Principle of Planar Optical Waveguide Splitter

Article Overview

A planar waveguide optical splitter (PLC splitter) divides a single optical signal into multiple outputs using silica-based waveguides on a planar substrate, relying on total internal reflection and precise waveguide branching.

Working Principle

A PLC splitter operates as a passive optical device that distributes light from one or two input fibers to multiple output fibers with high uniformity and low loss . The core principle is based on planar waveguide technology, where optical signals propagate through silica waveguides fabricated on a flat substrate using photolithography techniques adapted from semiconductor manufacturing .

o Launching: The incoming optical signal from the input fiber is coupled into the input waveguide on the PLC chip.
o Propagation: Light travels through the waveguides via total internal reflection, maintaining signal integrity.
o Splitting: The waveguides branch symmetrically in Y-shaped or cross-shaped patterns, dividing the optical power evenly across multiple paths.
o Output: The split signals exit through the output waveguides and fibers, each carrying a fraction of the original optical power .

Structure

A PLC splitter consists of:

o A planar waveguide chip made of silica glass.
o Input and output waveguide arrays coupled to the chip.
o Optional packaging types such as bare fiber, ABS, LGX, or rack-mount configurations depending on deployment needs . The number of output ports (e.g., 1x4, 1x8, 1x32, 1x64) determines the splitting ratio, and the design ensures uniform optical power distribution across all outputs .

Advantages

Compared to traditional FBT (Fused Biconical Taper) splitters, PLC splitters offer:

o High splitting accuracy and uniformity.
o Low insertion loss.
o Compact size suitable for large-scale optical networks.
o Scalability for high port counts, making them ideal for FTTH and PON networks .

Principle of Planar Optical Waveguide Splitter

Applications

PLC splitters are widely used in passive optical networks (PON), including EPON, GPON, and BPON, to connect central office equipment to multiple end users. They can be deployed in centralized architectures (e.g., 1x32 at the central office) or distributed architectures (e.g., 1x4 near the OLT followed by 1x8 at terminal enclosures), . In summary, the planar waveguide optical splitter leverages precise waveguide design and branching to efficiently split optical signals, providing a reliable, scalable, and low-loss solution for modern fiber-optic communication networks .

PLC (Planar Lightwave Circuit) splitters are crucial components in optical networks, facilitating the distribution of optical

A PLC optical splitter is a passive optical device fabricated using silica waveguide technology on a planar substrate. It divides optical

Learn how Planar Lightwave Circuit (PLC) technology enhances optical networks with high precision, stability, and

PLC splitters utilize a planar lightwave circuit chip made of silica glass waveguides to distribute the optical power.

PLC Splitter (Planar light-wave circuit splitter) is a type of optical power management device that is fabricated using

A Y-branch structure fabricated by planar technology is a fundamental element in constructing photonic integrated circuits such as

This chapter presents an introduction to the optical waveguides including planar and nonplanar structures.

Planar Lightwave Circuit (PLC) splitters play a vital role in modern fiber optic communication networks by enabling the

A 50:50 beam splitter for the light and matter waves based on a planar waveguide is studied. The light version of

Petr Kuzel Types of guiding structures: Planar waveguides (integrated optics) Fibers (communications) Theory: Rays and field

Principle of Planar Optical Waveguide Splitter

The 1×32 Planar Waveguide Optical Splitter features a low-profile package, measuring 20 mm in width, 80 mm in length, and 6 mm

We present a new high-efficiency splitter waveguide design based on photonic topological insulators. The system"s

In the world of fiber optics, where high-speed data transmission is king, some components work behind the scenes to

In this paper, 1 × 8 s - bend - arc based symmetrical and wavelength insensitive optical beam splitter is modeled using beam

In this paper, we proposed an optical splitter planar waveguide design with super multi channels. The design utilizes

Abstract This chapter presents an introduction to the optical waveguides including planar and nonplanar structures. Additionally, an

Web: https://bssoda.pl