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Optical Waveguide Communications Glossary Artech House

Development of a High-power and Ultra-high-vacuum Waveguide Coupler Working at C/X Band

Traveling Wave In-line Asymmetric Directional Coupler Modulator Academic Press

A full-scale folded waveguide coupler has been fabricated which will provide information on power handling, impedance matching, and multipactor effects. The coupler dimensions are 30 X 60 X 300 cm. The cross section of the coupler is small enough that a phased pair of couplers could be placed in a single Tore Supra or TFTR port. A single coupler could be placed in a CIT-size port. A movable back plate allows frequency adjustment over the range 78 to 140 MHz. Impedance matching at the waveguide has been achieved using a movable coaxial transmission line feed. bench-top comparisons with loop antennas have been made. The folded waveguide coupler will be mounted on the Radio Frequency Test Facility for high-power tests up to 1.5 MW.

Optical MEMS, Nanophotonics, and Their 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.

Design and Analysis of a Multichannel Waveguide Coupler Elsevier

JLAB SRF cavities employ waveguide type fundamental power couplers (FPC). The FPC design for the 7-cell upgrade cavities was optimized to minimize the dipole field kick. For continuous wave (CW) operation, the forwarding RF power will be at different magnitude to drive the different beam current and cavity gradient. This introduces some deviation from optimized FPC field for varying beam loading. This article analyzes the beam behavior both in centroid kick and head-tail kick under different beam loading conditions.

Electrooptic Waveguide Directional Coupler Modulator in Aluminum Gallium Arsenide-gallium Arsenide John Wiley & Sons

Covering a wide range of application areas, from wireless communications and navigation, to sensors and radar, this practical resource offers you the first comprehensive, multidisciplinary overview of radio engineering. You learn important techniques to help you with the generation, control, detection and utilization of radio waves, and find detailed guidance in radio link, amplifier, and antenna design. The book approaches relevant problems from both electromagnetic theory based on MaxwellOCOs equations and circuit theory based on KirchoffOCOs and OhmOCOs laws, including brief introductions to each theory."

Development of a High-power and Ultra-high-vacuum Waveguide Coupler Working at C/X Band The Electrochemical Society

A unisex coupler assembly is disclosed capable of providing a leak tight coupling for waveguides with axial alignment of the waveguides and rotational capability. The sealing means of the coupler assembly are not exposed to RF energy, and the coupler assembly does not require the provision of external flanges on the waveguides. In a preferred embodiment, O ring seals are not used and the coupler assembly is, therefore, bakeable at a temperature up to about 150°C. The coupler assembly comprises a split collar which clamps around the waveguides and a second collar which fastens to the split collar. The split collar contains an inner annular groove. Each of the waveguides is provided with an external annular groove which receives a retaining ring. The split collar is clamped around one of the waveguides with the inner annular groove of the split collar engaging the retaining ring carried in the external annular groove in the waveguide. The second collar is then slipped over the second waveguide behind the annular groove and retaining ring therein and the second collar is coaxially secured by fastening means to the split collar to draw the respective waveguides together by coaxial force exerted by the second collar against the retaining ring on the second waveguide. A sealing ring is placed against an external sealing surface at a reduced external diameter end formed on one waveguide to sealingly engage a corresponding sealing surface on the other waveguide as the waveguides are urged toward each other.

Photonic Signal Processing CRC Press

The present program goal was to enhance the waveguide coupler design to provide a device which can be aligned with a standard micromanipulator and achieve 50% or better coupling efficiency. The design approach was to develop static mechanical spacers for the waveguide coupler which furnish easy and precise transverse and longitudinal positioning of a LiNbO3 waveguide with respect to an injection laser diode. The program was to include the following tasks: (1) modify the waveguide coupler design and assembly procedures to provide a device that can be readily assembled and will achieve near theoretical coupling efficiency; (2) fabricate these optimized couplers using Hitachi laser diodes and evaluate these devices; (3) deliver two couplers without Ti:LiNbO3 waveguides attached; and (4) provide a cost estimate for the fabrication of ten such units. The variation in tolerances of the components and the capability of present state-of-the-art micropositioning devices to obtain and hold mechanical position accuracies required for the laser diode to waveguide coupler are not adequate to obtain reliable devices that meet the program goal of 50% coupling efficiency. The positional stability of bonding materials for the laser diode and waveguide were also determined to be inadequate to maintain the precise tolerance required. It is recommended that consideration be given to an R and D program to investigate the viability of a monolithic integrated optic approach for the laser diode to waveguide coupler using a common substrate.

Silicon-on-insulator Technology and Devices XII CRC Press

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.

John Wiley & Sons

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.

A Study of Microwave Directional Couplers ... Springer Nature

Provides a comprehensive look at the application of photonic approaches to the problem of analog-to-digital conversion. It looks into the progress made to date, discusses present research, and presents a glimpse of potential future technologies.

Foundations for Guided-Wave Optics 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.

Integrated Optics: Theory and Technology Springer

A resonant cavity waveguide coupler for ICRH of a magnetically confined plasma. The coupler consists of a series of inter-leaved metallic vanes disposed within an enclosure analogous to a very wide, simple rectangular waveguide that has been "folded" several times. At the mouth of the coupler, a polarizing plate is provided which has coupling apertures aligned with selected folds of the waveguide through which rf waves are launched with magnetic fields of the waves aligned in parallel with the magnetic fields confining the plasma being heated to provide coupling to the fast magnetosonic wave within the plasma in the frequency usage of from about 50 to 200 mHz. A shorting plate terminates the back of the cavity at a distance approximately equal to one-half the guide wavelength from the mouth of the coupler to ensure that the electric field of the waves launched through the polarizing plate apertures are small while the magnetic field is near a maximum. Power is fed into the coupler folded cavity by means of an input coaxial line feed arrangement at a point which provides an impedance match between the cavity and the coaxial input line.

An Investigation of a Variable Waveguide Coupler with 360 Degrees of Phase Control John Wiley & Sons

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.

A Contradirectional Waveguide Coupler with High Directivity and Tight Coupling Cambridge University Press

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.

WAVEGUIDE COUPLER KICK TO BEAM BUNCH AND CURRENT DEPENDENCY ON SRF CAVITIES. Development of a High-power and Ultra-high-vacuum Waveguide Coupler Working at C/X BandAbstract: Waveguide directional couplers working at 5.712/11.9924 GHz are developed. Even holes symmetrical to the structure are drilled along the central line of the narrow-wall of the waveguide, which are used to couple the electromagnetic power from the main-waveguide to the sub-waveguide. The final prototypes have achieved satisfactory performances of high-power, ultra-high-vacuum and high-directivity. The microwave measurement results are also qualified.Improved Injection Laser Waveguide CouplerThe present program goal was to enhance the waveguide coupler design to provide a device which can be aligned with a standard micromanipulator and achieve 50% or better coupling efficiency. The design approach was to develop static mechanical spacers for the waveguide coupler which furnish easy and precise transverse and longitudinal positioning of a LiNbO3 waveguide with respect to an injection laser diode. The program was to include the following tasks: (1) modify the waveguide coupler design and assembly procedures to provide a device that can be readily assembled and will achieve near theoretical coupling efficiency; (2) fabricate these optimized couplers using Hitachi laser diodes and evaluate these devices; (3) deliver two couplers without Ti:LiNbO3 waveguides attached; and (4) provide a cost estimate for the fabrication of ten such units. The variation in tolerances of the components and the capability of present state-of-the-art micropositioning devices to obtain and hold mechanical position accuracies required for the laser diode to waveguide coupler are not adequate to obtain reliable devices that meet the program goal of 50% coupling efficiency. The positional stability of bonding materials for the laser diode and waveguide were also determined to be inadequate to maintain the precise tolerance required. It is recommended that consideration be given to an R and D program to investigate the viability of a monolithic integrated optic approach for the laser diode to waveguide coupler using a common substrate.An Introduction to Fiber Optics

Technology developed for the NLC and for recent high gradient research may help building advanced ?fs beam diagnostics.

Direct Support and General Support Maintenance Manual Cambridge University Press

A waveguide hybrid coupler was investigated that provides variable control over the phase and amplitude of a signal radiated from a waveguide slot. The control technique was studied theoretically and empirically in two devices, a mechanical unit that incorporated four micrometer-driven probes and an electronic unit that utilized four varactor diodes around the slot. Coupling levels up to -12.3 db were obtained over a 360-degree range of phase control with the mechanical unit and up to -23.0 db over a similar range with the electronic unit. It was found that simple driving functions on the control elements provided theoretically predictable slot phase control, but that coupling variations increased at the higher coupling levels. (Author).

Optical Signal Processing John Wiley & Sons

Although the theory and principles of optical waveguides have been established for more than a century, the technologies have only been realized in recent decades. Optical Waveguides: From Theory to Applied Technologies combines the most relevant aspects of waveguide theory with the study of current detailed waveguiding technologies, in particular, photonic devices, telecommunication applications, and biomedical optics. With self-contained chapters written by well-known specialists, the book features both fundamentals and applications. The first three chapters examine the theoretical foundations and bases of planar optical waveguides as well as critical optical properties such as birefringence and nonlinear optical phenomena. The next several chapters focus on contemporary waveguiding technologies that include photonic devices and telecommunications. The book concludes with discussions on additional technological applications, including biomedical optical waveguides and the potential of neutron waveguides. As optical waveguides play an increasing part in modern technology, photonics will become to the 21st century what electronics were to the 20th century. Offering both novel insights for experienced professionals and introductory material for novices, this book facilitates a better understanding of the new information era—the photonics century.

Optical Fiber Telecommunications VA

Abstract: Waveguide directional couplers working at 5.712/11.9924 GHz are developed. Even holes symmetrical to the structure are drilled along the central line of the narrow-wall of the waveguide, which are used to couple the electromagnetic power from the main-waveguide to the sub-waveguide. The final prototypes have achieved satisfactory performances of high-power, ultra-high-vacuum and high-directivity. The microwave measurement results are also qualified.

Radio Engineering for Wireless Communication and Sensor Applications

The goal of this thesis is to develop an analytical model from which a waveguide coupler can be designed. The specific application considered here is to use a waveguide coupler to excite a plasma tube inside a waveguide. This application is desirable for use in laser systems. The approach taken is to model the plasma as an equivalent dielectric centered in the secondary waveguide. Standard waveguide analysis techniques are used to find a perturbed propagation constant in that waveguide. Successive approximations are made to the coupled wave equations until a piece-wise linear solution is obtained. This solution gives the field distribution resulting from any arbitrarily chosen coupling geometry. Thus, the distribution for any desired coupling characteristics can be determined in an iterative manner, essentially by trial and error. Preliminary tests were made on couplers designed using the model; initial results are promising but inconclusive. It is believed that this design method will provide the tool for designing couplers to obtain a desired field distribution in the secondary waveguide. (Author).

Wave Coupling and Matching of Waveguide Couplers in the Ion Cyclotron Range of Frequencies

Textbook on the physical principles of optical fibers - for advanced undergraduates and graduates in physics or electrical engineering.