

OZ Optics Limited

Polarization Maintaining Components

June 2016

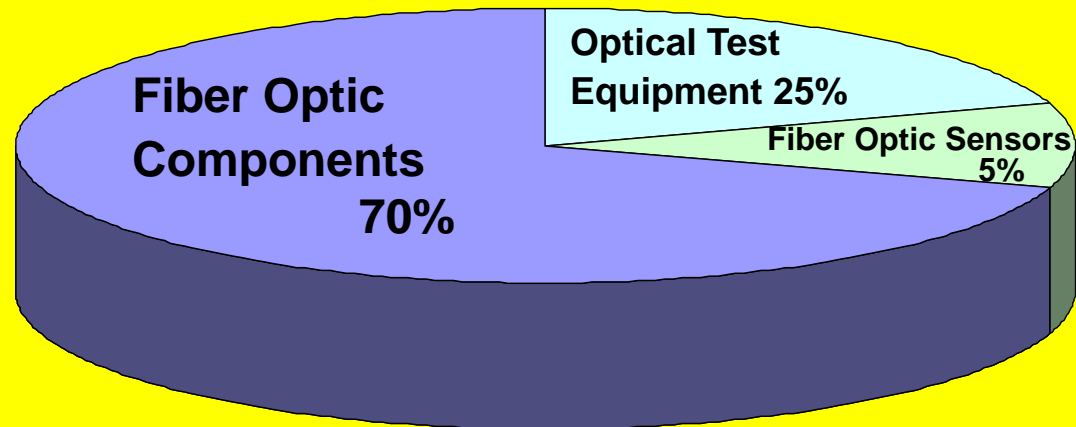
Company Profile

- Company founded in 1985;
- Corporate headquarters located in Ottawa, Canada;
- Manufacturing facility in Ottawa/Canada, Izmir/Turkey, and Jiaxing/China
- Seven Product Groups: **Laser-to-Fiber Delivery Systems, High Power Fiber Optic Components, Polarization Maintaining Products, Attenuators, Opto-Electronic Packaging, Test Equipment, Fiber Optic Sensor Systems**
- Sales offices in Canada, USA, Turkey and China



Company Profile

➤ Three Product Groups:



- Over 1,000 products
- Leading Edge R&D

OZ Optics Products



OZ Optics

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Global Leader in Fiber Optic Products since 1985

Polarization Maintaining Fiber Optic Components

Patent Numbers: USA 7058275, 7095931, 7295731, China 1672073



Polarization Maintaining
Connectors / Patchcords

Polarization Maintaining and Polarizing Splitters /
Combiners / Fused Couplers / Switches

All Fiber Manual and Electrically Driven
Polarization Controllers / Scramblers

PM Fiber Directional Taps /
Power Monitors

Manual / Electrically Controlled
PM Fiber Pigtailed Variable Attenuators

Fiber Pigtailed Polarizers

PLC Splitters

PM Fiber Pigtailed Circulators



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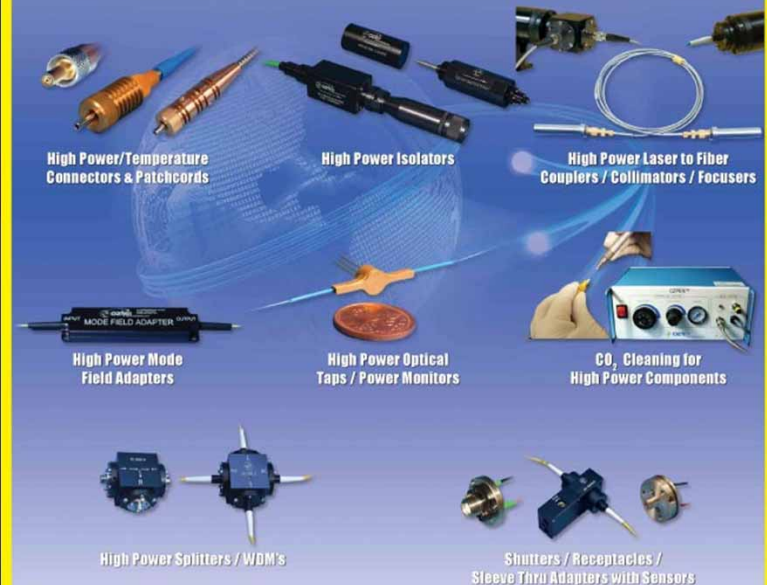
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High Power Fiber Optic Components

Patent Numbers: Canada 2494133, USA 7058275, 7095931, 7295731, China 1672073



High Power/Temperature
Connectors & Patchcords

High Power Isolators

High Power Laser to Fiber
Couplers / Collimators / Focusers

High Power Mode
Field Adapters

High Power Optical
Taps / Power Monitors

CO₂ Cleaning for
High Power Components

High Power Splitters / WDM's

Shutters / Receptacles /
Sleeve Thru Adapters with Sensors



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Fiber Optic Attenuators for SM, PM, and MM Fibers

Digital Variable Attenuators



- 0.01dB Resolution, Fast Response
- 0.001 to 100dB Attenuation Range
- 100mW Max

Electrically Controlled Variable Attenuators



- 0.01dB to 100dB Attenuation Range
- Up to 2 Watts Power Handling
- PC Based, Analog and Digital Control

MEMS Variable Attenuators



- 0.01dB to 40dB Attenuation Range
- Small Size, Low Cost, Low Power Consumption
- Low Wavelength Resonance, Low Crosstalk

SM / PM / MM Fiber Pigtailed Inline Variable Attenuators



- 0.01dB to 100dB Attenuation Range
- 500mW Power, 200ns Wavelength Response
- 0.01dB PC, Noise, Temperature Specifications

Single/Multi Channel Miniature Variable Attenuators



- Compact, Less Than 5mm Spacing Between Fibers
- Optimized for Multiple Fiber Arrays
- PC Based, Monolithic

Reflective Style Variable Attenuators



- 0.01dB to 60dB Attenuation Range
- 0.1dB Resolution
- 40dB, 50dB, 60dB Backreflection

Air Gap Variable Attenuators



- 0.1dB Resolution
- 100mW Power Handling
- 100ns Wavelength Response

Plug Type Fixed Attenuators



- Low Insertion Loss
- High Reliability
- Available in Various Fiber Types
- Available in Various Attenuation Values

Attenuating Fiber Patchcords



- Available in Various Fiber Types
- Available in Various Attenuation Values
- Available in Various Connector Types
- High Reliability and Long Lifetime



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Laser & Laser Diode to Fiber Delivery Systems



Laser to Fiber Couplers



Bare Fiber Adaptors with Magnetic Clips



Bulkhead Receptacles



Pigtail/Receptacle Style High/Low Power Collimators/Focusers



High/Low Power Patchcords



WDM/RGB Combiners



OCT Modules and 2 micron Components



OEM Laser Diode to Fiber Couplers



Turnkey, Ultra Stable Laser Modules



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OZ Optics Products



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Fiber Optic Components for Optoelectronic Packaging

Hermetically Sealable Patchcords with Glass or Metal Solder



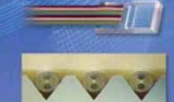
Single Channel



Multi Channel




Metalized Fibers



PM/SM/MM Fiber Pigtailed V-Groove Arrays




Polarization Measurement System for V-Grooves



Tapered / Lensed Fiber Polished / Laser Shaped




Glass Solder Preforms




Fiber Optic Ferrules



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Fiber Optic Test Equipment



Polarization Extinction Ratio Measurement Systems



Power Meters with Smart Detector Heads



Broadband Digital Variable Attenuators



Optical Fiber Length Meters



High Power Visual Fault Locators Fiber Optic Stable Sources



Inline Optical Power Monitors/Meters



Laser Diode Sources Single/Multiwavelength



Fiber Optic Smart Patchcords



Fiber Optic Fault Finders



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Product Innovation



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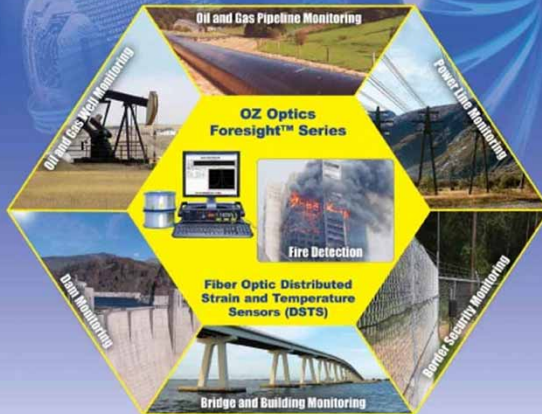


Global Leader in Fiber Optic Products since 1985

Fiber Optic Distributed Strain and Temperature Sensors

USA Patent Numbers: 7499151, 7599047

- BOTDA only, BOTDR only, or both BOTDA and BOTDR modules in one unit
- Simultaneous measurement of strain and temperature
- Fast, dynamic measurement of strain and/or temperature up to 100 km sensing range
- Uses standard telecommunication fiber to minimize costs



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Fiber Optic Fault Finder for Optical Network Safeguard™

- Monitors and reports network health status in real time, 24 hours/day, 365 days/year
- Lowers network operating and maintenance expenses
- Reduces revenue loss due to fiber plant outages
- User friendly interface via various wireless interfaces (Wi-Fi, GPRS), USB, or RS-232
- Reports fault location, giving GPS coordinates with time stamp
- Early alert and outage reports via cellular phone, email, IM, SMS, or text messaging



OZ Guard Automated Test Solution



Remote Monitoring a WDM Network



Remotely Accessible/Wireless Fault Finders



GPS Locator



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Product Innovation



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2 micron Fiber Optic Components for PM and SM Fibers

Fiber Optic Patchcords

Fused Couplers / Taps / Beam Splitters / Combiners

Fiber Pigtailed Laser Diode Sources

Pigtail / Receptacle Style Collimators / Focusers

Polarizers

Manual / Electrically Controlled Variable Attenuators

Isolators



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Fiber Optic Products for OCT Applications

OCT Modules

Manual / Electrically Controlled Broadband Variable Attenuators

Manual / Electrically Controlled Fiber Optic Delay Lines

Manual / Electrically Controlled Polarization Controllers

Fiber Pigtailed Broadband SLED Sources

Fiber Collimators / Focusers

Broadband Fused Couplers



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Company Profile

Over 470 employees worldwide:

- 260 in Ottawa and US
- 50 in Turkey
- 160 in China

OZ Canada



OZ China



OZ Turkey

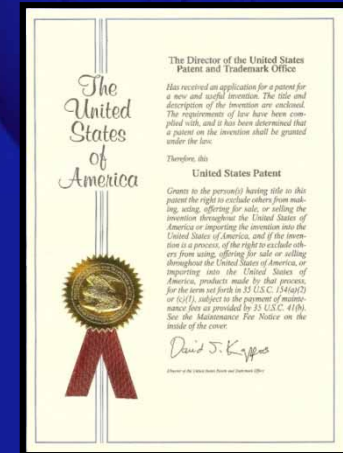
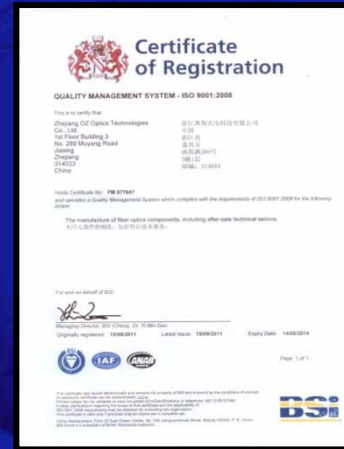
Company Profile

OZ Optics is lead by an experienced team:

- **Ömür Sezerman, Chairman, President & CEO**
 - Founder and CEO since inception (31 years)
- **Zahide Sezerman, VP of Human Resources**
 - With OZ Optics since inception (31 years)
- **Garland Best, VP of Components Division**
 - 24 years at OZ Optics
- **Gordon Youle, VP of Test Equipment Division**
 - 17 years at OZ Optics
- **Martin Powell, Operation Manager**
 - 12 years at OZ Optics
- **Sarah Miller, Controller**
 - 3 years at OZ Optics
- **Metin Sezerman, General Manager of OZ Turkey**
 - 15 years at OZ Optics
- **Bing Li, General Manager of OZ Optics China**
 - 12 years at OZ Optics

Company Profile

- ISO9001:2008 certified
- Broad patent portfolio
- Advanced proprietary processing technology



Company Profile

➤ *Using our strong direct sales and distributors, we address the following markets:*



Company Profile

➤ *OZ Optics has resellers and distributors in over 30 Countries & Regions and over 10,000 customers globally:*



In-House Production Capabilities

- Experienced and well-trained staff in following fields:
 - optical, mechanical, electronics & software

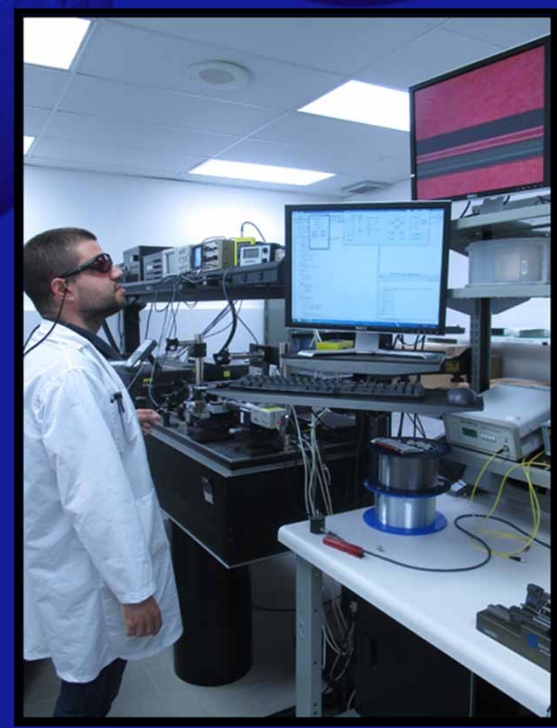
CNC Machine Shop



AR Coating



Femtosecond Laser Lab



Clean Room



Laser Conditioning/Cleaving



Branch Network



Facility – Ottawa Headquarters

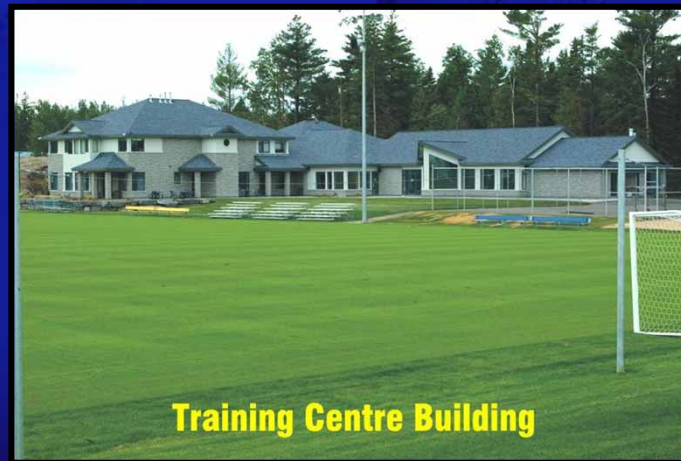
- 60,000 sq ft. – Manufacturing and R&D Facilities
- 15,000 sq ft. – Admin, Sales and Marketing
- 15,000 sq ft. – Training and Fitness Facility
- R&D, Product Design, Engineering, Final Assembly & QA



Facility – Ottawa Headquarters



Production Area



Training Centre Building



Meeting Room



Swimming Pool

OZ Optics – Turkey Factory

- Operational since 2000
- 33,000 sq ft. Manufacturing Facility
- Located in Free Trade Zone
- Low Tax Rates
- Sub Component Parts Manufacturing
- Cost Effective Manufacturing
- High Quality Labor



OZ Optics China

- Operational since 2009
- Wholly Foreign Owned Enterprise
- Subcomponent Parts Manufacturing
- Cost Effective Manufacturing
- High Quality Labor
- Extensive Training
(3-6 months in OZ Canada)



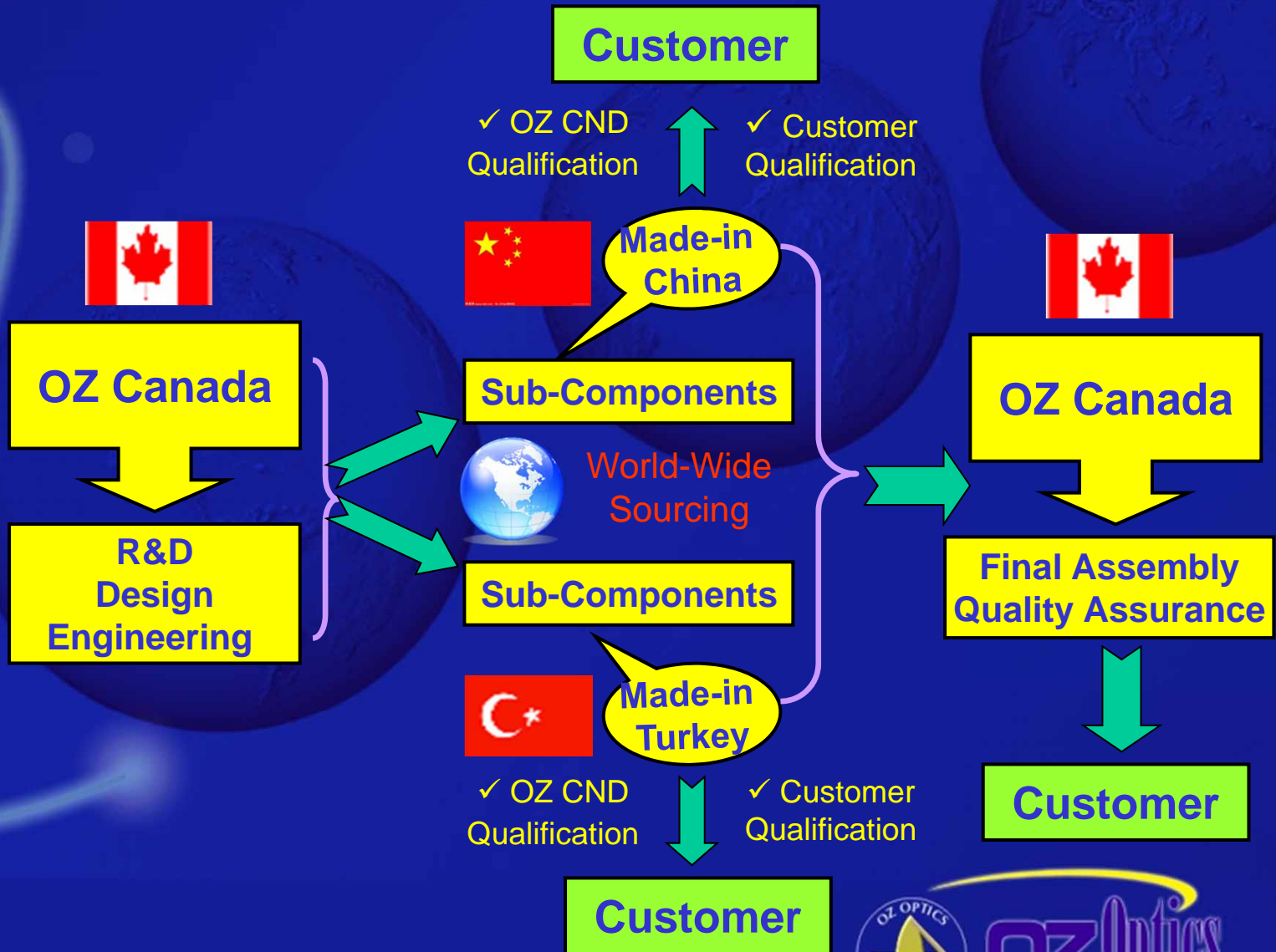
OZ China Facility

Jiaxing, China

- Located in Economic Development Zone
- 500 sq meters – Admin, Sales and Marketing
- 1500 sq meters – Manufacturing Area
 - 100 sq meters – Class 10,000 Clean Room
 - 100 sq meters – ESD Working Area



Manufacturing Strategy



Industry Standards

All products manufactured are in strict accordance with international industry standards:

➤ *Telecordia Compliance*



➤ *CE Compliance*



➤ *RoHS Compliance*



➤ *ISO 9001:2008 Certified (China, Turkey and Canada)*

➤ *Controlled Goods Directorate Registered*

Core Competencies

- Pioneer in Polarization Maintaining (PM) Components
- Leader in Wavelength Flattened, High Power & Low PDL Components
- Leader in High Power Fiber Optic Delivery Systems
- Custom Test Equipment, Including Polarization Test Equipment and FTTH Equipment
- Widest Range in Attenuator Product Offering
- Fiber Optic Distributed Strain and Temperature Sensors
- Complete product line for OCT applications & 2 Micron

Leading Technology

- **High Power Isolators**
 - power handling > 50W
 - low loss, low cost turnkey solution



High Power Free Space and Pigtailed Isolators

- **Pioneer in Polarization Maintaining (PM) Components**
 - wavelength flattened
 - high power & low PDL
 - PM test equipment



Polarization Maintaining Patchcords

Distributed Strain and Temperature Sensors



- **Fiber Optic Sensor**
 - fast and simultaneous measurement of strain & temp
 - large structure health monitoring

High Power Collimators/Focusers



- **Leader in High Power Fiber Optic Delivery Systems**
 - specializes in custom design



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OUR VISION

- Be the preferred Supplier of choice
- Capture and expand market share
- Maximize shareholder value

OUR MISSION

- To become the leading provider of innovative optical products to telecom and non-telecom sectors

OUR CORE VALUES

- Leadership
- Teamwork
- Boldness
- Commitment
- Innovation
- Rewards

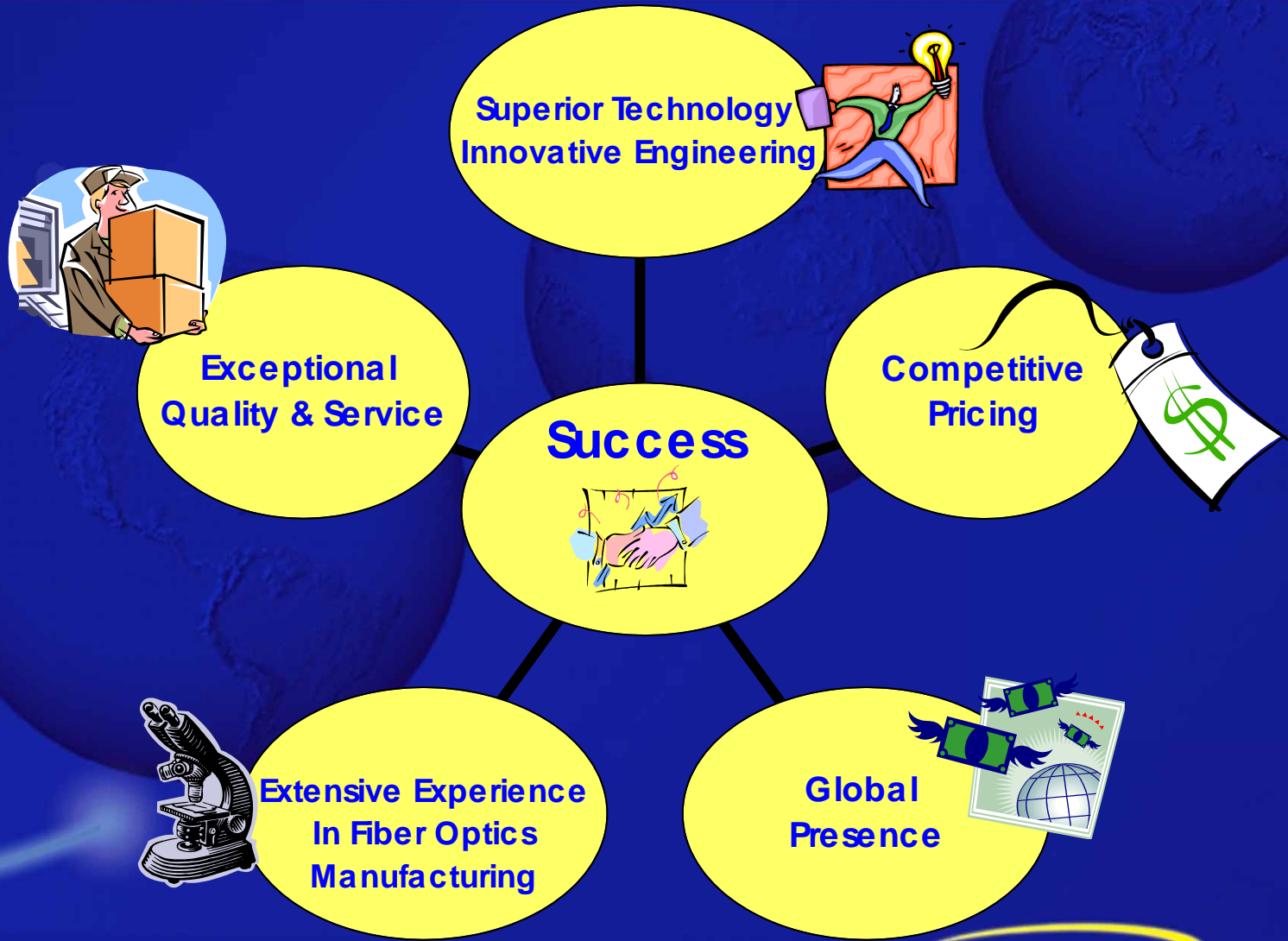
OUR QUALITY POLICY

- Provide our Customers with a competitive advantage, leveraging performance, price and delivery, through a continuous process of Quality advancement in all areas of our Company
- Communicate effectively to our Customers, Suppliers and Shareholders our commitment to Quality and continuous improvement
- Promote opportunities of professional development for all members of our Company through education, training and personal challenge

Ömür Sezerman
President



Competitive Advantage



Polarization Maintaining Components

OZ Optics is the pioneer in PM Fiber Optic Components. We offer the widest range of PM components and we were the first company in the world to manufacture PM fiber components and test equipment, starting in 1985

Features:

- High Power Handling Capability (over to 5 Watts at 1550nm tested to over 50 Watts CW at 1064nm)
- Better than 30dB Extinction Ratios can be achieved
- Wavelength Flattened Response for S, C & L Bands (1470nm –1620nm)
- Complete Support For Non-telecom Wavelengths and Applications (375-2100nm)

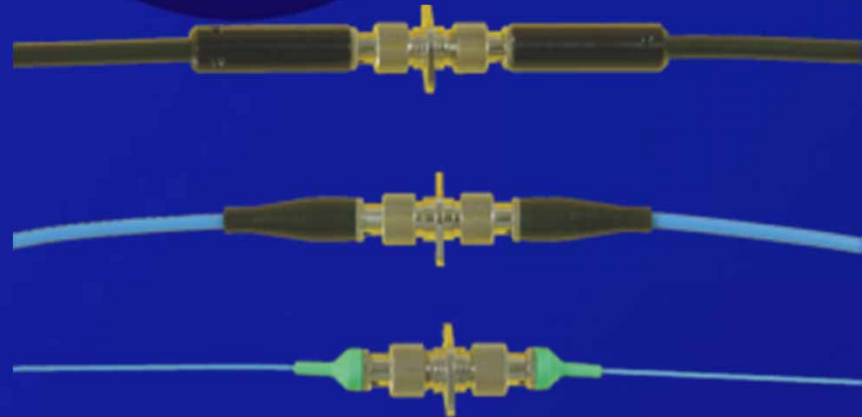
Polarization Maintaining Components

OZ Optics Offers:

- Patented Fiber Alignment Technology
- Low Cost, Superior Service & Exceptional Quality
- High Volume Manufacturing Capability

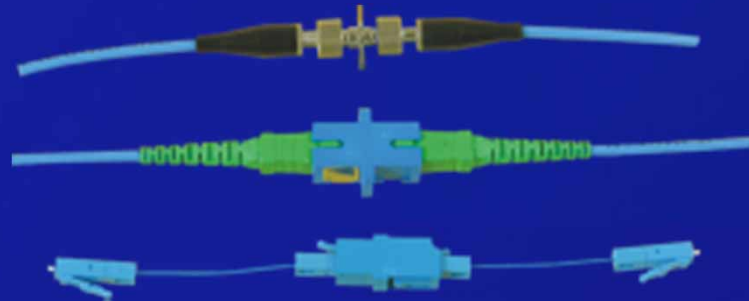
Polarization Maintaining Patchcords

- Up to 30dB Polarization Extinction Ratios
- <0.3dB Insertion Loss, Up to 60dB Backreflection
- Super, Ultra, Angled FC/PC, SC, AT&T-ST, LC, MU, E2000, DMI and Custom connectors



Polarization Maintaining Patchcords

- **Up to 30dB Polarization Extinction Ratios**
- **< 0.3dB Insertion Loss, Better than 60dB Backreflection**
- **Super, Ultra, Angled FC/PC, SC, AT&T-ST, LC, MU, E2000, DMI and Custom connectors**



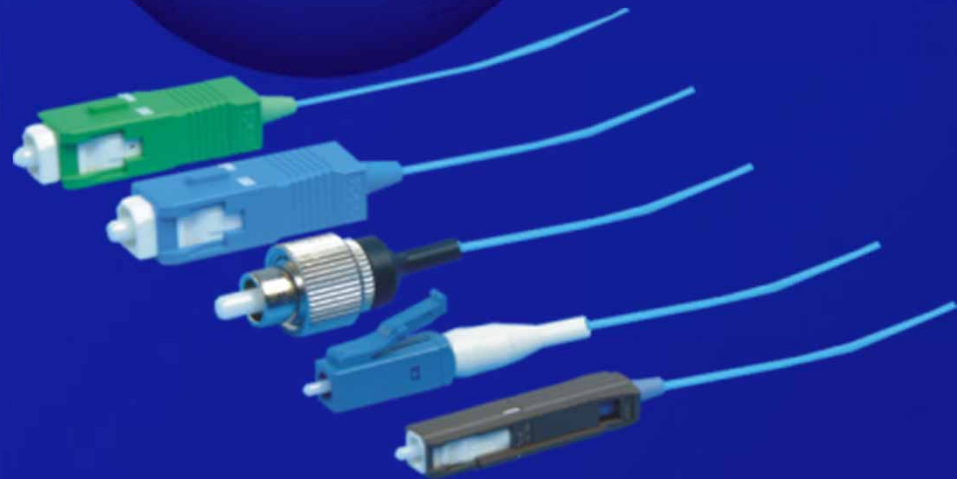
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- Super, Ultra, Angled FC/PC, SC, AT&T-ST, LC, MU, E2000, DMI and Custom connectors



Miniature PM Connectors and Patchcords

- **PC Board Mountable**
- **Small form factor allows dense packing in small spaces**
- **Up to 30dB Polarization Extinction Ratios**
- **< 0.3dB Insertion Loss, Up to 60dB Backreflection**



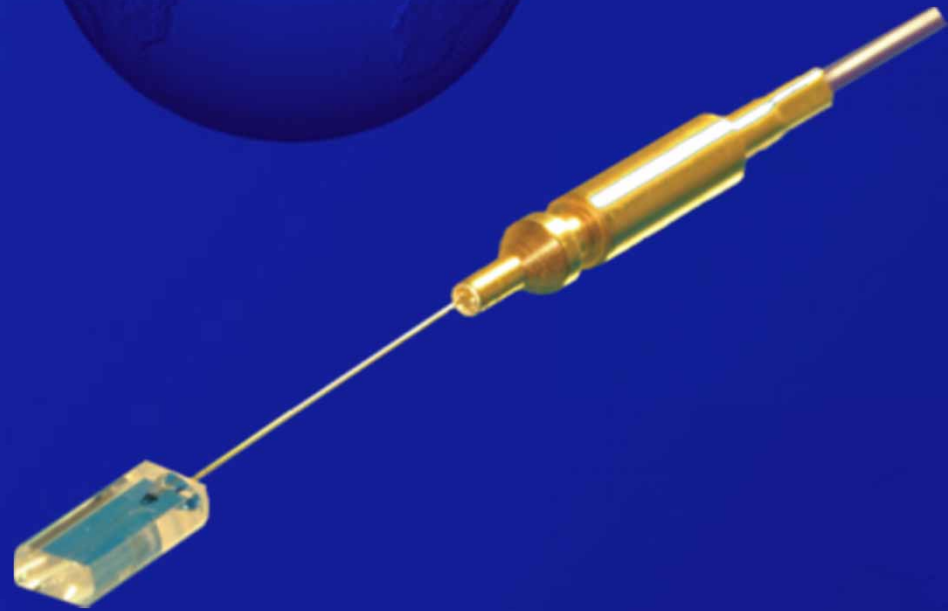
PM Hermetically Sealable Patchcords

- 20dB, 25dB Polarization Extinction Ratios
- Custom OEM Designs & Terminations
- Patchcord With Optical Tap is Available



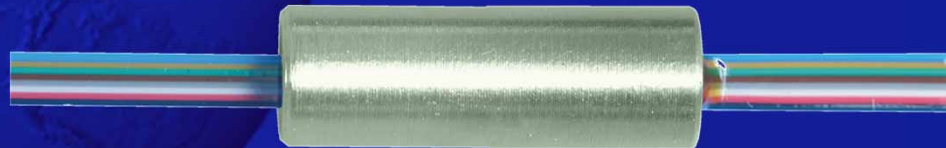
PM Hermetically Sealable Patchcords

- 20dB, 25dB Polarization Extinction Ratios
- Custom OEM Designs & Terminations
- Ideal for Component Packaging



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- 20dB, 25dB Polarization Extinction Ratios
- Custom OEM Designs & Terminations
- Ideal for Component Packaging



PM Hermetically Sealable Patchcords

- 20dB, 25dB Polarization Extinction Ratios
- Custom OEM Designs & Terminations
- Patchcord With Optical Tap is Available



Tapered PM Fibers

- **Improves Coupling from Waveguides, Diodes**
- **As Small as 2 Micron Spot Sizes**
- **Circular & Oval Spot Profiles**



PM Fiber Pigtailed V-Grooves

- 127, 250, 400 or 500 Micron Spacing
- Over 20dB Extinction Ratios
- Rods Aligned to Within 0.5 Degrees



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PM Fiber Pigtailed V-Grooves

- 127, 250, 400 or 500 Micron Spacing
- Over 20dB Extinction Ratios
- Polarization Axis Aligned to within 0.5 Degrees



PM Fiber Pigtailed V-Grooves

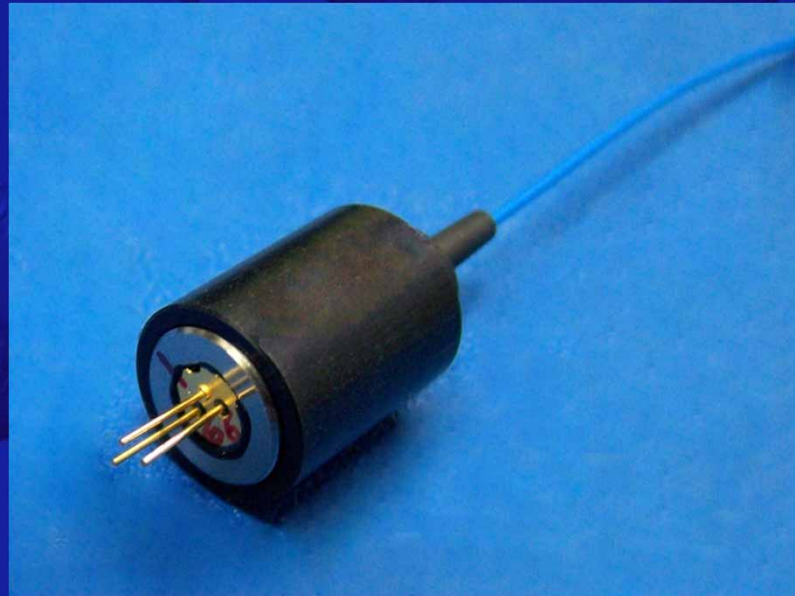
- 127, 250, 400 or 500 Micron Spacing
- Over 20dB Extinction Ratios
- Polarization Axis Aligned to within 0.5 Degrees



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PM Fiber Pigtailed Sources

- Up to 30dB Polarization Extinction Ratios
- > 80% Coupling for Lasers, 40% for Laser Diodes
- 375 nm to 2050 nm Wavelengths



PM Fiber Pigtailed Sources

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- > 80% Coupling for Lasers, 40% for Diodes
- 375nm to 2050 nm Wavelengths



Polarization Maintaining Sources

- **Up to 40dB Polarization Extinction Ratios**
- **> 80% Coupling for Lasers, 40% for Diodes**
- **375nm to 2050 nm Wavelengths**



Polarization Maintaining Source Couplers

- Up to 30dB Polarization Extinction Ratios
- > 80% Coupling for Lasers, 40% for Diodes
- 375nm to 2050 nm Wavelengths



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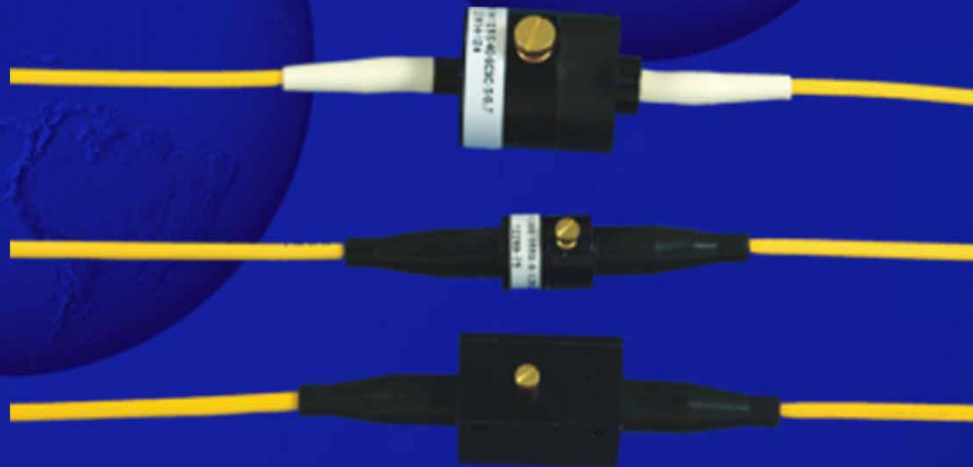
Polarization Maintaining Source Couplers

- Up to 30dB Polarization Extinction Ratios
- > 80% Coupling for Lasers, 40% for Diodes
- 375nm to 2050 nm Wavelengths



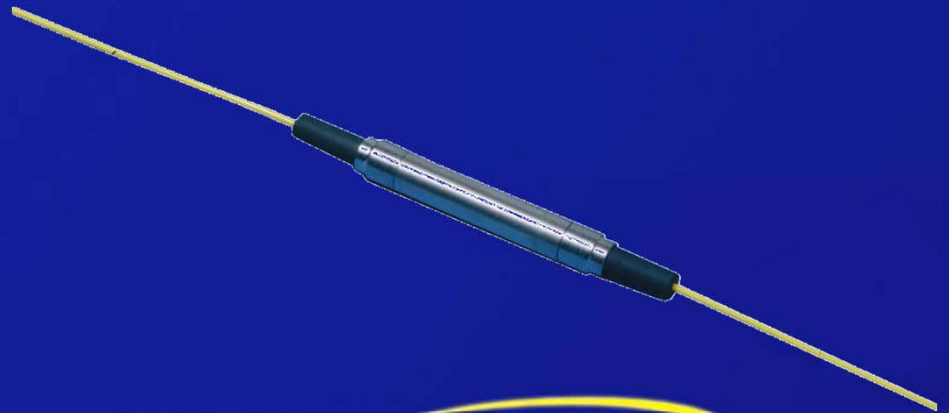
PM Fiber Variable Attenuator

- Up to 30dB Extinction Ratios, Up to 10 Watts CW Power
- 0.6dB to 80dB Attenuation, -40, -50, -60dB Backreflection
- Meets Telcordia Specifications
- MEMS Based Attenuators Available



Fiber Optic Fixed Filters

- **400nm to 2200nm Wavelengths, SMF, PMF & MMF**
- **-40dB, -50dB, -60dB Backreflection**
- **Filters Can Be Fixed or Removable**



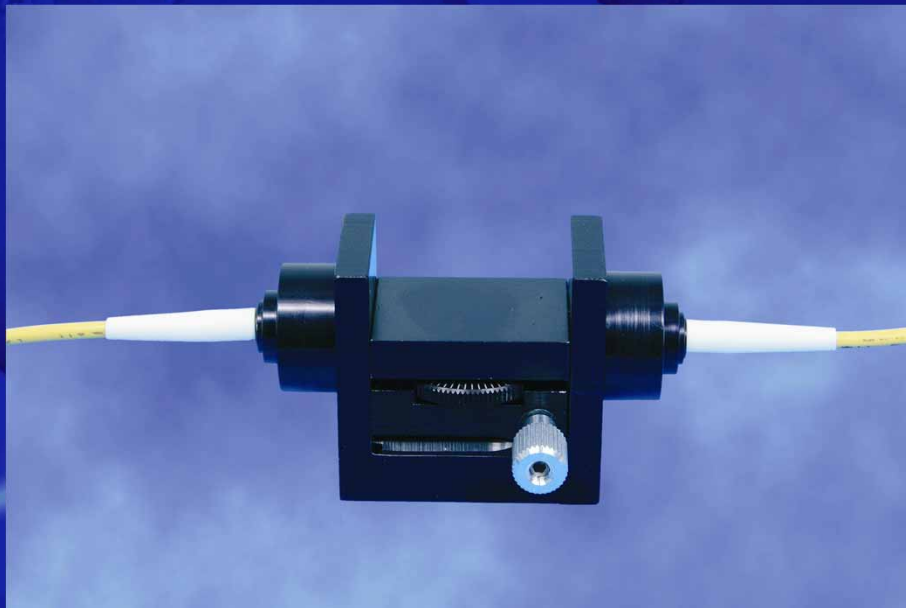
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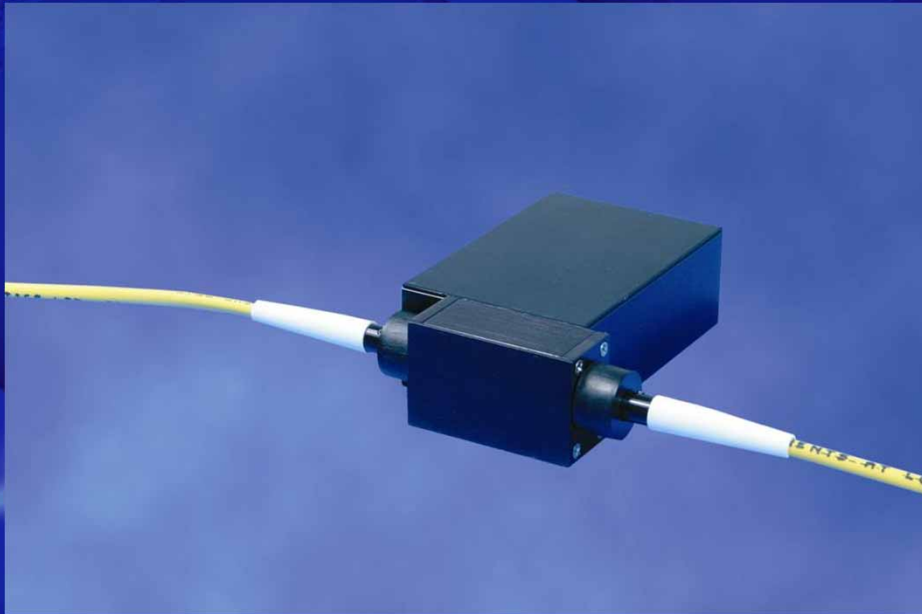
Tunable Filters

- **< 1.2nm Line Width, 0.1nm Resolution**
- **50nm Tuning Range,**
- **Manual, Motor Driven and Digital Versions**



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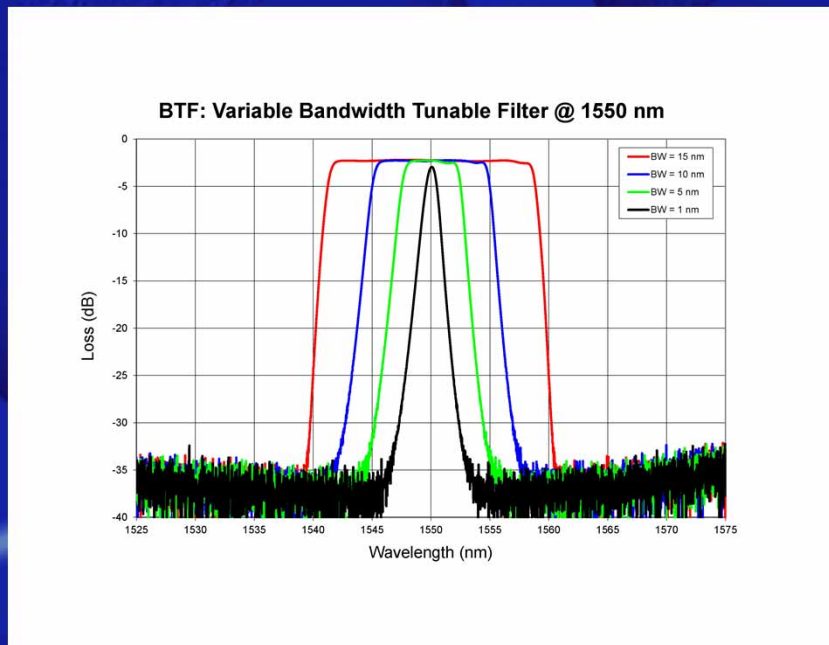
Tunable Bandwidth Filters

- 1nm to 18nm FWHM Adjustable Line Width
- 45nm Tuning Range
- Flat Top Filter Shape



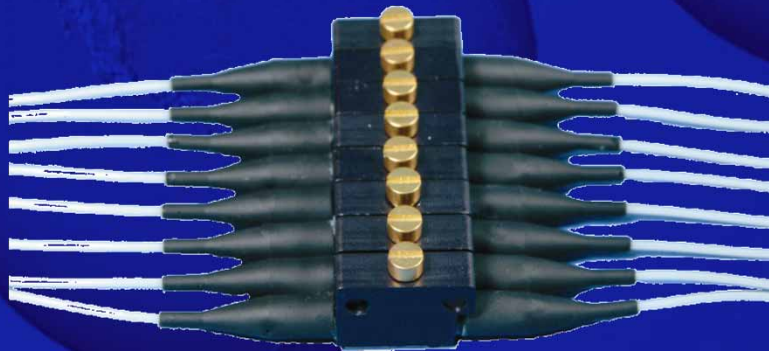
Tunable Bandwidth Filters

- Polarization Insensitive
- High Out-of-Band Suppression
- Singlemode, Multimode and PM Versions



PM Fiber Variable Attenuator

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- MEMS Based Attenuators Available



Polarization Rotators / Analyzers

- **Greater than 30dB Extinction Ratios**
- **-40, -50, -60dB Backreflection Levels, 1dB IL**
- **Fiber-Fiber, Source-Fiber & Fiber-Photodiode Versions**



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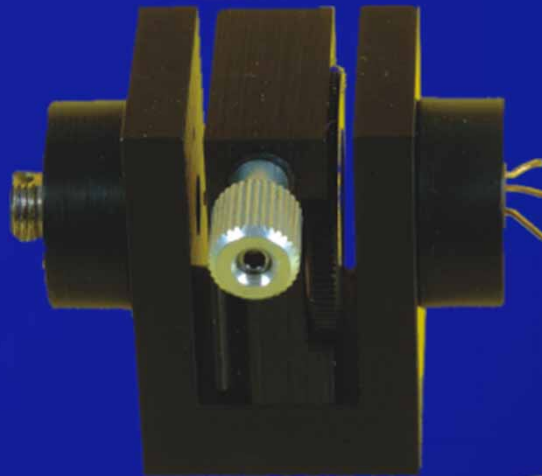
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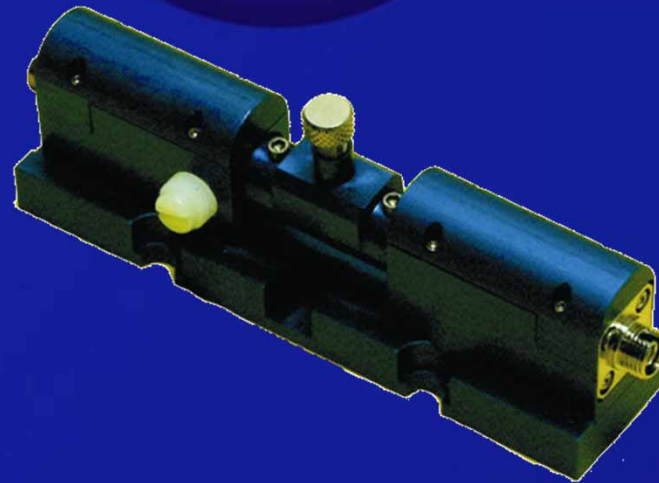
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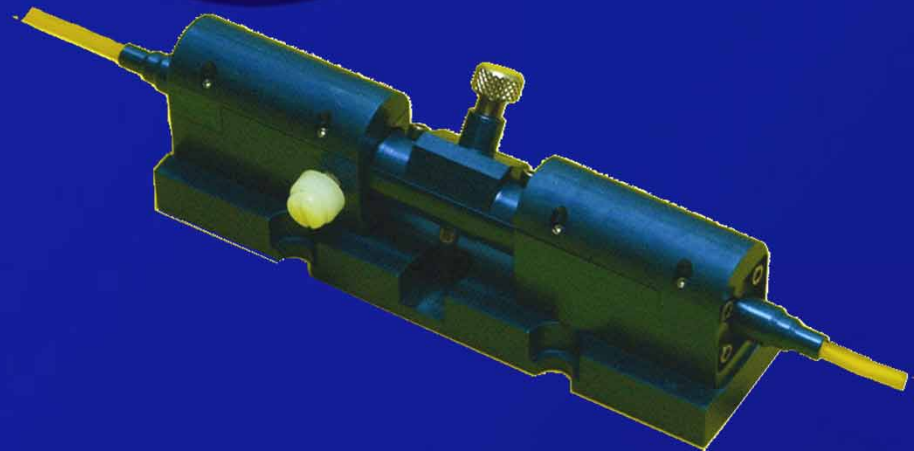
Manually Adjustable Polarization Controllers

- **Designed to Control Polarization State**
- **All Fiber Version – No Intrinsic Loss**
- **Pigtail and Receptacle Version**



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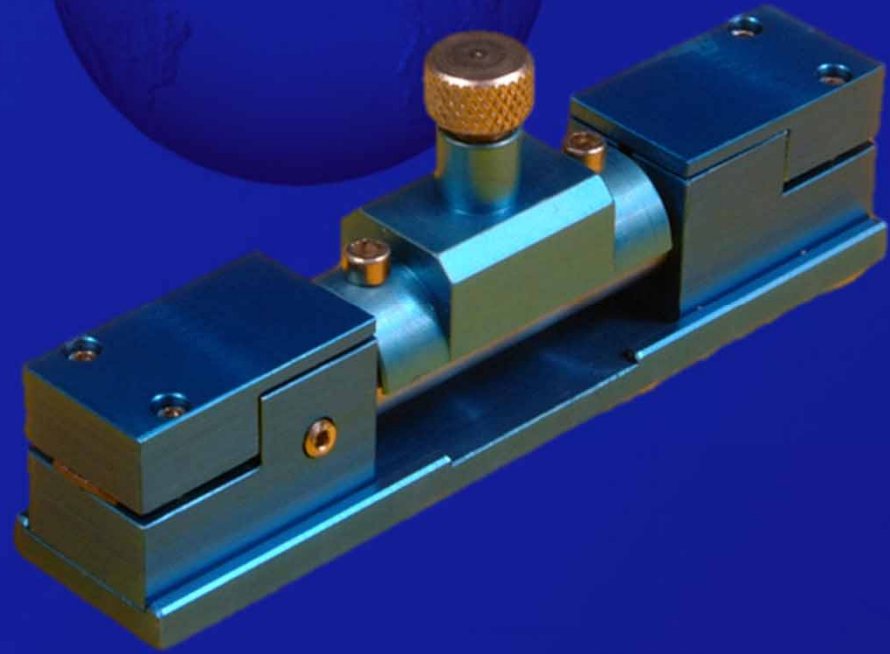
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Manually Adjustable Polarization Controllers

- **Designed to Control Polarization State**
- **Wave plate Version**
 - **Has Angle Readouts, Repeatable Output**
- **Pigtail and Receptacle Versions**



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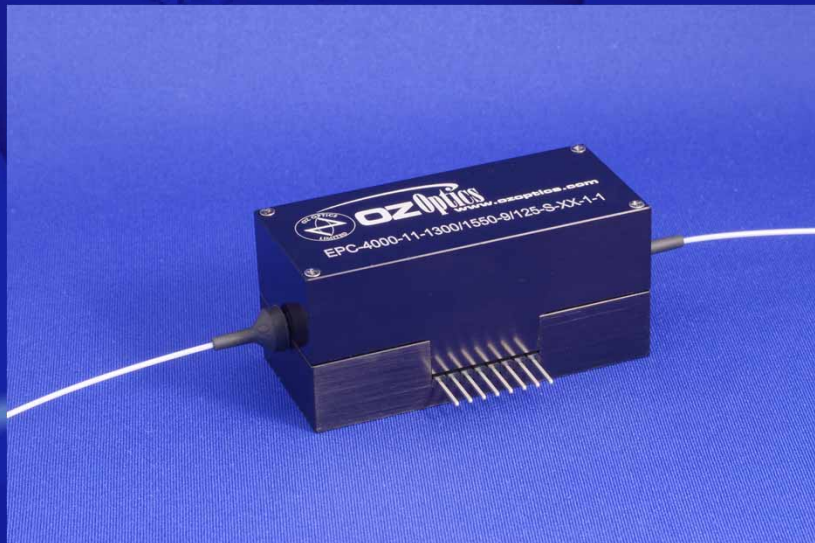
Electrically Driven Polarization Controllers

- Continuous Control of Polarization
- No Insertion Losses or Return Losses
- > 100 Hz Response Speed
- New! High Speed Version, up to 30kHz response speed



High Speed Electrically Driven Polarization Controllers

- Continuous Control of Polarization
- Up to 30kHz Response Speed
- Negligible Insertion Losses, Return Losses, or PDL
- Compact and PCB Mountable



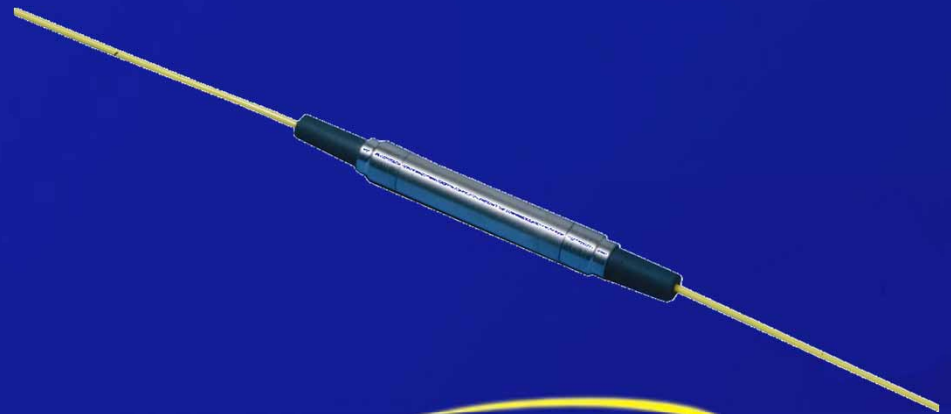
Fiber Pigtailed Polarizers

- **Up to 30dB Extinction Ratios**
- **Based on Free Space Optics**
- **0.6dB Insertion Loss, Low Cost, Compact**
- **-40, -50, -60dB Backreflection Levels**
- **400-2050 nm wavelengths**



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All-Fiber Polarizers

- **>35dB (Up to 50 dB) Extinction Ratios possible**
- **<0.5dB Insertion Loss Achievable**
- **Low cost and compact size (3mm OD housing)**
- **Broad operating wavelength**
- **-70dB Backreflection Levels**



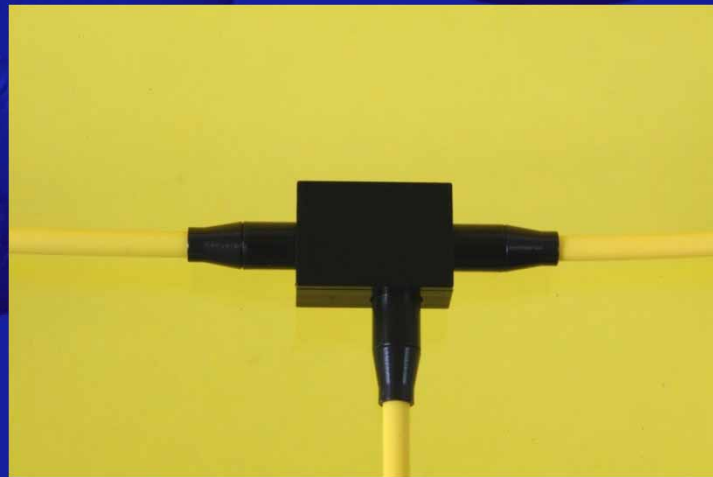
Polarization Maintaining Splitters

- Splits Polarized Light into 2 PM or SM Fibers
- 0.6dB IL, -40, -50, -60dB Backreflection
- 1x2 & 2x2 Versions Available
- 350-2050 nm Versions



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- 1x2 & 2x2 Versions Available
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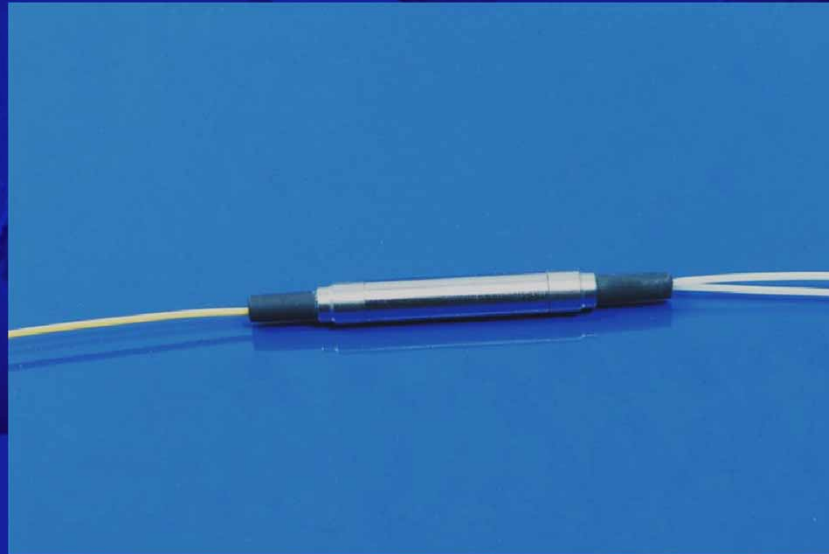
Polarization Maintaining Fused Splitters

- Splits Polarized Light into 2 PM Fibers
- 50/50 to 95/5 Split Ratios, Polarizing Versions
- 1x2 & 2x2 Versions Available
- 633 –2000nm Wavelengths



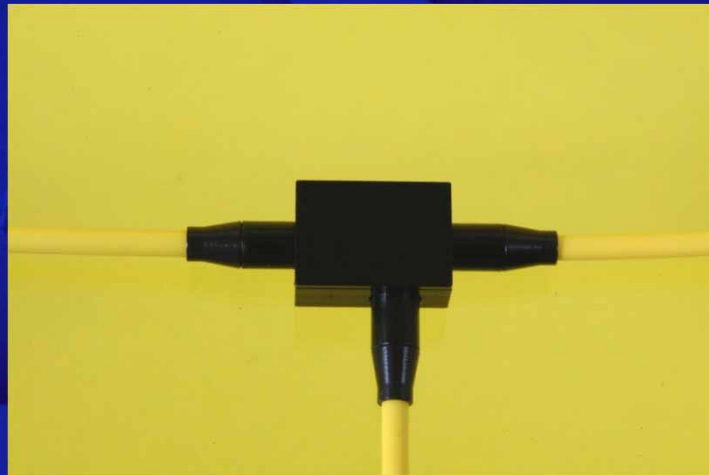
Polarizing Splitters / Combiners

- Splits Light into Two Polarizations
- 0.6dB IL, -40, -50, -60dB Backreflection
- 1x2 & 2x2 Versions Available

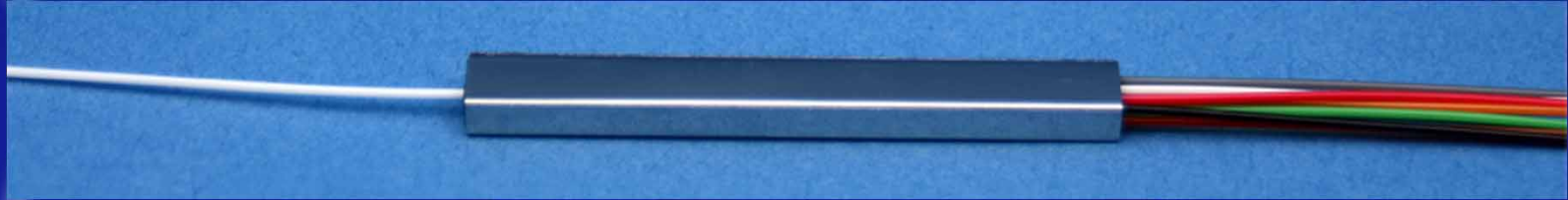


Polarizing Splitters / Combiners

- Splits Light into Two Polarizations
- 0.6dB IL, -40, -50, -60dB Backreflection
- 1x2 & 2x2 Versions Available



PM Planar Light Circuit (PLC) Splitters



- **1x2 to 1x32 Splitter Configurations**
- **C, L and S Band Operation**
- **Miniature Package Size**

PM Fiber Optic Circulators

- **0.7dB Typical Insertion Loss**
- **532 - 1550nm Wavelength Versions**
- **Up to 30dB Extinction Ratios**



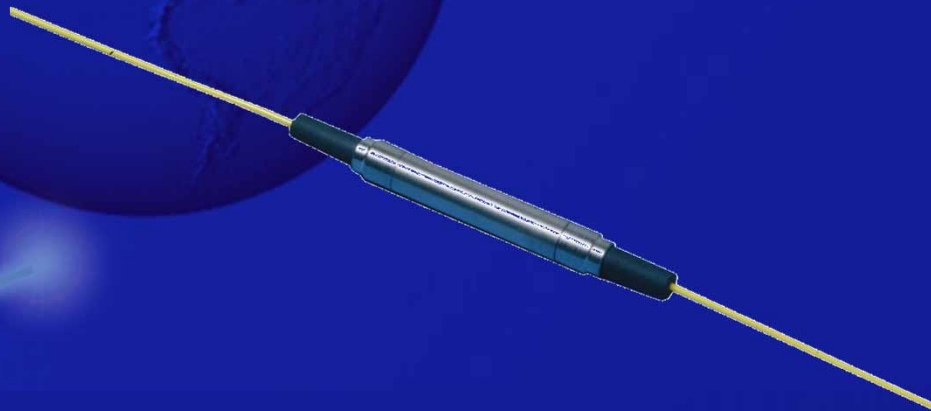
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- **Up to 30dB Extinction Ratios**



Fiber Pigtailed Isolators

- $\leq 0.8\text{dB}$ IL, As Much as 60dB Isolation
- -40dB, -50dB, -60dB Backreflection
- 532nm to 2050nm Wavelengths
- Singlemode or PM Fiber Versions
- Polarizing or Polarization Independent Versions



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Faraday Mirrors and Rotators

- **Used in EDFA, Tunable Lasers, Etc.**
- **0.7dB Typical Insertion Loss**
- **-40, -50, -60dB Backreflection**



Polarization Maintaining Fiber Switch

- **> 20 dB Polarization ER**
- **Latching and Non-Latching versions**
- **< 0.6 dB loss**
- **Now offering MEMS based 1 x N optical Switches (Non-Latching)**



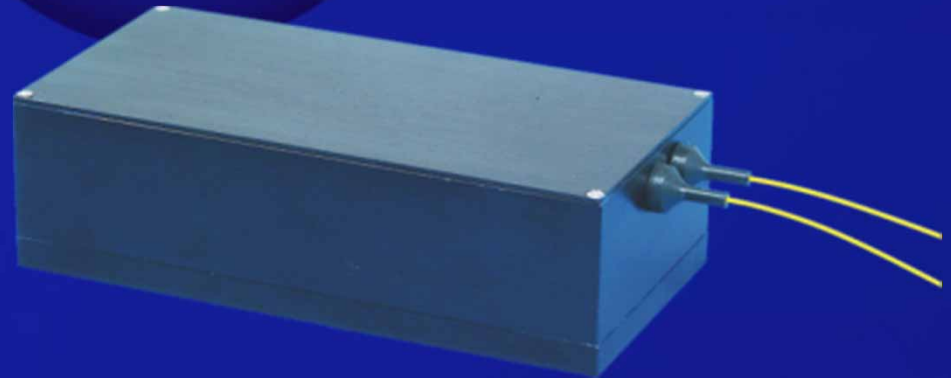
Variable Optical Delay Lines

- **Motor Driven Version is Available**
- **Over 300ps Delay Range, < 1dB IL**
- **As Fine as 0.003ps Resolution**



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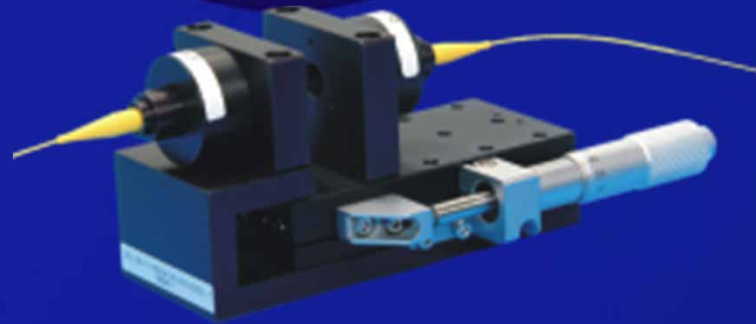
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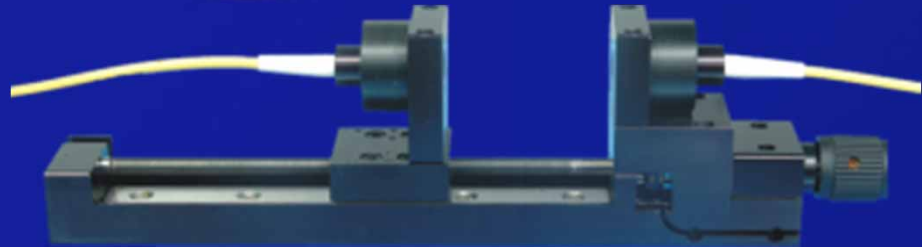
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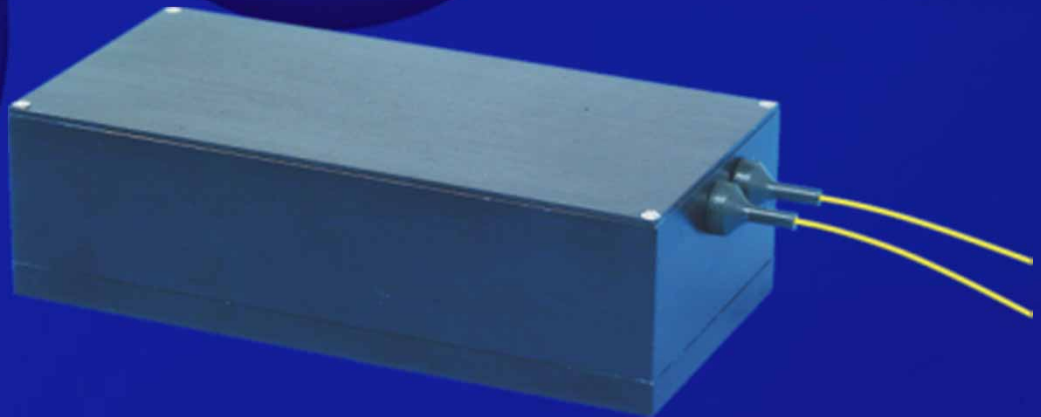
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Differential Polarization Delay Lines

- **Varies the Delay Between Two Polarizations**
- **$\pm 50\text{ps}$ Delay, 0.1ps Resolution**
- **$< 1.2\text{dB}$ Losses over the Delay Range**



Polarization Measurement Systems

- Includes Source, Meter & Master PM Patchcord
- Measures up to 40dB Extinction Ratios
- Available for 400 – 2000 nm
- FC, SC, LC, MU, E2000 or Custom Connectors & Ferrules
- Test Systems for PM Fiber Pigtailed V-Groove Assemblies



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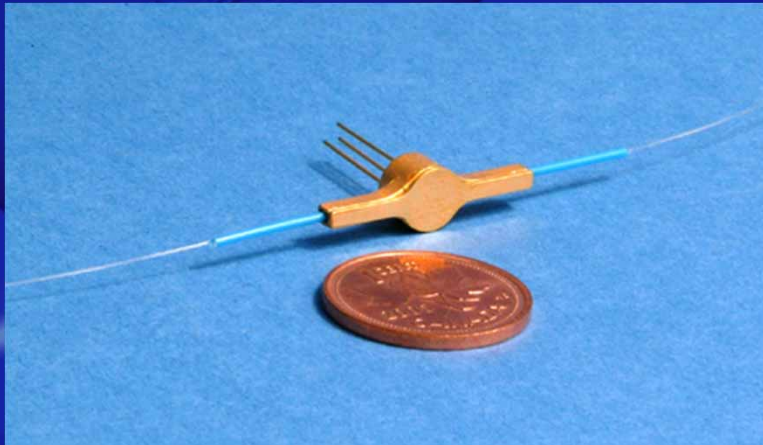
Polarization Dependent Loss Emulator

- 0.05dB to 10dB polarization dependent loss
- Fixed or manually variable PDL
- Broad wavelength range, compact, and low cost
- PMD Free Version Available



PM Fiber Power Monitors/Tap Couplers

- **Wide Wavelength Range, up to 2 Watts Power Handling**
- **Single Channel**
- **Digital Display Version Used to Monitor and Measure Power Simultaneously**
- **Allows optical monitoring without disconnecting**
- **Can be locally or remotely accessed**
- **Ideal for FTTH networks**



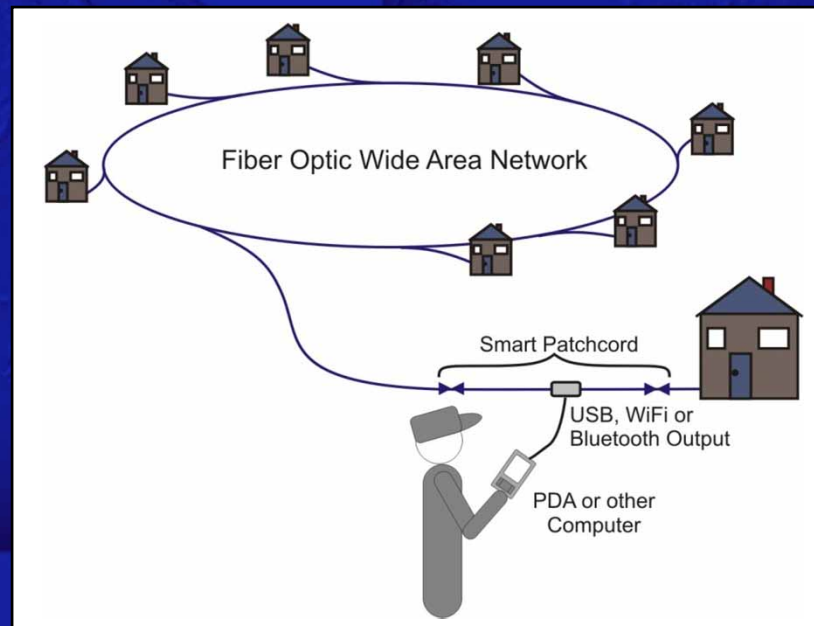
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- Can be locally or remotely accessed
- Ideal for FTTX networks



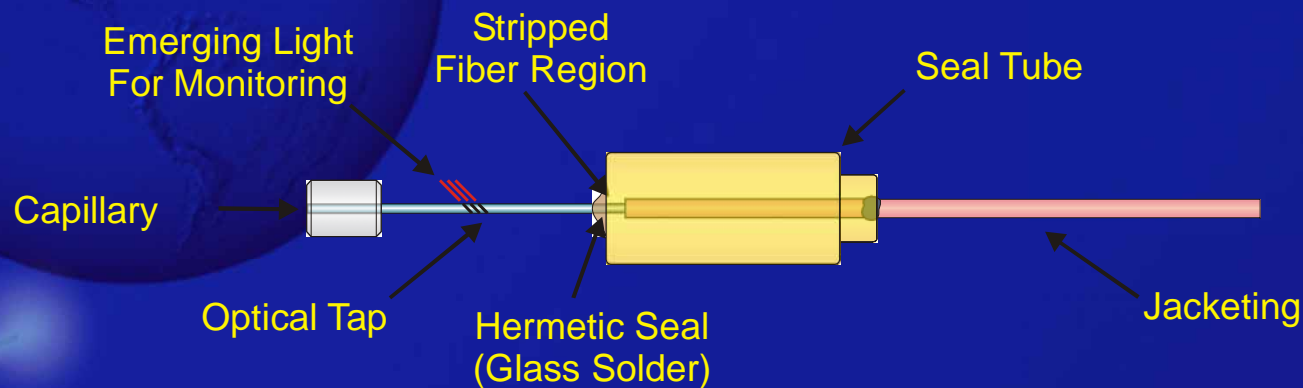
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PM Components for OCT Applications

- Complete Module or Separate Components such as:
 - Broadband Isolators
 - Sources
 - Attenuators
 - Collimators
 - Fused Splitters
 - Delay Lines



OZ Optics

Your solution provider for existing and next generation fiber optic components and test equipment

Please Contact Our Sales Dept:

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Toll Free: 1-800-361-5415

Email: sales@ozoptics.com.

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