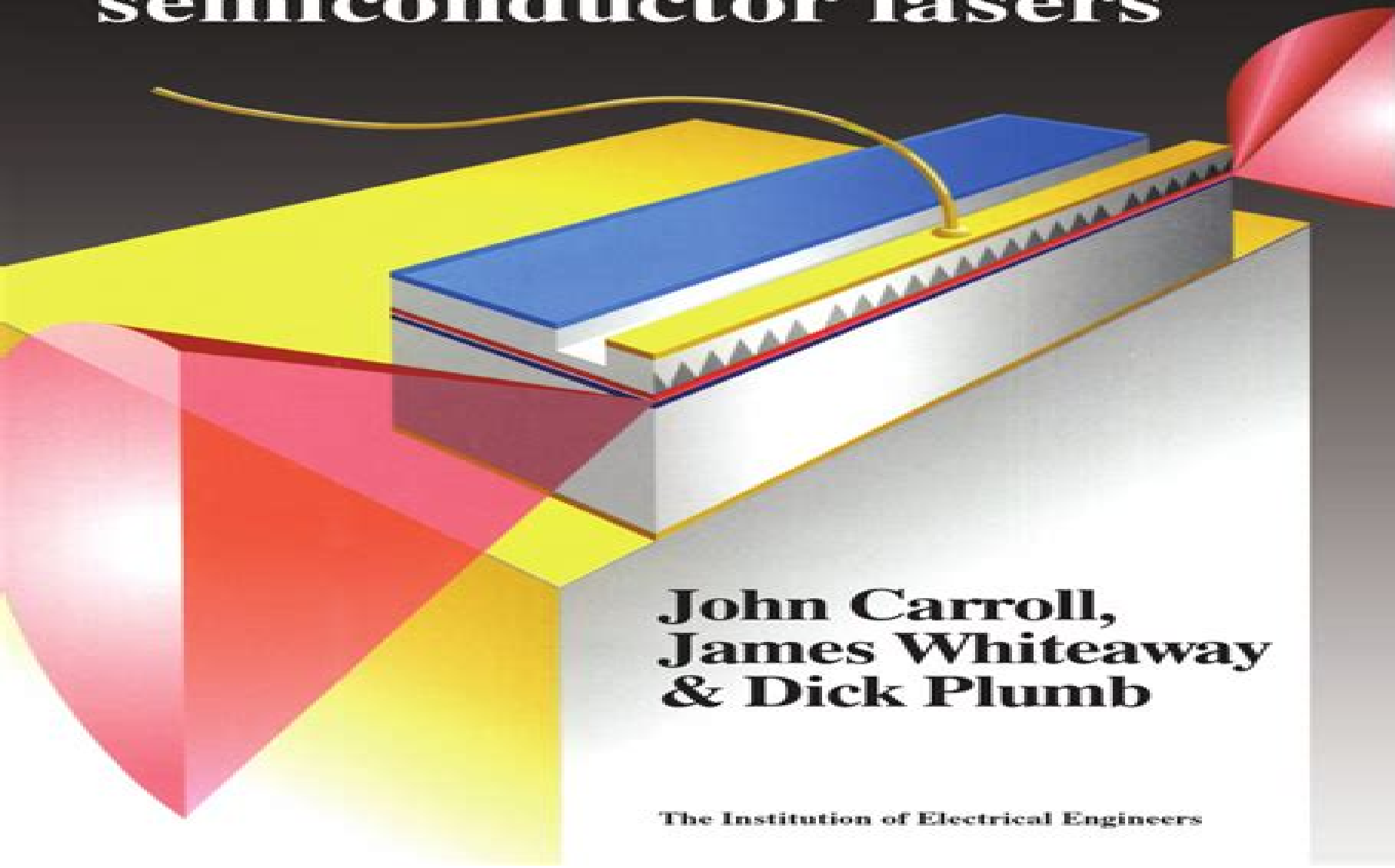




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Distributed feedback semiconductor lasers



**John Carroll,
James Whiteaway
& Dick Plumb**

The Institution of Electrical Engineers

Distributed Feedback Semiconductor Lasers Operating In

Dr. H. Ghafouri-Shiraz



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Distributed Feedback Semiconductor Lasers John E. Carroll, James Whiteaway, Dick Plumb, 1998 Concentrating on presenting a thorough analysis of DFB lasers from a level suitable for research students this book emphasises and gives extensive coverage of computer aided modeling techniques *Distributed Feedback Laser Diodes* Dr. H. Ghafouri-Shiraz, B. S. K. Lo, 1996-08-06 Distributed Feedback Laser Diodes Principles and Physical Modelling H Ghafouri Shiraz B S K Lo University of Birmingham UK Advances in optical fibre based communications systems have played a crucial role in the development of the information highway By offering a single mode oscillation and narrow spectral output distributed feedback DFB semiconductor laser diodes offer an excellent optical light source for fibre based communication systems This comprehensive text focuses on the basic working principles of DFB laser diodes and details the development of a new technique for enhanced system performance Considers the optical waveguiding characteristics and properties of semiconductor materials and the physics of DFB semiconductor lasers Presents a powerful modelling technique based on the transfer matrix method which can be used to improve the design of laser diodes optical filters and amplifiers Examines the effect of the various corrugation shapes on the coupling coefficients and lasing characteristics of DFB laser diodes Technical advice to improve immunity against the spatial hole burning effect Extensive referencing throughout and a comprehensive glossary of symbols and abbreviations Distributed Feedback Laser Diodes is an indispensable text for senior students of electrical and electronic engineering and physics and will consolidate their knowledge in this rapidly growing field As a technical guide for the structural design of DFB laser diodes it will serve as an invaluable reference for researchers in optoelectronics and semiconductor and device physics *Distributed Feedback Laser Diodes and Optical Tunable Filters* H. Ghafouri-Shiraz, 2003-11-07 Advances in optical fibre based communications systems have played a crucial role in the development of the information highway By offering a single mode oscillation and narrow spectral output distributed feedback DFB semiconductor laser diodes offer excellent optical light sources as well as optical filters for fibre based communications and dense wavelength division multiplexing DWDM systems This comprehensive text focuses on the basic working principles of DFB laser diodes and optical filters and details the development of a new technique for enhanced system performance Considers the optical waveguiding characteristics and properties of semiconductor materials and the physics of DFB semiconductor lasers Presents a powerful modelling technique based on the transfer matrix method which can be used to improve the design of laser diodes optical fibres and amplifiers Examines the effect of the various corrugation shapes on the coupling coefficients and lasing characteristics of DFB laser diodes Technical advice to improve immunity against the spatial hole burning effect Extensive referencing throughout and a comprehensive glossary of symbols and abbreviations Suitable for both introductory and advanced levels This is an indispensable textbook for undergraduate and postgraduate students of electrical and electronic engineering and physics as it consolidates their knowledge in this rapidly

growing field As a technical guide for the structural design of DFB laser diodes and optical filters the book will serve as an invaluable reference for researchers in opto electronics and semi conductor device physics

Distributed Feedback Laser Diodes and Optical Tunable Filters Dr. H. Ghafouri-Shiraz, 2004-02-06 Advances in optical fibre based communications systems have played a crucial role in the development of the information highway By offering a single mode oscillation and narrow spectral output distributed feedback DFB semiconductor laser diodes offer excellent optical light sources as well as optical filters for fibre based communications and dense wavelength division multiplexing DWDM systems This comprehensive text focuses on the basic working principles of DFB laser diodes and optical filters and details the development of a new technique for enhanced system performance Considers the optical waveguiding characteristics and properties of semiconductor materials and the physics of DFB semiconductor lasers Presents a powerful modelling technique based on the transfer matrix method which can be used to improve the design of laser diodes optical fibres and amplifiers Examines the effect of the various corrugation shapes on the coupling coefficients and lasing characteristics of DFB laser diodes Technical advice to improve immunity against the spatial hole burning effect Extensive referencing throughout and a comprehensive glossary of symbols and abbreviations Suitable for both introductory and advanced levels This is an indispensable textbook for undergraduate and postgraduate students of electrical and electronic engineering and physics as it consolidates their knowledge in this rapidly growing field As a technical guide for the structural design of DFB laser diodes and optical filters the book will serve as an invaluable reference for researchers in opto electronics and semi conductor device physics

Dynamics of Distributed Feedback Lasers and Semiconductor Laser Arrays Yuan-Hwang Liao, 1997

Physics of Semiconductor Lasers B. Mroziwicz, M. Bugajski, W. Nakwaski, 2017-01-31 Written for readers who have some background in solid state physics but do not necessarily possess any knowledge of semiconductor lasers this book provides a comprehensive and concise account of fundamental semiconductor laser physics technology and properties The principles of operation of these lasers are therefore discussed in detail with the interrelations between their design and optical electrical and thermal properties The relative merits of a large number of laser structures and their parameters are described to acquaint the reader with the various aspects of the semiconductor lasers and the trends in their development

Laser Diode Modulation and Noise Klaus Petermann, 2012-12-06 Laser diodes represent a key element in the emerging field of opto electronics which includes for example optical communication optical sensors or optical disc systems For all these applications information is either transmitted stored or read out The performance of these systems depends to a great deal on the performance of the laser diode with regard to its modulation and noise characteristics Since the modulation and noise characteristics of laser diodes are of vital importance for optoelectronic systems the need for a book arises that concentrates on this subject This book thus closes the gap between books on the device physics of semiconductor lasers and books on system design Complementary to the specific topics concerning modulation and noise the first part of this book

reviews the basic laser characteristics so that even a reader without detailed knowledge of laser diodes may follow the text. In order to understand the book the reader should have a basic knowledge of electronics semiconductor physics and optical communications. The work is primarily written for the engineer or scientist working in the field of optoelectronics; however, since the book is self-contained and since it contains a lot of numerical examples, it may serve as a textbook for graduate students. In the field of laser diode modulation and noise, a vast amount has been published during recent years. Even though the book contains more than 600 references, only a small part of the existing literature is included.

Nuclear Science Abstracts, 1976 **Industrial Applications of Lasers** John F. Ready, 1997-04-25

A practical book with a variety of uses, this book can help applications engineers spark problem-solving techniques through the use of lasers. *Industrial Application of Lasers*, Second Edition, takes the reader through laser fundamentals, unusual properties of laser light, types of practical lasers available, and commonly used accessory equipment. The book also applies this information to existing and developing applications. Current uses of lasers including laser welding and cutting, electronic fabrication techniques, lightwave communications, laser-based applications in alignment, surveying, and metrology are all covered, as well as discussing the potential for future applications such as all-optical computers, remote environmental monitoring, and laser-assisted thermonuclear fusion. Explains basic laser fundamentals as well as emphasizing how lasers are used for real applications in industry. Describes the importance of laser safety. Discusses potentially important future applications such as remote environmental monitoring. Includes rare expert lore and opinion.

Handbook of Distributed Feedback Laser Diodes, Second Edition Geert Morthier, Patrick Vankwikelberge, 2013-09-01. Since the first edition of this book was published in 1997, the photonics landscape has evolved considerably, and so has the role of distributed feedback (DFB) laser diodes. Although tunable laser diodes continue to be introduced in advanced optical communication systems, DFB laser diodes are still widely applied in many deployed systems. This also includes wavelength-tunable DFB laser diodes and DFB laser diode arrays usually integrated with intensity or phase modulators and semiconductor optical amplifiers. This valuable resource gives professionals a comprehensive description of the different effects that determine the behavior of a DFB laser diode. Special attention is given to two new chapters on wavelength-tunable DFB laser diodes and bistable and unstable DFB laser diodes. Among many other updates throughout the reference, semiconductor and electromagnetic professionals are also provided two new appendices. This book fully covers the underlying theory, commercial applications, necessary design criteria, and future direction of this technology.

Progress in Optics, 1988-05-01. *Progress in Optics: Ultrafast All-Optical Signal Processing Devices* Dr. Hiroshi Ishikawa, 2008-09-15. Semiconductor-based ultrafast all-optical signal processing devices are a key technology for the next generation of ultrahigh bandwidth optical communication systems. The introduction of ultrafast communication systems based on all-optical signal processing is considered to be one of the most promising ways to handle the rapidly increasing global communication traffic. Such systems will enable real-time super-high definition moving

pictures such as high reality TV conference remote diagnosis and surgery cinema entertainment and many other applications with small power consumption The key issue to realize such systems is to develop ultra fast optical devices such as light sources all optical gates and wavelength converters Ultra Fast All Optical Signal Processing Devices discusses the state of the art development of semiconductor based ultrafast all optical devices and their various signal processing applications for bit rates 100Gb/s to 1Tb/s Ultra Fast All Optical Signal Processing Devices Provides a thorough and in depth treatment of the most recent achievements in ultrafast all optical devices Discusses future networks with applications such as HD TV and super high definition moving screens as a motivating background for devices research Covers mode locked semiconductor lasers electro absorption modulator based 160Gb/s signal sources SOA based symmetric Mach Zehnder type all optical gates intersubband transition gate device and more Explains the technical issues behind turning the ultra fast optical devices into practical working tools Examples of above 160Gb/s transmission experiments Discusses future prospects of the ultra fast signal processing devices This invaluable reference will provide device researchers and engineers in industry researchers at universities including graduate students and post doctoral researchers and professors and research institutes with a thorough understanding of ultrahigh bandwidth optical communication systems Device and communication market watchers will also find this book useful

Masers and Lasers Mario Bertolotti, 2015-03-13 Masers and Lasers An Historical Approach examines the progress of research and practical use of lasers chronologically covering the fundamental science in detail alongside fascinating biographical sketches of famous physicists and summaries of seminal papers It supplies helpful drawings of prototype devices conceptual diagrams to aid in underst

Semiconductor Lasers Govind P. Agrawal, Niloy K. Dutta, 2013-11-27 Since its invention in 1962 the semiconductor laser has come a long way Advances in material purity and epitaxial growth techniques have led to a variety of semiconductor lasers covering a wide wavelength range of 0.3-100 μm The development during the 1970s of GaAs semiconductor lasers emitting in the near infrared region of 0.8-0.9 μm resulted in their use for the first generation of optical fiber communication systems However to take advantage of flow losses in silica fibers occurring around 1.3 and 1.55 μm the emphasis soon shifted toward long wavelength semiconductor lasers The material system of choice in this wavelength range has been the quaternary alloy InGaAsP During the last five years or so the intense development effort devoted to InGaAsP lasers has resulted in a technology mature enough that lightwave transmission systems using InGaAsP lasers are currently being deployed throughout the world This book is intended to provide a comprehensive account of long wave length semiconductor lasers Particular attention is paid to InGaAsP lasers although we also consider semiconductor lasers operating at longer wave lengths The objective is to provide an up to date understanding of semicon ductor lasers while incorporating recent research results that are not yet available in the book form Although InGaAsP lasers are often used as an example the basic concepts discussed in this text apply to all semiconductor lasers irrespective of their wavelengths

Fundamentals of Fibre Optics in Telecommunication and Sensor Systems Bishnu P.

Pal, 1992 Fibre Optics Is A Very Important Constituent Of Modern Information Technology One Major Economic Benefit Offered By Fibre Optics Is Very High Information Transmission Rate At Low Cost Per Circuit Km The First Fibre Optic Telephone Link Went Public In Late 1970S Ever Since The Industrially Advanced Nations Around The World Have Been Striving To Deploy Fibre Optics In Almost Every Sector Of Communication Including Computer Networks And Data Links Rarely Since The Discovery Of Transistors Have We Noticed Such A Fantastic Growth Rate Of A New Technology As An Important Byproduct Of This Phenomenal Progress A New Class Of Ultra Sensitive Optical Sensors And Devices Based On Fibre Optics Has Emerged Which Are Being Developed For Large Scale Use In Industrial And Biomedical Sectors This Book Provides Semi Tutorial Presentations Of The Fundamentals Of This Emerging Technology As Applied To Telecommunication And Sensor Development Each Chapter Contributed By Leading Researchers Is Appended With A Large Number Of References To The Original Publications The Book Is Broadly Divided Into Three Parts The First Part Is Devoted To Propagation Effects In Optical Waveguides Including Polarization And Non Linear Effects And Their Measurements Fabrication And Cabling Technologies Of Optical Fibres Are Also Discussed In This Part The Second Part Of The Book Deals With Optical Sources Detectors Integrated Optical Devices And System Designs Involved In Optical Communication Technology The Last Part Of The Book Covers Topics Like Intensity Modulated And Interferometric Optical Fibre Sensors In Line Fibre Optic Components For Signal Processing And Multiplexing Of Optical Signals And Application Of Fibre Optics In The Power Sector The Extensive Coverage Should Prove Useful To Senior Undergraduate And Postgraduate Students Researchers And Also To R D Engineers Who Want A Tutorial Introduction To The Technologies Of Fibre Optic Telecommunication And Sensors

Advances in Imaging and Electron Physics, 1999-04-13 Advances in Imaging Electron Physics merges two long running serials Advances in Electronics Electron Physics and Advances in Optical Electron Microscopy The series features extended articles on the physics of electron devices especially semiconductor devices particle optics at high and low energies microlithography image science and digital image processing electromagnetic wave propagation electron microscopy and the computing methods used in all these domains

Nonlinear Fiber Optics Govind P. Agrawal, 2013 Machine generated contents note ch 1 Introduction 1 1 Historical Perspective 1 2 Fiber Characteristics 1 2 1 Material and Fabrication 1 2 2 Fiber Losses 1 2 3 Chromatic Dispersion 1 2 4 Polarization Mode Dispersion 1 3 Fiber Nonlinearities 1 3 1 Nonlinear Refraction 1 3 2 Stimulated Inelastic Scattering 1 3 3 Importance of Nonlinear Effects 1 4 Overview Problems References ch 2 Pulse Propagation in Fibers 2 1 Maxwell s Equations 2 2 Fiber Modes 2 2 1 Eigenvalue Equation 2 2 2 Single Mode Condition 2 2 3 Characteristics of the Fundamental Mode 2 3 Pulse Propagation Equation 2 3 1 Nonlinear Pulse Propagation 2 3 2 Higher Order Nonlinear Effects 2 3 3 Raman Response Function and its Impact 2 3 4 Extension to Multimode Fibers 2 4 Numerical Methods 2 4 1 Split Step Fourier Method 2 4 2 Finite Difference Methods Problems References ch 3 Group Velocity Dispersion

Note continued 3 1 Different Propagat

Physics of Photonic

Devices Shun Lien Chuang, 2009-01-20 The most up to date book available on the physics of photonic devices This new edition of *Physics of Photonic Devices* incorporates significant advancements in the field of photonics that have occurred since publication of the first edition *Physics of Optoelectronic Devices* New topics covered include a brief history of the invention of semiconductor lasers the Lorentz dipole method and metal plasmas matrix optics surface plasma waveguides optical ring resonators integrated electroabsorption modulator lasers and solar cells It also introduces exciting new fields of research such as surface plasmonics and micro ring resonators the theory of optical gain and absorption in quantum dots and quantum wires and their applications in semiconductor lasers and novel microcavity and photonic crystal lasers quantum cascade lasers and GaN blue green lasers within the context of advanced semiconductor lasers *Physics of Photonic Devices* Second Edition presents novel information that is not yet available in book form elsewhere Many problem sets have been updated the answers to which are available in an all new *Solutions Manual* for instructors Comprehensive timely and practical *Physics of Photonic Devices* is an invaluable textbook for advanced undergraduate and graduate courses in photonics and an indispensable tool for researchers working in this rapidly growing field *Current Research And Development In Optical Fiber Communications In China* Qiming Wang, 1997-01-03 In the last decade China has experienced one of the fastest economic growth in the world Leading this enormous growth is the development of telecommunications that has a growth rate far exceeding that of its GNP With such fast growth China will have the largest telecommunication network with 420 million lines by 2010 The backbone of the national telecom network in China is primarily optical fiber cables today This book contains a selection of reports reviewing the progress of the research and development in optoelectronics and optical fiber communications in China The first four papers focus on the current development in optical fiber communications with particular interest in studies of soliton transmission and optical WDM transmission experiments The next four papers describe the research results on quantum well lasers bi stable lasers electro absorption modulators and SEED and photonic integrated devices Fiber ring lasers using EDFA and the ASE noise in the PIN receiver due to EDFA are discussed in the next two papers respectively The last two papers describe the research activities and results of the development of the GaAs ICs for high speed lightwave systems and their characterization using optical sampling techniques The contents included in this book may be regarded as the epitome of the current status of research in this field in mainland China **Comprehensive Semiconductor Science and Technology**, 2011-01-28 Semiconductors are at the heart of modern living Almost everything we do be it work travel communication or entertainment all depend on some feature of semiconductor technology *Comprehensive Semiconductor Science and Technology* Six Volume Set captures the breadth of this important field and presents it in a single source to the large audience who study make and exploit semiconductors Previous attempts at this achievement have been abbreviated and have omitted important topics Written and Edited by a truly international team of experts this work delivers an objective yet cohesive global review of the semiconductor world The

work is divided into three sections The first section is concerned with the fundamental physics of semiconductors showing how the electronic features and the lattice dynamics change drastically when systems vary from bulk to a low dimensional structure and further to a nanometer size Throughout this section there is an emphasis on the full understanding of the underlying physics The second section deals largely with the transformation of the conceptual framework of solid state physics into devices and systems which require the growth of extremely high purity nearly defect free bulk and epitaxial materials The last section is devoted to exploitation of the knowledge described in the previous sections to highlight the spectrum of devices we see all around us Provides a comprehensive global picture of the semiconductor world Each of the work s three sections presents a complete description of one aspect of the whole Written and Edited by a truly international team of experts

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