptly titled "**Spontaneous Emission And Laser Oscillation In Microcavities**," compiled by a very acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we will delve into the book's central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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