Products for Fiber Sensing Applications

Optoplex Corporation is a leading technology company with proprietary optical technologies and products for applications from Telecom, Datacom, Optical Sensing, to Optical Spectral Instrumentations. In addition to commercial applications, Optoplex has been designing and manufacturing high reliability products for fiber sensing applications.

In fiber sensing applications, usually scattering light is measured that is sensitive to the change of the environment conditions, such as temperature, pressure, and stress, etc.
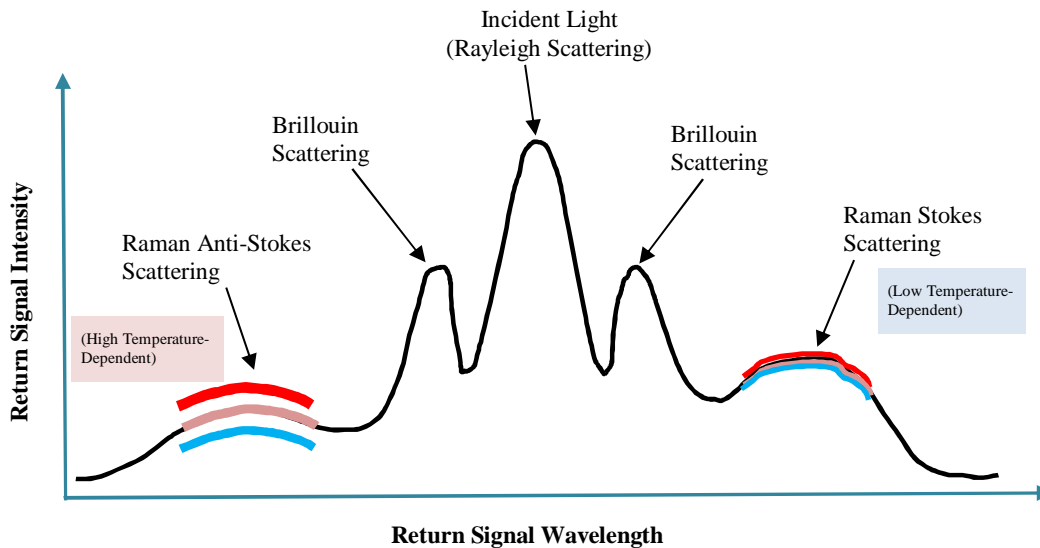

Figure 1. Scattering in fiber sensing

There are two major types of fiber sensing: FBG based fiber sensing and distributed fiber sensing.
Among the distributed fiber sensing, distributed temperature sensing (DTS) has been widely employed in the past ten years while distributed acoustic sensing (DAS) becomes more and more attractive.

DTS uses Raman Anti-Stokes scattering that is temperature dependent (while Raman Stokes scattering is very weakly temperature dependent). Usually 50µm multimode fiber (MMF) is used in DTS.

DAS usually uses single-mode-fiber (SMF). The fact that DAS system uses single-mode cable allows obtaining better special resolution and reducing noise.
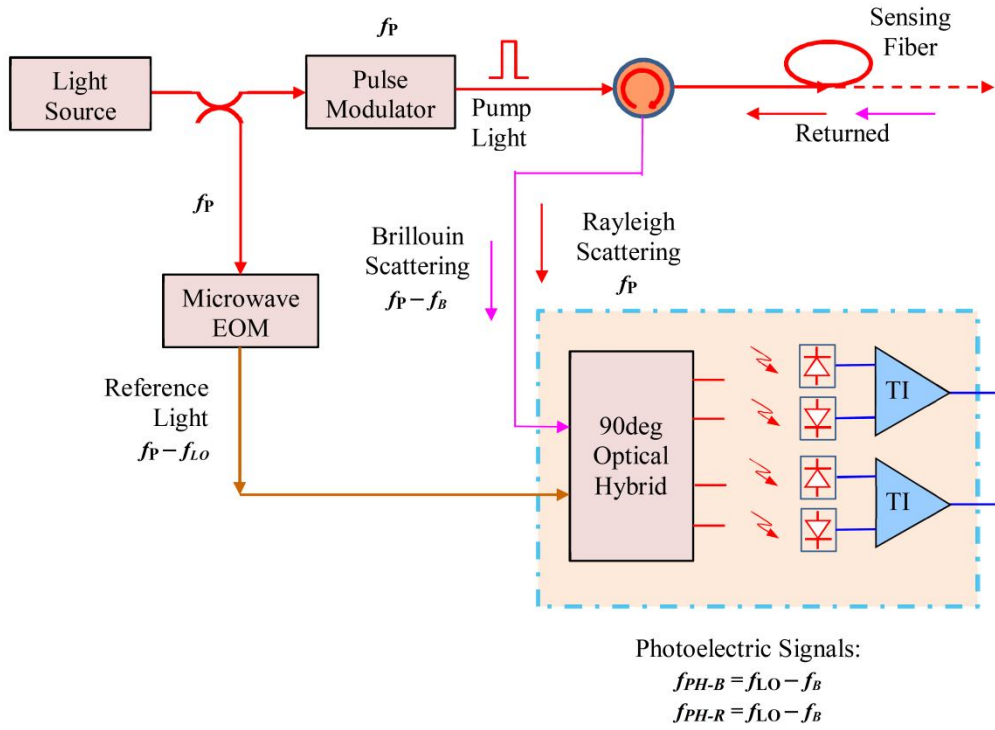
Figure 2. A schematic setup of Brillouin scattering fiber sensing system
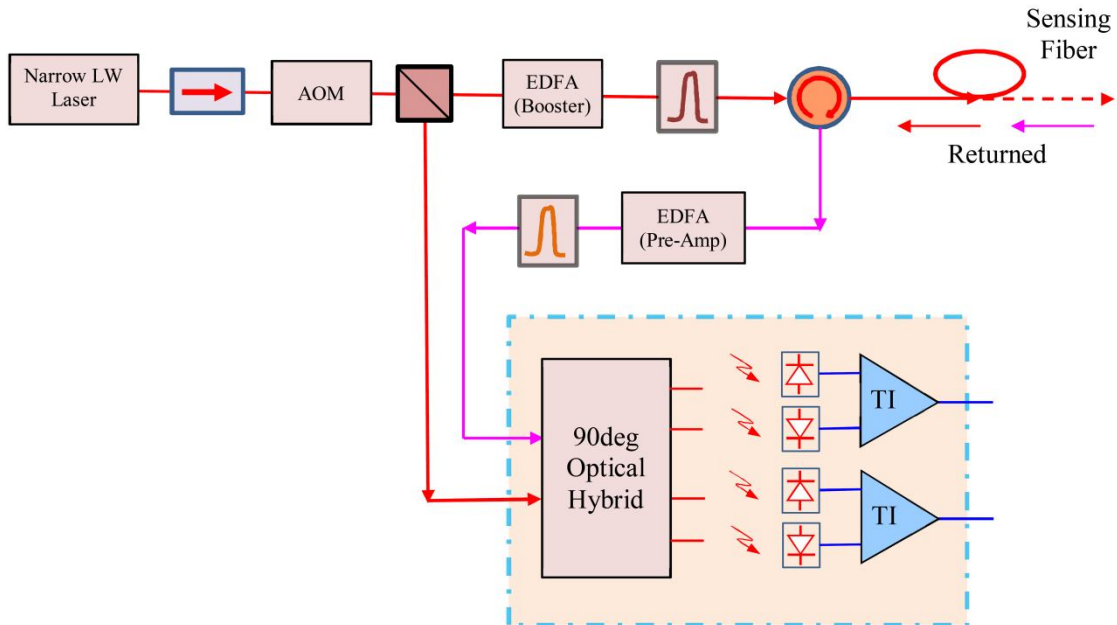

Figure 3. A schematic of a phase-sensitive coherent OTDR system

Optoplex has developed telecom-grade high performance, high reliability products for fiber sensing applications.

Light Sources   http://www.optoplex.com/Lasers_Light_Sources.htm

Key products are
- iTLA TLS
- ASE Light Source
- Comb Light Source
- Fiber Lasers
  - Single Frequency Narrow Linewidth CW FL
  - Single Frequency Narrow Linewidth Pulsed FL
  - Single Frequency Narrow Linewidth CW FL OEM Module (Coming Soon)

EDFA   http://www.optoplex.com/EDFA.htm

Key products are
- MSA EDFA Booster
- MSA EDFA Pre-Amp
- High Power EDFA
  - 2W
  - 10W (Coming Soon)

Etalon   http://www.optoplex.com/F-P_Etalon_Products.htm

Applications include: wavelength reference, noise suppressions or spectral shaping.

Key Features

- Free-space optics and athermal design
- Very small temperature dependent frequency shift (TDFS)
- Low insertion loss
- Broad Wavelength Range: C-, L-, C+L, O-Band, 1064nm
- FSR: 6.25 ~ 200GHz
- SMF/PMF, MMF
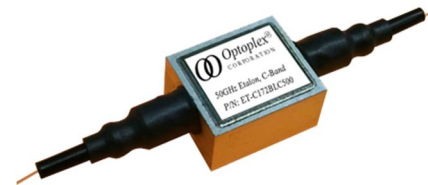
Spectral Shape: can be tailored per customer request

Comb Filter   http://www.optoplex.com/F-P_Etalon_Products.htm

- Similar to Etalon

Standard Comb Filter, 100GHz FSR

100GHz Super Comb Filter, 20GHz FWHM
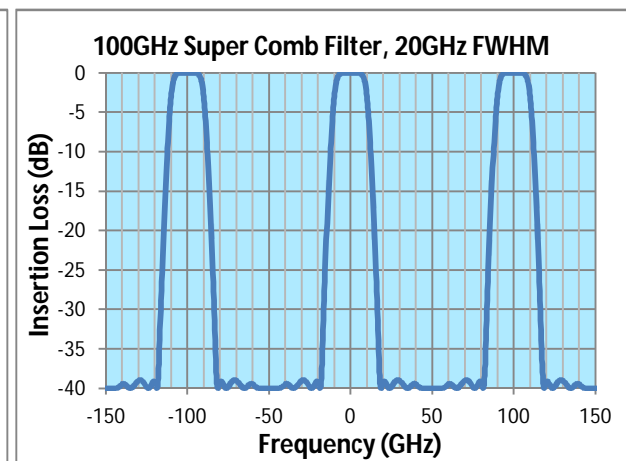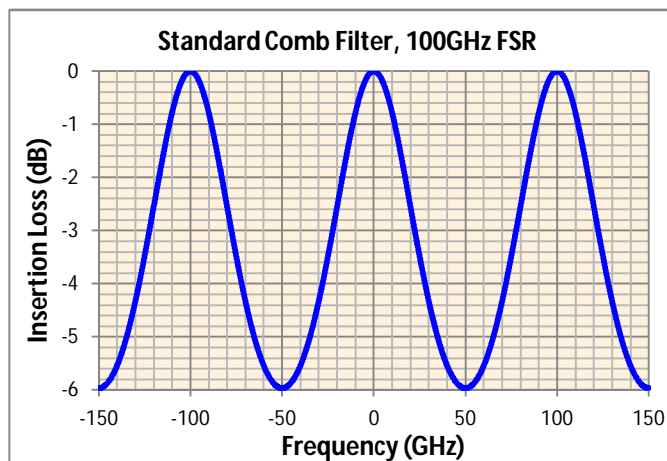
Spectral Shape: can be tailored per customer request

- Tunable Comb Filter
  o NGPON2 TF
  o Thermal TF

90deg Optical Hybrid   http://www.optoplex.com/Optical_Hybrid.htm

For coherent detection in DPSK or BPSK optical communications; or for coherent balanced detection on Lidar systems. Offers superior performance.

- Wavelength Range: C-band, 1310nm or 1064nm
- Free-space optics and athermal design
- Low insertion loss
- Small Skew: < 5ps
- Super Phase Difference: 90 ± 10°
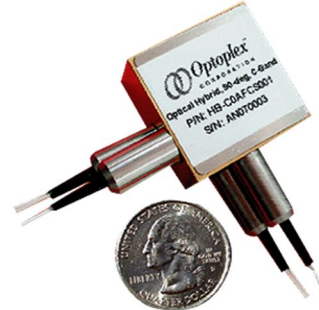
90deg Optical Hybrid Integrated with Balanced Receiver

http://www.optoplex.com/90deg_Hybrid_Balanced_Receiver.htm

- Optical performance refers to **90deg Optical Hybrid**
- High CMRR
- Selections of Bandwidth: 15MHz, 100MHz, 200MHz, 400MHz, and 1600MHz. Other BW available upon request

Mach-Zehnder Delay Line Interferometer (DLI)

http://www.optoplex.com/Optical_Phase_Demodulators.htm
aka DPSK Demodulator

Key Features
- FSR: 2.5 ~ 500GHz
- Delay: customer specific (1ps for Telecom)
- Spectral Tunable, Semi Tunable, or Passive
- Large Spectral Tuning Range: > 10 FSR
- Low TDFS and PDFS
- Low IL and PDL

Tunable Filter http://www.optoplex.com/MEMS_tunable_Filter.htm

Optoplex's MEMS tunable filter is ideal for applications from wavelength locking, optical channel monitoring and optical add/drop in optical communications; optical filtering and wavelength management in fiber sensing and spectroscopic instrumentation.

Products include:
- Optical Engine
- Full Function Module

Key features are
- Athermal Design
- Fast Tuning Speed
- Wide Tuning Range: C-, L-, C+L, and O-Band
- Low TDL and WDL
- High Isolation
- Low Power Consumption

OSA http://www.optoplex.com/Optical_Spectrum_Analyzers_Top.htm

- Wavelength Range: C-, L-, C+L, O-, Full Band
- Refer to link above

Wavelength Range	Model
C-Band	OSA 50
C+L Band	OSA 100L
O-Band	OSA 100S
Full-Band	OSA 500
NIR Band	OSA 1000
C-Band, High Resolution	OSA 50A

Wavelength Lockers http://www.optoplex.com/Wavelength_Locker.htm

Key Features
- Working Wavelength Range: C-band, 1310nm, or 1064nm
- Athermal design
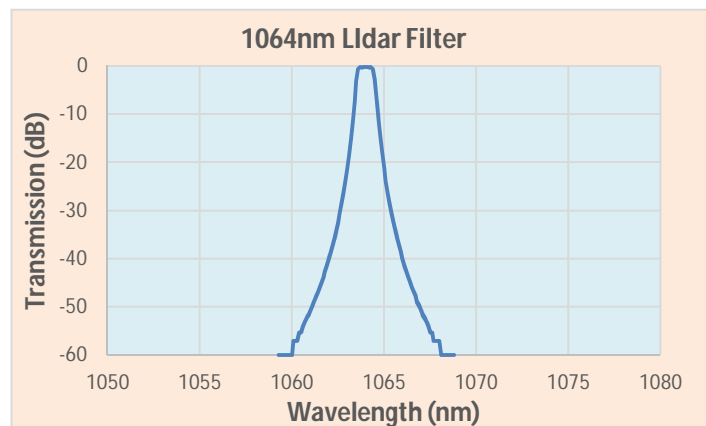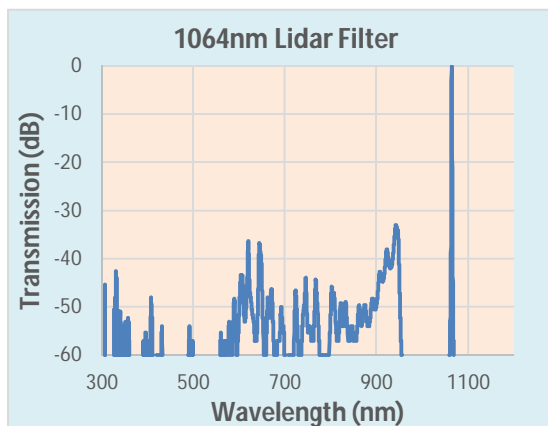- FSR: 25, 50, 100 or 200GHz. Or customer specific
- Small TDFS

Special Filters

- Lidar Filter (see below)
- MOPA Filter
- Rayleigh Filter (see below)
- Raman Filter

Lidar Filters

- o Center Wavelength: 1064nm or others
- o FWHM: < 1nm or customer specific
- o High Transmission: > 90% (typical 95%)
- o Side-Band Blocking Wavelength Range: 300 ~ 1200nm
- o Blocking Optical Density (OD): > OD 4 over 300 ~ 1200nm

Rayleigh Laser Line Filters

A very steep slope band-pass filter to separate the Brillouin or Raman scattering signals from the Rayleigh laser signal to increase the detection sensitivity and dynamic range.

Key Features
- o Center Wavelength: customer specific
- o FWHM: ~ 10GHz
- o Slope: > 750dB/nm
- o Low insertion loss
- o Free-space optics and Athermal design to offer very small TDFS