Waveguide Coupler

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Simplified Flangeless Unisex Waveguide Coupler Assembly Don White Consultants Incorporated

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.

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

A reference for the engineer interested in the design procedure. Covers practical considerations with complete design examples. The appendices contain two simple computer programs for the analysis of symmetrical three and four-port networks, and coupled-line configuration applications for replicatio

Matching of the waveguide coupler for the RF separator deflecting structure IET

This study analyzes the coupling and directional characteristics of an unbalanced line directional coupler. Certain assumptions were made to idealize the conditions of operation, but an extension of the method used in the analysis would make it suitable for adaption to any particular conditions of operation. The results of this analysis are the basic design equations needed for the design of unbalanced line directional couplers.

A Contradirectional Waveguide Coupler with High Directivity and Tight Coupling Artech House Publishers

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

Integrated Optical Multiple Waveguide Coupler Switches and Lenses

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

Waveguide Coupler for X-Band Deflectors

The TECH EDGE Series is a new generation of handbooks designed for the general electronic community covering a variety of topics & applications. Each book is narrow in scope, yet packed to provide the latest in technological developments &/or solutions to today's engineering problems. Approximately 125 pages of text, illustrations, tables & figures. TECH EDGE books can be bought either individually, as a series, or at group discounts. The first installment of the TECH EDGE Series is a six-book set on RF & Microwaves. Presenting theory while stressing practical aspects & design examples, each book treats pertinent interface problems that most other publications are not concerned with. Nearly 700 pages of text, graphs, figures & tables make up this complete series. Microwave performance is only as good as its power coupling devices & components. Thus, in addition to covering couplers, dividers & hybrids, this book also addresses coaxial cables, connectors, attenuators, isolators & filter-multiplexers which are very important components affecting microwave & measurement practices.

Folded Waveguide Cavity Coupler for ICRF Heating

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.

Mode-selective Directional Couplers

As silicon photonics enters mainstream technology, we find ourselves in need of methods to seamlessly transfer light between the optical fibers of global scale telecommunications networks and the on-chip waveguides used for signal routing and processing in local computing networks. Connecting these components directly results in high loss from their unequal sizes. Therefore, we employ a coupler, which acts as an intermediary device to reduce loss through mode and index matching, and provide alignment tolerance. This thesis presents a potential fiber-to-waveguide coupler design for use in integrating such networks. A quadratic index stack focuses incident light from a fiber in one plane, while a planar lens and linear taper do likewise in the perpendicular plane. Once the mode is sufficiently compressed, the light then enters and propagates through the waveguide. We performed simulations using the beam propagation method and finite difference time domain, among other modeling techniques, to optimize coupling efficiency and gain an understanding of how varying certain parameters affects coupler performance. The simulation results were then incorporated into a mask layout for fabrication and measurement.

Directional Coupler Design Using Coplanar Waveguide

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.

Matching of the Waveguide Coupler for the RF Seperator Deflecting Structure

This book collects much of Helszajn's work (formerly, Heriot-Watt University) and includes closed-form and finite element calculations of the propagation constant, attenuation and mode spectrum for the ridge waveguide, and power-current and power-voltage definitions of impedance. Circular polarization is also treated. Propagation properties where the waveguide has a dielectric filler are calculated. The treatment is then extended to more complex designs, including quadruple ridge waveguides with and without a gyromagnetic filler. The text includes descriptions of many of the passive devices which can be realized using these waveguides, including isolators, phase shifters, and circulators. c. Book News Inc.

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

This paper introduces a new type of waveguide coupler for ion cyclotron range of frequencies (ICRF) heating which is an adaptation of a concept known as a "folded waveguide" reported by Barrow and Schaevitz in connection with low-frequency waveguide transmission systems. The basic idea involves "folding" a simple rectangular waveguide to form a more compact structure. Cutoff for the folded waveguide occurs when one-half of a free-space wavelength equals the path length around the "folds" of the structure. By adding a large number of folds, the path length around the folds can be made large, leading to very low cutoff frequencies relative to those for simple rectangular waveguides having comparable outside dimensions. Folded waveguide couplers are practical for frequencies as low as 60 MHz for some ports found on present-day experients.

Plastic Optical Fiber Coupler with Hollow Taper Waveguide

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.

Microwave Transmission Line Couplers

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.

One of Possible Constructions of Waveguide Coupler for Superstructure

A new type of waveguide coupler for plasma heating in the ion cyclotron range of frequencies is described. The coupler consists of a series of interleaved metallic vanes within a rectangular enclosure analogous to a wide rectangular waveguide that has been "folded" several times. At the mouth of the coupler, a plate is attached which contains coupling apertures in each fold or every other fold of the waveguide, depending upon the wavenumber spectrum desired. This plate serves primarily as a wave field polarizer that converts coupler fields to the polarization of the fast magnetosonic wave within the plasma. Theoretical estimates indicate that the folded waveguide is capable of high-efficiency, multimegawatt operation into a plasma. Bench tests have verified the predicted field structure within the waveguide in preparation for high-power tests on the Radio Frequency Test Facility at the Oak Ridge National Laboratory.

Ridge Waveguides and Passive Microwave Components

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).

The Unbalanced Line Directional Coupler

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.degree. 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.

A High Efficiency Thin-film Optical Waveguide Coupler

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.

Folded Waveguide Coupler

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).

Coupling and Loading Measurements for a Dielectric-filled ICRF Waveguide Coupler

The efficiency with which a double-heterostructure, GaAlAs laser diode can be edge-coupled to a Ti:LiNbO3 diffused waveguide has been studied using both theoretical and experimental approaches. Both the analytical and the numerical estimates of the coupling efficiency predict maximum efficiencies of approximately 50% for the laser diodes used in this program. Measurements of the sensitivity of the coupling efficiency to both transverse and longitudinal misalignment have been performed and these measurements show the coupling efficiency to be a slow function of the longitudinal separation and a strong function of the transverse offset. When the measured data are fit to an analytical model, the results indicate that a maximum coupling efficiency of about 50% has been achieved. Two coupler chips were fabricated and delivered to NRL. The coupler chips used a flip-chip design and were fabricated on silicon substrates. The units delivered to NRL had coupling efficiencies of 5% - 10% and thus fell short of the theoretically predicted efficiency. This result was due primarily to the stringent alignment tolerance imposed by the sensitivity of the coupling efficiency to transverse offset.

Fiber to Waveguide Couplers for Silicon Photonics