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Integrated Optics: Theory and Technology Cambridge University Press

The design of 1) a T-junction fundamental mode rectangular to-circular waveguide input coupler, 2) a multiple-hole input coupler and 3) a higher order mode (HOM) input coupler for a low-terahertz gyrotron travelling wave amplifier were studied. The T-junction input coupler with a Bragg reflector and a multiple-hole directional coupler were optimized for operation between 360 and 384 GHz, the proposed bandwidth of a low THz gyro TWA. The T-junction coupler and the multiple-hole coupler achieved the respective bandwidths of 10% and 35%. A higher order mode (HOM) two-branch waveguide coupler based on the even distribution of incident power was designed to couple the rectangular TE₁₀ mode to the circular TE₆₁ mode. The optimised tapered waveguide input coupler achieved an operating frequency range of 359-385 GHz, equating to a bandwidth of 7%. A prototype waveguide coupler scaled to W-band (75-110 GHz) was manufactured. The vector network analyser measured return loss of the HOM coupler was shown to be Plastic Optical Fiber Coupler with Hollow Taper Waveguide Springer Nature

Up-to-date coverage of the analysis and applications of coplanar waveguides to microwave circuits and antennas

The unique feature of coplanar waveguides, as opposed to more conventional waveguides, is their uniplanar construction, in which all of the conductors are aligned on the same side of the substrate. This feature simplifies manufacturing and allows faster and less expensive characterization using on-wafer techniques. Coplanar Waveguide Circuits, Components, and Systems is an engineer's complete resource, collecting all of the available data on the subject. Rainee Simons thoroughly discusses propagation parameters for conventional coplanar waveguides and includes valuable details such as the derivation of the fundamental equations, physical explanations, and numerical examples. Coverage also includes: Discontinuities and circuit elements Transitions to other transmission media Directional couplers, hybrids, and magic T Microelectromechanical systems based switches and phase shifters Tunable devices using ferroelectric materials Photonic bandgap structures Printed circuit antennas

Finite Element Methods for Nonlinear Optical Waveguides Academic Press

Professor Hunsperger's Integrated Optics is one of the few texts that is comprehensive and thorough enough for use both as a classroom text (practice problems are included) and as a specialist's reference. The gratifying success of the first two editions and the continuing rapid development of the field necessitated the writing of this third edition. All chapters have been revised and updated, and a new chapter, on quantum well devices, has been added. As in the previous editions, detailed descriptions of the phenomena, devices, and technology used in optical integrated circuits and their relationship to fiber optics are presented. The trend of telecommunications toward the use of single mode systems

operating at the longer wavelengths of 1.3 and 1.55 μm is explained and documented with illustrations of recently developed devices and systems. Broader coverage of GaInAsP devices and optical integrated circuits is provided, and the new growth techniques of molecular beam epitaxy (MBE) and metal-organic chemical vapor deposition (MOCVD) are described. A discussion of the extensive development of hybrid optical integrated circuits in lithium niobate is also included. From the reviews: I never had the opportunity of using Hunsperger as a text to teach from but after reading the present third edition, I think it must be a pleasure to do so. It is a good book because of its precise language and its didactic organization (with many clear tables), it is exhaustive in its details, and rigorous in its background; it is well suited for a graduate-level course.

Plasmonic Nanoelectronics and Sensing Springer

This book deals with microwave and optical transmission from the unique viewpoint of Maxwell's theory, and via the consistent theoretical framework of coupled modes (ideal modes, local modes and super modes). A feature of the book is its particular emphasis on the usefulness of the coupled mode theory. The author has carried out to the end the solution of a diversity of waveguide problems, such as curved waveguides, tapered waveguides, tolerances of imperfections for a microwave and optical transmission line, etc. Another feature reflected in this volume is its presentation of adequate background material required for understanding the theory, which often appears complicated and difficult in the literature. The book begins with phenomenological theories of coupled modes, with the intention to familiarize the reader in a simple way with the basic concepts relevant to a further development of the coupled mode theory. Solutions of the coupled mode equations with constant or variable coefficients and orthogonal expansions in waveguides, whose combination represents a complete solution of Maxwell's equations, are treated in mathematical detail, with sufficient physical

description to elucidate the underlying principles.

Photonic Devices Information Gatekeepers Inc

A non-linear wave is one of the fundamental objects of nature. They are inherent to aerodynamics and hydrodynamics, solid state physics and plasma physics, optics and field theory, chemistry reaction kinetics and population dynamics, nuclear physics and gravity. All non-linear waves can be divided into two parts: dispersive waves and dissipative ones. The history of investigation of these waves has been lasting about two centuries. In 1834 J. S. Russell discovered the extraordinary type of waves without the dispersive broadening. In 1965 N. J. Zabusky and M. D. Kruskal found that the Korteweg-de Vries equation has solutions of the solitary wave form. This solitary wave demonstrates the particle-like properties, i. e. , stability under propagation and the elastic interaction under collision of the solitary waves. These waves were named solitons. In succeeding years there has been a great deal of progress in understanding of soliton nature. Now solitons have become the primary components in many important problems of nonlinear wave dynamics. It should be noted that non-linear optics is the field, where all soliton features are exhibited to a great extent. This book had been designed as the tutorial to the theory of non-linear waves in optics. The first version was projected as the book covering all the problems in this field, both analytical and numerical methods, and results as well. However, it became evident in the process of work that this was not a real task.

Silicon Photonics John Wiley & Sons

Handbook of Microwave Component Measurements Second Edition is a fully updated, complete reference to this topic, focusing on the modern measurement tools, such as a Vector Network Analyzer (VNA), gathering in one place all the concepts, formulas, and best practices of measurement science. It includes basic concepts in each chapter as well as appendices which provide all the detail needed to understand the science behind microwave measurements. The book offers an insight into the best practices for ascertaining the true nature of the device-under-test (DUT), optimizing the time to setup and measure, and to the greatest extent possible, remove the effects of the measuring equipment from that result. Furthermore, the author writes with a simplicity that is easily accessible to the student or new engineer, yet is thorough enough to provide details of measurement science for even the most advanced applications and researchers. This welcome new edition brings forward the most modern techniques used in industry today, and recognizes that more new techniques have developed since the first edition published in 2012. Whilst still focusing

on the VNA, these techniques are also compatible with other vendor's advanced equipment, providing a comprehensive industry reference.

Photonic Signal Processing Springer Science & Business Media

A classroom-tested introduction to integrated and fiber optics This text offers an in-depth treatment of integrated and fiber optics, providing graduate students, engineers, and scientists with a solid foundation of the principles, capabilities, uses, and limitations of guided-wave optic devices and systems. In addition to the transmission properties of dielectric waveguides and optical fibers, this book covers the principles of directional couplers, guided-wave gratings, arrayed-waveguide gratings, and fiber optic polarization components. The material is fully classroom-tested and carefully structured to help readers grasp concepts quickly and apply their knowledge to solving problems. Following an overview, including important nomenclature and notations, the text investigates three major topics: Integrated optics Fiber optics Pulse evolution and broadening in optical waveguides Each chapter starts with basic principles and gradually builds to more advanced concepts and applications. Compelling reasons for including each topic are given, detailed explanations of each concept are provided, and steps for each derivation are carefully set forth. Readers learn how to solve complex problems using physical concepts and simplified mathematics. Illustrations throughout the text aid in understanding key concepts, while problems at the end of each chapter test the readers' grasp of the material. The author has designed the text for upper-level undergraduates, graduate students in physics and electrical and computer engineering, and scientists. Each chapter is self-contained, enabling instructors to choose a subset of topics to match their particular course needs. Researchers and practitioners can also use the text as a self-study guide to gain a better understanding of photonic and fiber optic devices and systems.

Millimetre and Sub-millimetre Wave Input Couplers for Gyrotron Travelling Wave Amplifiers Artech House

The growing demand for instant and reliable communication means that photonic circuits are increasingly finding applications in optical communications systems. One of the prime candidates to provide satisfactory performance at low cost in the photonic circuit is silicon. Whilst silicon photonics is less well developed as compared to some other material technologies, it is poised to make a serious impact on the telecommunications industry, as well as in many other applications, as other technologies fail to meet the yield/performance/cost trade-offs. Following a sympathetic tutorial approach, this first book on silicon photonics provides a comprehensive overview of the technology. Silicon Photonics explains the concepts of the technology, taking the reader through the introductory principles, on to more complex building blocks of the optical circuit. Starting with the basics of waveguides and the properties peculiar to silicon, the book also features: Key design issues in optical circuits. Experimental methods. Evaluation techniques. Operation of waveguide based devices. Fabrication of silicon waveguide

circuits. Evaluation of silicon photonic systems. Numerous worked examples, models and case studies. Silicon Photonics is an essential tool for photonics engineers and young professionals working in the optical network, optical communications and semiconductor industries. This book is also an invaluable reference and a potential main text to senior undergraduates and postgraduate students studying fibre optics, integrated optics, or optical network technology.

Radio Engineering for Wireless Communication and Sensor Applications CRC Press

Optical Signal Processing is a collection of synopses of the works of many experts in the different fields of optical signal processing. The book also includes systems or algorithms that have been successfully tried and used. The monograph is divided into seven parts. Part I discusses color image processing and white-light Fourier transformations, while Part II covers topics related to pattern recognition such as optical feature extraction and unconventional correlators. Part III deals with temporal signal processing and its related optical architectures, acoustooptic synthetic aperture radar processors, and acoustooptic signal processors. Part IV tackles nonlinear optical processors and waveguide devices. Part V discusses optical and tomographic transformation. Part VI deals with optical numeric processing, optical linear algebra processors, and related algorithm and software. Part VII talks about devices and components and their applications such as fiber-optic delay-line signal processors and spatial light modulators. The text is recommended for engineers and scientists in the field of optical signal processing, especially those who would like to know more of its advancements.

Electrooptic Waveguide Directional Coupler Modulator in Aluminum Gallium Arsenide-gallium Arsenide Springer Science & Business Media

This memorandum describes the quarter-wavelength line method of measuring the directivity of a coaxial coupler. It gives the error analysis of the method in detail and shows that the method has the capability of precise and repeatable measurements.

Optical Waveguide Communications Glossary Springer Science & Business Media

Photonic devices lie at the heart of the communications revolution, and have become a large and important part of the electronic engineering field, so much so that many colleges now treat this as a subject in its own right. With this in mind, the author has put together a unique textbook covering every major photonic device, and striking a careful balance between theoretical and practical concepts. The book assumes a basic knowledge of optics, semiconductors and electromagnetic waves. Many of the key background concepts are reviewed in the first chapter. Devices covered include optical fibers, couplers, electro-optic devices, magneto-optic devices, lasers and

photodetectors. Problems are included at the end of each chapter and a solutions set is available. The book is ideal for senior undergraduate and graduate courses, but being device driven it is also an excellent engineers' reference.

Optical Waveguides John Wiley & Sons

This book covers device design fundamentals and system applications in optical MEMS and nanophotonics. Expert authors showcase examples of how fusion of nanoelectromechanical (NEMS) with nanophotonic elements is creating powerful new photonic devices and systems including MEMS micromirrors, MEMS tunable filters, MEMS-based adjustable lenses and apertures, NEMS-driven variable silicon nanowire waveguide couplers, and NEMS tunable photonic crystal nanocavities. The book also addresses system applications in laser scanning displays, endoscopic systems, space telescopes, optical telecommunication systems, and biomedical implantable systems. Presents efforts to scale down mechanical and photonic elements into the nano regime for enhanced performance, faster operational speed, greater bandwidth, and higher level of integration. Showcases the integration of MEMS and optical/photonic devices into real commercial products. Addresses applications in optical telecommunication, sensing, imaging, and biomedical systems. Prof. Vincent C. Lee is Associate Professor in the Department of Electrical and Computer Engineering, National University of Singapore. Prof. Guangya Zhou is Associate Professor in the Department of Mechanical Engineering at National University of Singapore.

Photonic Waveguide Components on Silicon Substrate John Wiley & Sons

This book focuses on the design and development of SU-8 polymer and silicon waveguide-based devices using the effective index based matrix method. Various fabrication techniques like laser direct writing (LDW), Focused Ion Beam (FIB) and optical lithography are discussed. FIB lithography has been explored for photonic-crystal structures on the waveguide and for directional coupler in coupled region. This technique is shown to be suitable in fabricating photonic crystal structures as well as for making any precise modifications in micro- and nano-meter photonic waveguide structures. This book can be a useful reference for students, researchers, and fabrication engineers working in the areas of integrated optics, optical communications, laser technology and optical lithography for device manufacturing. *Foundations for Guided-Wave Optics* Springer Science & Business Media

This book presents part of the iM3F 2020 proceedings from the Mechatronics track. It highlights key challenges and recent trends in

mechatronics engineering and technology that are non-trivial in the age of Industry 4.0. It discusses traditional as well as modern solutions that are employed in the multitude spectra of mechatronics-based applications. The readers are expected to gain an insightful view on the current trends, issues, mitigating factors as well as solutions from this book.

Optical Fiber Telecommunications VA CRC Press

This issue of λ ECS Transactions λ describes processing, materials and equipment for CMOS front-end integration including gate stack, source/drain and channel engineering. Topics include strained Si/SiGe and Si/SiGe on insulator; high-mobility channels including III-V λ s, etc.; nanowires and carbon nanotubes; high-k dielectrics, metal and FUSI gate electrodes; doping/annealing for ultra-shallow junctions; low-resistivity contacts; advanced deposition (e.g. ALD, CVD, MBE), RTP, UV, plasma and laser-assisted processes.

Advances in Microwaves Springer Nature

A comprehensive overview, from fundamental theory and numerical methods to the design of real plasmonic structures for nanoelectronic and sensing applications.

Official Gazette of the United States Patent and Trademark Office CRC Press

The potential of photonic signal processing (PSP) to overcome electronic limits for processing ultra-wideband signals, provide signal conditioning that can be integrated in line with fiber optic systems, and improve signal quality makes this technology extremely attractive for improvement in receiver sensitivity performance. Spanning the current transitional period, Photonic Signal Processing: Techniques and Applications addresses the merging techniques of processing and manipulating signals propagating in the optical domain. The book begins with a historical perspective of PSP and introduces photonic components essential for photonic processing systems, such as optical amplification devices, optical fibers, and optical modulators. The author demonstrates the representation of photonic circuits via a signal flow graph technique adapted for photonic domain. He describes photonic signal processors, such as differentiators and integrators, and their applications for the generation of solitons, and then covers the application of these solitons in optically amplified fiber transmission systems. The book illustrates the compensation dispersion using a photonic processor, the design of optical filters using photonic processor techniques, and the filtering of microwave signals in the optical domain. Exploring methods for the processing of signals in the optical domain, the book includes solutions to photonic circuits that use signal flow techniques and significant applications in short pulse generation, the filtering of signals, differentiation, and the integration of signals. It delineates fundamental techniques on the processing of signals in the optical domain as well as their applications that lead to advanced aspects of performing generation of short pulses, integration, differentiation, and filtering for optical communications systems and networks and processing of ultra-high speed signals.

Coupled Mode Theory VSP

Non-linear, or chaotic behaviour in real world systems has been reported in

electronic circuits and communications systems, chemical reactions, biological behaviour. Applications include solitons, integrable systems, cellular automata, pattern formation, qualitative structure and bifurcation theory, onset of chaos and turbulence, analytic dynamics, and transport phenomena. This book presents important new research in this dynamic field.

Applications of Waveguide and Circuit Theory to the Development of Accurate Microwave Measurement Methods and Standards Cambridge University Press

Nonlinear Optical Materials and Devices for Applications in Information Technology takes the reader from fundamental interactions of laser light in materials to the latest developments of digital optical information processing. The book emphasises nonlinear optical interactions in bulk and low-dimensional semiconductors, liquid crystals and optical fibres. After establishing the basic laser--material interactions in these materials, it goes on to assess applications in soliton propagation, integrated optics, smart pixel arrays and digital optical computing.

NASA Tech Briefs John Wiley & Sons

The basic of the BPM technique in the frequency domain relies on treating the slowly varying envelope of the monochromatic electromagnetic field under paraxial propagation, thus allowing efficient numerical computation in terms of speed and allocated memory. In addition, the BPM based on finite differences is an easy way to implement robust and efficient computer codes. This book presents several approaches for treating the light: wide-angle, scalar approach, semivectorial treatment, and full vectorial treatment of the electromagnetic fields. Also, special topics in BPM cover the simulation of light propagation in anisotropic media, non-linear materials, electro-optic materials, and media with gain/losses, and describe how BPM can deal with strong index discontinuities or waveguide gratings, by introducing the bidirectional-BPM. BPM in the time domain is also described, and the book includes the powerful technique of finite difference time domain method, which fills the gap when the standard BPM is no longer applicable. Once the description of these numerical techniques have been detailed, the last chapter includes examples of passive, active and functional integrated photonic devices, such as waveguide reflectors, demultiplexers, polarization converters, electro-optic modulators, lasers or frequency converters. The book will help readers to understand several BPM approaches, to build their own codes, or to properly use the existing commercial software based on these numerical techniques.