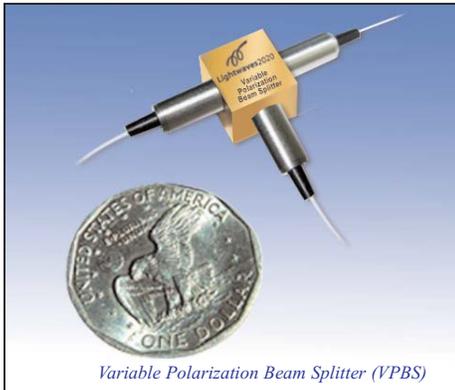


# Lightvision

A publication of Lightwaves2020 Jul. 1, 2010

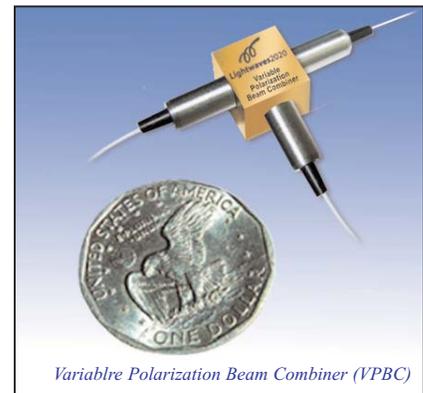
## Introducing New Products – VPBS/VPBC & VPBM



Variable Polarization Beam Splitter (VPBS)

Combination of polarization division multiplexing (PDM) and dense wavelength division multiplexing (DWDM) provides a simple, attractive, and cost-effective way to increase communication systems capacity/efficiency many folders, making multi-Tb/s data rate practical.

Both coherent detection and PDM fiber optic systems require **variable (or adjustable) polarization beam splitters (VPBS) and variable polarization beam combiners (VPBC)**. In PDM systems, it is obvious that the states of polarization (SOPs) between vertical and horizontal polarizations or amount of the polarization-shifting-keys should maintain the extinction ratio as high as possible. In the coherent optical detection systems, the SOPs between the received optical signal and the local oscillator are required to be identical. However, the SOPs of the received optical signal are oftenly changed due to the birefringence of optical fibers, temperature effects, and environmental stress. Consequently, it requires a VPBC to readjust the polarization of received signal to match the LO's polarization.



Variable Polarization Beam Combiner (VPBC)

Lightwaves2020 manufactures two types VPBS/VPBC with different control speeds, namely:

- Electro-Optic (EO) crystal VPBS/VPBC, with high control speed of microsecond ( $\mu\text{s}$ )
- Liquid Crystal (LC) VPBS/VPBC, with control speed of millisecond(ms)

The basic structure of a fiber-optic VPBS or VPBC consists of an EO crystal cell (or an LC cell), a polarization-beam splitter (PBS) cube, and input and output fiber pigtailed collimators, as illustrated in **Figure 1 (a) and (b)**, respectively. The input of VPBS is a single-mode (SM) fiber with a low back-reflection GRIN-lens collimator and the two outputs are polarization-maintaining (PM) fibers with GRIN-lens collimators.

## Variable Polarization Beam Splitter

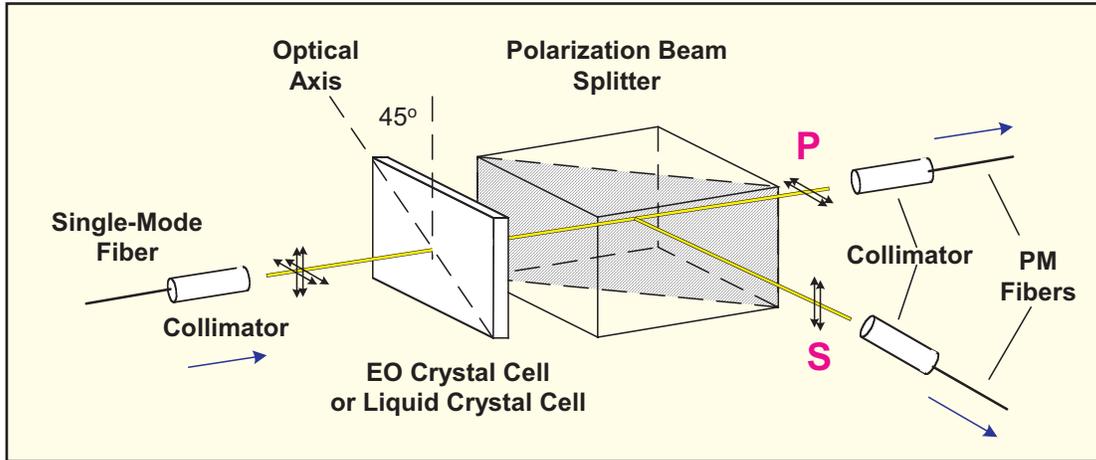


Figure 1(a)

## Variable Polarization Beam Combiner

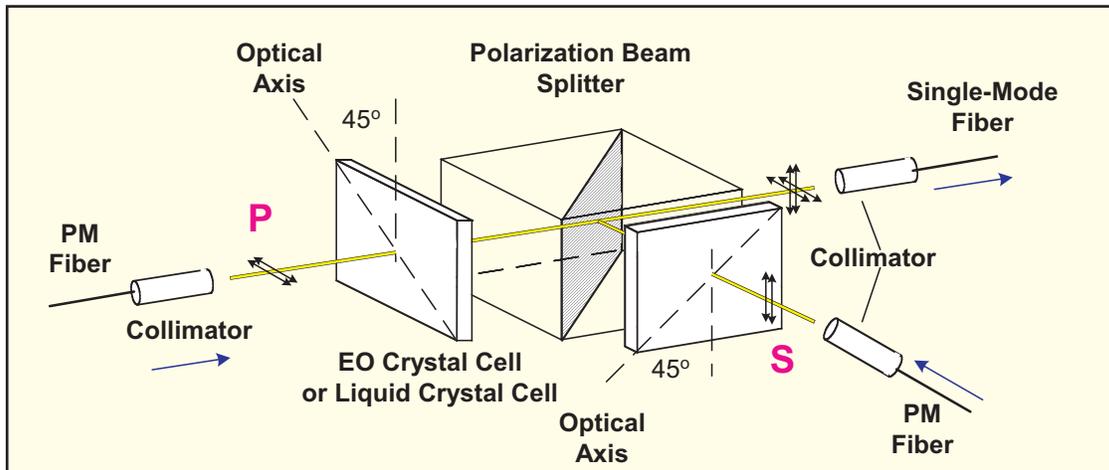


Figure 1(b)

The control voltage applied on the EO crystal cell (or LC cell) changes the phase retardation, so that the SOP of the optical beam can change from vertical to horizontal or vice versa, after passing through the EO crystal cell (or LC cell). Because the vertically polarized beam (S component) is reflected by PBS, the horizontally polarized beam (P component) is transmitted through PBS, and the P and S components after the EO crystal cell (or LC cell) are controlled by EO cell S phase retardation; the intensity ratio of P and S components can be continuously tuned by the central voltage of the EO cell (or LC cell).

In addition to VPBS and VPBC, Lightwaves2020 can also provide variable polarization beam mixer (VPBM), as depicted in [Figure 2](#), which combines and then splits polarized light signals. The combiner portion of the mixer has two input optical fibers, both are PM fibers. The ends of these fibers are respectively connected to collimator subassemblies. The light from the two input fibers are directed to an interface of a polarization-beam combiner (PBC) cube. The output light of the PBC is directed toward the EO crystal cell (or LC cell), and then incident upon an interface of a PBS cube. Two output fibers of PBS, connected to collimator subassemblies, are positioned to receive signals which are split by the PBS cube. The desired splitting ratio can be controlled by the applied control voltage of EO cell (or LC cell).

## Variable Polarization Beam Mixer

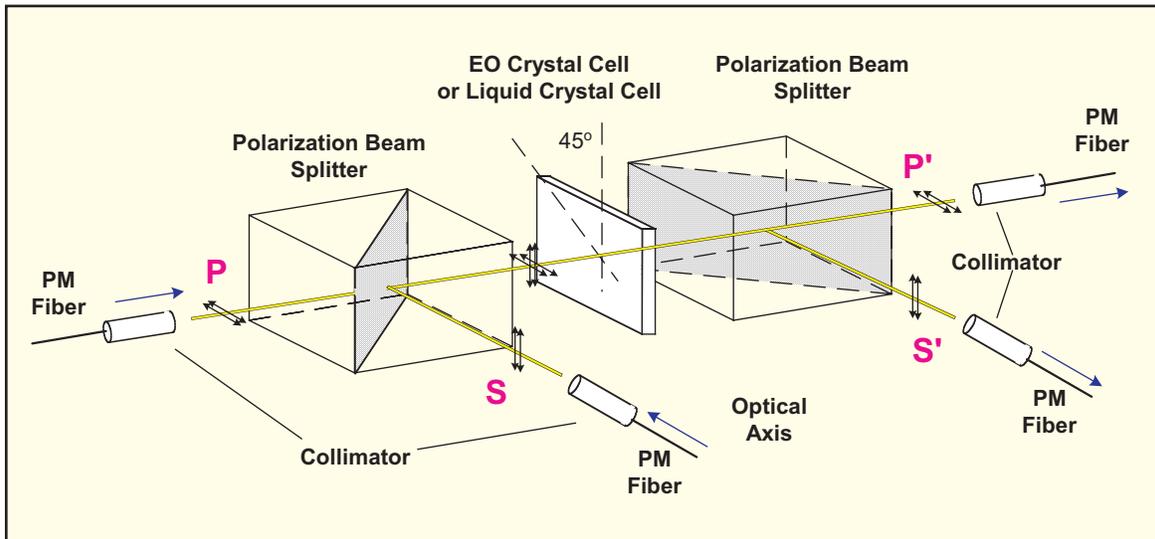


Figure 2

Lightwaves2020 has a special package technology to produce highly reliable LC cells as well as EO crystal cells which have been successfully demonstrated in many other high performance products, such as variable optical attenuators (VOA) and endless polarization controllers.

**New EDFA**  
**with Automatic Gain Control**

Nowadays, in response to different system requirements, Lightwaves2020 provides customized EDFA design for different customers with faster turnaround time. In 2010, one of the leading Japanese telecommunication companies qualified Lightwaves2020 as the sole Variable Gain EDFA module supplier for one of their new advanced EDFA products, C-band WDM optical amplification system for 40G (10GbE x 4) transmission.

Known for their superior design and manufacturing capability in telecommunication industry, especially on the electronics side, this leading Japanese telecommunication company has produced many world-class, cutting edge solutions for information network needs, such as SARAENC/SARADEC, one single-chip LSI for AVC/H.264 HDTV/SDTV encoder/decoder application. Lightwaves2020 is a leading developer and vertically integrated manufacturer of advanced optical devices, modules, and subsystems designed for fiber-optics industry. With many years' experience in the technologies of EDFA development, precision thin film coatings, and proprietary packaging, Lightwaves2020 provided satisfactory support both on the quality and on the schedule sides to this tier 1 Japanese customer during the product development stage. Currently, Lightwaves2020's Variable Gain EDFA is advanced to the volume production stage. Definitely, the partnership offers Lightwaves2020 a great opportunity to expand its business in Japan.

## Polarization Controller (PC): Fault-Free, Zero-Failure, and 100% Reliable!!

One of our customers is a world leader in the design and manufacture of fiber optic intrusion detection systems which are applied globally to communication systems, perimeter security systems, as well as the protection of oil and gas pipelines. These systems require optical components with the highest level of performance and long-term reliability.

Over the last 5 years, they have deployed hundreds of Lightwaves2020's polarization controllers in their systems worldwide with zero reported field failures, according to the company's CTO, Dr. Katsifolis. This is a testament to Lightwaves2020's impressive product quality, stringent test standards, and extensive experience in the fiber optics component manufacturing industry. "Plugging a Lightwaves2020 polarization controller into your system is like plugging in a resistor. Our experience is that it will be fault free and reliable every time", Dr. Katsifolis said.

### Lightvision

Lightvision is a publication of Lightwaves2020 as a service to customers and sales associates. No part of this newsletter may be reproduced without the written consent of the publisher.

**Editor**

**Vivian Wang**

**Art Designer**

**Roger Kuo**

## NEWSWIRE



At 2010 OFC/NFOEC, we proudly presented the most leading edge products to our value customers and other show participants.

The product drew most attention from our exhibit booth visitors was Alpha Tunable Filter, a tunable optical filter designed to choose specified wavelength over a certain range. Other innovative optical filters including Angular Tunable Filter, Linear Variable Filter, etc., were also very popular among the inquiries.

We are very excited about the achievements we made at this year's OFC/NFOEC. Getting a chance to meet customers and visitors from all over the world has brought great opportunities for our business growth and prosperity!!



**Lightwaves2020**

1323 Great Mall Drive, Milpitas, CA 95035-8037  
Tel.408.503.8888 Fax. 408.503.8988  
[www.lightwaves2020.com](http://www.lightwaves2020.com)  
[sales@lightwaves2020.com](mailto:sales@lightwaves2020.com)