Waveguide Coupler

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An Investigation of a Variable Waveguide Coupler with 360 Degrees of Phase Control
CRC 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.

Recent Trends in Mechatronics Towards Industry 4.0 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

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

Design and Analysis of a Multichannel Waveguide Coupler Springer Science & Business Media

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

Wave Coupling and Matching of Waveguide Couplers in the Ion Cyclotron Range of Frequencies John Wiley & Sons

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.

Electrooptic Waveguide Directional Coupler Modulator in Aluminum Gallium Arsenide-gallium Arsenide Springer

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.

WAVEGUIDE COUPLER KICK TO BEAM BUNCH AND CURRENT DEPENDENCY ON SRF CAVITIES. Cambridge University 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.

A Study of Microwave Directional Couplers ... John Wiley & Sons

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.

Designing Waveguide Couplers for Microwave Excitation of Laser Gases CRC Press

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.

Simplified Flangeless Unisex Waveguide Coupler Assembly CRC Press

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.

An Introduction to Fiber Optics Springer Science & Business Media

Optical Fiber Telecommunications V (A&B) is the fifth in a series that has chronicled the progress in the research and development of lightwave communications since the early 1970s. Written by active authorities from academia and industry, this edition not only brings a fresh look to many essential topics but also focuses on network management and services. Using high bandwidth in a cost-effective manner for the development of customer applications is a central theme. This book is ideal for R&D engineers and managers, optical systems implementers, university researchers and students, network operators, and the investment community. Volume (A) is devoted to components and subsystems, including: semiconductor lasers, modulators, photodetectors, integrated photonic circuits, photonic crystals, specialty fibers, polarization-mode dispersion, electronic signal processing, MEMS, nonlinear optical signal processing, and quantum information technologies. Volume (B) is devoted to systems and networks, including: advanced modulation formats,

coherent systems, time-multiplexed systems, performance monitoring, reconfigurable add-drop multiplexers, Ethernet technologies, broadband access and services, metro networks, long-haul transmission, optical switching, microwave photonics, computer interconnections, and simulation tools. Biographical Sketches Ivan Kaminow retired from Bell Labs in 1996 after a 42-year career. He conducted seminal studies on electrooptic modulators and materials, Raman scattering in ferroelectrics, integrated optics, semiconductor lasers (DBR , ridge-waveguide InGaAsP and multi-frequency), birefringent optical fibers, and WDM networks. Later, he led research on WDM components (EDFAs, AWGs and fiber Fabry-Perot Filters), and on WDM local and wide area networks. He is a member of the National Academy of Engineering and a recipient of the IEEE/OSA John Tyndall, OSA Charles Townes and IEEE/LEOS Quantum Electronics Awards. Since 2004, he has been Adjunct Professor of Electrical Engineering at the University of California, Berkeley. Tingye Li retired from AT&T in 1998 after a 41-year career at Bell Labs and AT&T Labs. His seminal work on laser resonator modes is considered a classic. Since the late 1960s, He and his groups have conducted pioneering studies on lightwave technologies and systems. He

led the work on amplified WDM transmission systems and championed their deployment for upgrading network capacity. He is a member of the National Academy of Engineering and a foreign member of the Chinese Academy of Engineering. He is a recipient of the IEEE David Sarnoff Award, IEEE/OSA John Tyndall Award, OSA Ives Medal/Quinn Endowment, AT&T Science and Technology Medal, and IEEE Photonics Award. Alan Willner has worked at AT&T Bell Labs and Bellcore, and he is Professor of Electrical Engineering at the University of Southern California. He received the NSF Presidential Faculty Fellows Award from the White House, Packard Foundation Fellowship, NSF National Young Investigator Award, Fulbright Foundation Senior Scholar, IEEE LEOS Distinguished Lecturer, and USC University-Wide Award for Excellence in Teaching. He is a Fellow of IEEE and OSA, and he has been President of the IEEE LEOS, Editor-in-Chief of the IEEE/OSA J. of Lightwave Technology, Editor-in-Chief of Optics Letters, Co-Chair of the OSA Science & Engineering Council, and General Co-Chair of the Conference on Lasers and Electro-Optics.

Silicon Photonics 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.

Matching of the Waveguide Coupler for the RF Seperator Deflecting Structure

Cambridge University Press

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.

Matching of the Waveguide Coupler for the RF Separator Deflecting Structure
Academic Press
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.

Foundations for Guided-Wave Optics
Artech House
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."

Elsevier

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.

Integrated Optical Multiple Waveguide Coupler Switches and Lenses The Electrochemical Society

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.

Handbook of Microwave Component Measurements Springer Nature

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 Fiber Telecommunications VA

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.

Silicon-on-insulator Technology and Devices XII

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).

Tests of a High-power Folded Waveguide Coupler for ICRF Heating

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