

General Introduction of Tunable Filters

Tunable filter has been widely used in various applications from testing & measurements, to lasers, optical sensing and optical communications. There are different technologies that can achieve tunable functions, such as grating based, MEMS-based, thermal tuning, angle tuning, F-P etalon, liquid crystal, gradual tuning filters, ...etc.

However, the existing tunable filters have some issues. Among them, tuning speed is the most critical one. Most tunable filters have a tuning speed of milliseconds or slower. The second critical issue is that most tunable filters involve moving parts, resulting in long term reliability issues.

Today, the high-speed transmission in telecommunication requires much faster response for tunable filters, especially in 40G (or 100G) ROADM. In these applications, microsecond response time is mandatory.

Lightwaves2020, as a leading technology company in fiber optical communication, recently developed a high-speed tunable filter to meet such demands. It is a voltage driven tunable filter based on novel electro-optic material, with a tuning speed of few microseconds.

Our high-speed tunable filter attracted tremendous interest during the OFC'2008 exhibition in San Diego, CA. So far we have received many inquiries for the high-speed tunable filters mainly for the following three applications.

1) Tunable Add/Drop

- 2-Port Single Channel Tunable Filter: for tunable add/drop application.
- 3-Port Single Channel Tunable Filter: for tunable add/drop with an express port.
- Multi-Channel Tunable Filter Array: 4-, 6-, 8- and 16- channel tunable filter arrays for ROADM applications.
- Multi-port Channel Tunable Mux/DeMux: 4-, 8- and 16-channel tunable mux/demux. This is still under-development.

2) Scanning Filter for Spectroscopic Applications

The tunable filter is engineered to have very narrow bandwidth, about 0.01nm, with a FSR (free spectral range) of up to 90nm, and finesse of 1,000. Applications include OSA in testing and measurement and special spectroscopic scanning in sensing applications.

3) Fiber Lasers

Tunable filters with bandwidth from 0.01nm to 0.1nm, designed with FSR of 10nm to 90nm can be tailored to meet the special applications.

Based on solid electro-optic materials, the tunable filters can be used in high power lasers, especially in nano-second high power pulsed lasers.

As a technology oriented company, we also provide custom design and manufacturing to meet your special requirements. Please contact our sales at [\(408\) 503-8888](tel:408-503-8888) or sales@lightwaves2020.com

The image shows three small, rectangular electronic components, identified as Lightwave2020 tunable filters, with rainbow-colored optical fibers connected to them. The filters are arranged in a row, and a checkered racing flag is positioned behind them, symbolizing speed. The background is a soft blue gradient.

Lightwave2020's High-Speed Tunable Filter

Ms SPEED

No Moving Parts, Affordable

Lightwaves2020's Electro-Optic Fabry-Perot Tunable Filter is a specialized filter based on the Electro-Optic crystal Fabry-Perot Etalon technology. The wavelength tuning is achieved by an applied electrical field, which modulates the refractive index of crystal. There are no moving parts in the tunable filter. Integrated high-speed tunable filter does not need alignment in application. So it is shock resistant and has small footprint. The maximum scanning frequency to 100kHz can provide fast transient phenomenon test.

The Electro-Optic Fabry-Perot Tunable Filter is essentially none-sensitive to input polarization of the optical signal as well. The polarization independent feature makes it very stable and repeatable without a polarization controller.

The bandwidth of the tunable filter can be designed from 0.2nm to 0.001nm by choosing the finesse of the Etalon. The temperature-controlled design has as high as 10-6nm wavelength stability.

A 0-5V of scanning voltage enables the tunable filter to scan whole C-band, L-band, and even C+L-band wavelength range. The scanning voltage can be programmed to select any expected wavelength transmitted. These features make the high-speed tunable filter a unique candidate in many high-speed network applications, such as WDM, OPM, OCM, RODAM, WSS et al system design.

FEATURES

- Shock resistant, no moving parts
- High scanning speed to 100KHz
- Small footprint
- Wide tuning range from 1500nm to 1610nm
- High resolution 0.01nm for accurate spectrum analysis
- Low insertion loss
- No alignment required
- None-sensitive to input polarization of the optical signal
- Low cost

MAIN APPLICATIONS

- Ultra-high resolution optical spectrum analysis (OSA)
- Optical performance monitoring (OPM) and optical channel monitoring (OCM)
- Tunable channel drop for WDM
- Tunable optical noise filtering and channel locking
- Optical IR spectroscopy
- Sensing application

Lightwave2020's High-Speed Tunable Filter

Parameters	Unit	Specification
Operating Wavelength Range	nm	1064, 1310, 1530 to 1610
Free Spectrum Range	nm	10, 40, 80
Bandwidth	nm	0.1 to 0.01
Standard Finesse	-	10, 100, 1000
Maximum Insertion Loss	dB	< 3.0
PDL	dB	< 0.1
PMD	ps	< 0.1
Maximum Back Reflection	dB	< -50
Active Loss	dB	< 0.1
Maximum Scanning Speed	kHz	< 100
Scanning Voltage (with driver)	VFRS	0 - 5
Scanning Voltage (w/o driver)	VFRS	0 - 180

Monolithic Liquid Crystal Based VOA Arrays

Smaller Footprint, Lower Insertion Loss

Lightwaves2020's liquid crystal based variable optical attenuator array is a voltage-controlled module designed specifically for power management in optical networks. Unlike the conventional way of placing each individual VOA device side by side, the monolithic VOA array is made with monolithic method and features smaller footprint, lower insertion loss, lower power consumption and lower costs. In addition, it comes with an option of a built-in driver. With a dynamic range of up to 40dB attenuation and operates in the C-band, L-band or C+L band, this product has high precise optical power control and continuous tuning without moving parts.

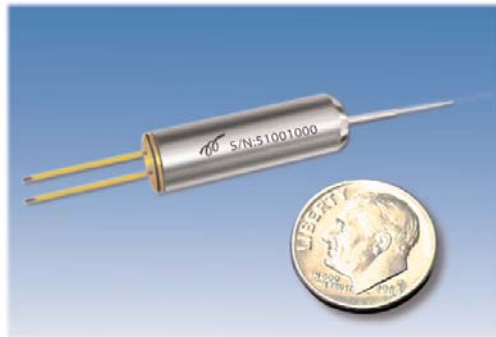
The monolithic VOA packaged in small footprint makes it ideal for integration onto circuit boards and for saving space. The module is driven by a 0-5V DC voltage using an easy-to-plug 12-pin electric interface connector. It can be used in network optical power adjustment, channel balancing in WDM systems, EDFA gain-tilt and power balancing, Raman amplifiers and multi-channel OADM applications.



Wide-Band VOA

No Moving Parts

Unlike MEMs VOA, Lightwaves2020's liquid crystal based variable optical attenuator has no moving parts and offers a wide-band (from 1260nm to 1620nm) feature. It is voltage-controlled and designed specifically for power management in optical networks. Sealed in a compact coaxial package of 7.2mm in diameter, the VOA's small footprint makes it ideal for integration onto circuit board. It also features precise attenuation control without backlash, small driving voltage, low power consumption, excellent PDL performance, and low insertion loss. It offers a dynamic range of up to 40dB attenuation (50dB attenuation available upon request).



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NEWSWIRE



Lightwaves2020 recently receives the Certificate of United States Patent No. 7,362,504 - Miniature circulator devices and methods for making the same. This invention is about using the Faraday rotator elements in miniature optical devices as the polarization orientation element to create oppositely oriented magnetic domains so that polarization rotations of 45 degrees in both clockwise and counter-clockwise directions can be simultaneously achieved on the same magnetic garnet.

Lightwaves2020 delightfully welcomes the new members of the family: Sarah Law (Purchasing Specialist), Gloria Chiang (Sales Account Manager), Jason Gong (Electronics Engineer), and Zhenwei Lu (Firmware Engineer).

Lightwaves2020 has been actively recruiting the elite to join the company. Current openings include Sales Account Manager, HR Manager, Optical Engineer, and Hardware Electronic Engineer. Whoever interested in these positions is very welcome to forward the resume to hr@lightwaves2020.com. The detailed qualification and requirements can be found on HotJobs.



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