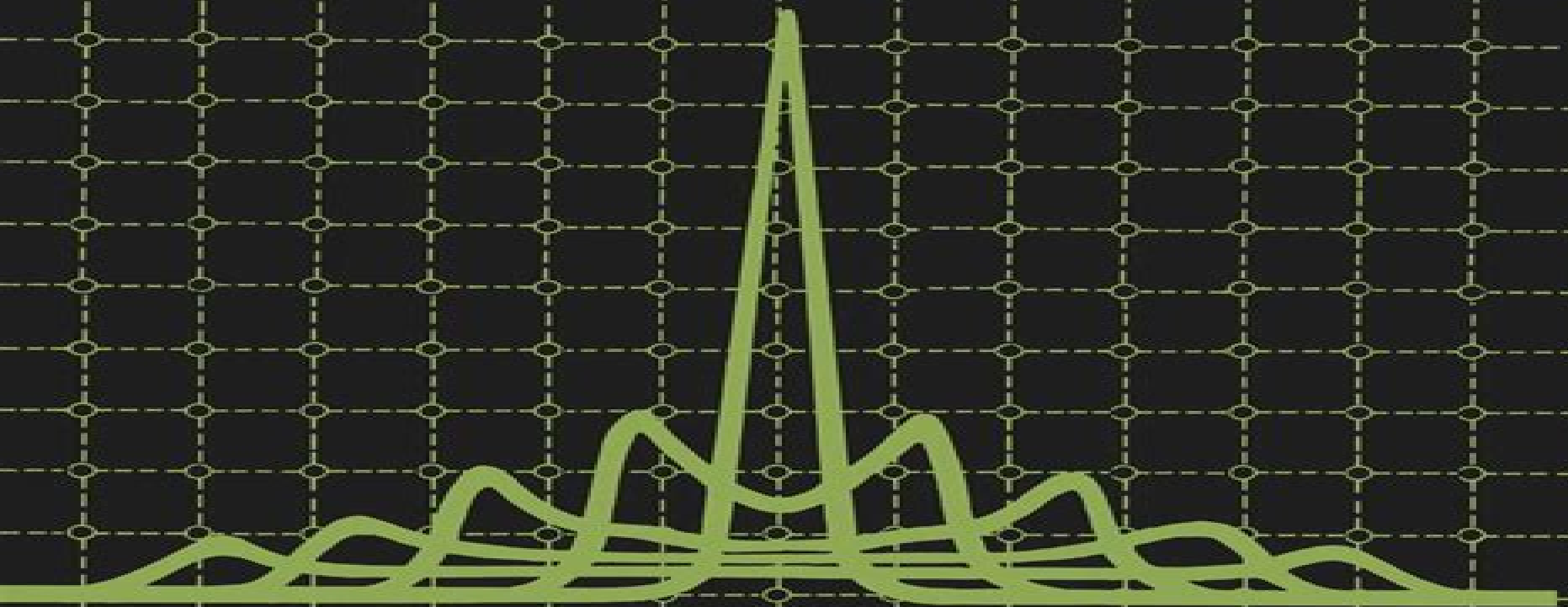


LONG-WAVELENGTH SEMICONDUCTOR LASERS

G.P. AGRAWAL
N.K. DUTTA



Long Wavelength Semiconductor Lasers

Manfred Helm



Long Wavelength Semiconductor Lasers:

Long-Wavelength Semiconductor Lasers Govind Agrawal, Niloy K. Dutta, 1986-12-31 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 low 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

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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 low 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 wavelength semiconductor lasers. Particular attention is paid to InGaAsP lasers, although we also consider semiconductor lasers operating at longer wavelengths. The objective is to provide an up-to-date understanding of semiconductor 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.

Long-Wavelength Infrared Semiconductor Lasers Hong K. Choi, 2004-03-18. Long wavelength Infrared Semiconductor Lasers provides a comprehensive review of the current status of semiconductor coherent sources emitting in the mid to far infrared spectrum and their applications. It includes three topics not covered in any previous book: far infrared emission from photo mixers as well as from hot hole lasers and InP based lasers emitting beyond two micrometers. Semiconductor lasers emitting at more than two micrometers have many applications such as in trace gas analysis, environmental monitoring, and industrial process control. Because of very rapid progress in recent years, until this book, no comprehensive information beyond scattered journal articles is available at present.

Design and Fabrication of High Speed, Long Wavelength, Semiconductor Lasers John Gilmary Wasserbauer, 1994

Semiconductor Lasers for Long-wavelength Optical-fibre Communications Systems M. J. Adams, 1987

Using Band-filling to Understand Long-wavelength Semiconductor Lasers and Q-switching of Solid-state Lasers Yi-jen Tsou, 1993

InGaAsNSb Xiaoping Yang, 2002

Long Wavelength Infrared Emitters Based on Quantum Wells and Superlattices Manfred Helm, 2000-10-31. This book offers a thorough survey of long wavelength infrared semiconductor emitters based primarily on quantum wells and superlattices. Featuring contributions from the most prominent researchers in the field, this volume allows readers to compare different types of lasers as well as examine investigations of potential far infrared terahertz sources. This is an essential reference for researchers, engineers, and graduate students who wish to obtain comprehensive knowledge about infrared semiconductor sources and recent developments in this field.

Semiconductor Lasers II Eli Kapon, 1999-01-14. Judging from the impact it has on our everyday lives, the semiconductor laser has emerged as perhaps the most important laser device currently in use. This volume presents information on recent advances in materials and structures.

Long-Wavelength Infrared Semiconductor Lasers Hong K. Choi, 2004

Long Wavelength Semiconductor Lasers Development for Infrared Heterodyne Applications National Aeronautics and Space Administration, 2018-12-29. PbSnTe single crystals were grown in a new 3 zone furnace. Molecular

beam epitaxy MBE growth parameters have been established including beam flux vs temperature and growth rates and dopant vs PbTe flux ratios for the various effusion sources involved Lattice matching studies were conducted and doping studies were completed Broad area Pb 1 x Sn x Te double heterostructure lasers were fabricated with active layer compositions up to x equals 0.04 at percent Sn in the active layers Electrical and optical test data are presented Feit Zeev and Kostyk Douglas NASA CR 189243 NAS 1.26 189243 NAS5 30445

Fundamentals of Semiconductor Lasers Takahiro Numai, 2006-05-10 Fundamentals of Semiconductor Lasers explains the physics and fundamental characteristics of semiconductor lasers with regard to systems applications The detailed and comprehensive presentation is unique in that it encourages the reader to consider different semiconductor lasers from different angles Emphasis is placed on recognizing common concepts such operating principles and structure and solving problems based on individual situations The treatment is enhanced by an historical account of advances in semiconductor lasers over the years discussing both those ideas that have persisted over the years and those that have faded out The first four chapters cover the basics of semiconductors including band structures optical transitions optical waveguides and optical resonators The remaining chapters discuss operating principles and basic characteristics of semiconductor lasers and advanced topics including dynamic single mode lasers quantum well lasers and control of spontaneous emission The reader need only be familiar with undergraduate level electromagnetism and quantum mechanics After reading this book the student will be able to think critically about semiconductor lasers and be able to read and understand journal papers in the field This book will be essential to any advanced undergraduate or graduate student of semiconductor lasers and any professional physicist or engineer looking for a good overview of the subject

Principles of Lasers Orazio Svelto, 2010-03-16 This fifth edition of Principles of Lasers includes corrections to the previous edition as well as being the first available as an ebook Its mission remains to provide a broad unified description of laser behavior physics technology and applications

Semiconductor Laser Theory Prasanta Kumar Basu, Bratati Mukhopadhyay, Rikmantra Basu, 2015-06-17 Developed from the authors classroom tested material Semiconductor Laser Theory takes a semiclassical approach to teaching the principles structure and applications of semiconductor lasers Designed for graduate students in physics electrical engineering and materials science the text covers many recent developments including diode lasers u

Process Technology for Semiconductor Lasers Kenichi Iga, Susumu Kinoshita, 2013-03-07 Process Technology for Semiconductor Lasers describes the design principles of semiconductor lasers mainly from the fabrication point of view A review is given of the history of semiconductor laser development and applications and of the materials used in lasing at short to long wavelengths The basic design principles for semiconductor laser devices and the epitaxy for laser production are discussed An entire chapter is devoted to the technology of liquid phase epitaxy and another one to vapor phase and beam epitaxies The characterizations of laser materials and the fabrication and characteristics of semiconductor lasers are treated Mode control techniques are presented

and surface emitting lasers are introduced in the final chapter

Core and Metro Networks Alexandros Stavdas, 2010-01-06 Find out everything you need to know about how current networks will have to evolve to provide for future broadband services In this book the authors provide an overview of the status challenges architectures and technological solutions for core and metropolitan networks Furthermore the book describes the current state of core and metropolitan telecommunication networks as well as the drivers and motives behind the current paradigm shift in the telecommunications industry Moreover the authors elaborate system design guidelines for both point to point and multi hop optical networks taking into consideration the analogue nature of the transmission channel Key Features Provides coverage of all aspects of core and metro networks supporting future broadband services and a detailed description of the state of the art Presents a clear path for migrating from point to point to data centric dynamic multi hop optical networks Shows how current systems will need to evolve over the coming years summarizing challenges and issues to be investigated in future research Covers a wide range of topics from network architectures to control plane to key optical and optoelectronic devices and best practice in transmission and system design Provides results best practices and guidelines for various technical problems including numerous hands on examples Written by authors from cutting edge companies such as Alcatel Lucent Siemens Lucent France Telecom BT and Telefonica Optical Core and Metro Networks will be of interest to researchers in industry and academia and advanced final year undergraduate and postgraduate students undertaking communications networking and optics courses

History Of Modern Optics And Optoelectronics Development In China Shouyun Tan, 2014-06-11 This book presents a collection of memoir papers on the development of modern and contemporary optics and optoelectronics in China from the 18th to 20th centuries The papers were written by famous scientists in China including members of the Chinese Academy of Sciences and the Chinese Academy of Engineering sharing their experience in different fields of optics and optoelectronics development This is a unique book in understanding the natural science history of optics and optoelectronics It gives you the general idea about how the western optical science spread to China in the 17th to 18th century the cradle of the contemporary optics in China Birth development and application of lasers in China high energy and high power lasers for laser antiballistic missile and laser nuclear fusion development of Chinese optical communication and optical information storage laser and infrared optics research for space science development of Chinese optical instruments etc

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 optoelectronics and semiconductor device physics

Optical and Microwave Technologies for Telecommunication

Networks Otto Strobel, 2016-03-23 This is a self contained book on the foundations and applications of optical and microwave technologies to telecommunication networks application with an emphasis on access local road cars trains vessels and airplanes indoor and in car data transmission as well as for long distance fiber systems and application in outer space and automation technology The book provides a systematic discussion of physics optics electromagnetic wave theory optical fibre technology and the potential and limitations of optical and microwave transmission

Reviewing **Long Wavelength Semiconductor Lasers**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is really astonishing. Within the pages of "**Long Wavelength Semiconductor Lasers**," an enthralling opus penned by a very acclaimed wordsmith, readers embark on an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve in to the book is central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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Long Wavelength Semiconductor Lasers Introduction

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