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Comparison of Flexible Wavelength Selector with other tunable filters

There are a couple of other niche wavelength filtering technologies: the acousto-optic tunable filter (AOTF) and liquid crystal filters. The AOTF is a solid state component based on applying radio frequency (RF) input to an exotic crystal such as tellurium dioxide (TeO_2). The resultant acoustic vibrations act as a moving diffraction grating. The main advantage of the AOTF is that it has fast switching time and can control multiple ouput simultaneously. However, it has numerous well-documented drawbacks. First, it is a complex RF-powered system that is relatively costly. Plus, this cost increases non-linearly with aperture size. The AOTF also has poor out-of-band extinction, typically $<10^2$. In addition, there is a fixed relationship between bandwidth and center wavelength, and, in many devices, the output angle shifts with wavelength.

In liquid crystal based devices, the phase of linearly polarized light is manipulated in a liquid crystal cell sandwiched between wave plates. The use of polarizers means that only a certain wavelength band can pass through the device. These are useful niche devices, but they have some limitations: the bandwidth is fixed, the input must be linearly polarized, and for un-polarized light the total throughput efficiency is <25%. In addition, the out-of-band extinction is much lower than a monochromator or bandpass filter, and the transmission edge slope is poor. For some illumination applications the low damage threshold can be another limitation.

A new patented technology now combines the advantages of all these earlier methods without most of the drawbacks. Specifically, Flexible Wavelength Selector provides the wavelength flexibility and precision of a monochromator with the large clear aperture of a filter. Moreover, it is a simple, economical, and robust tunable filter that can be packaged as a compact device for microscopy.

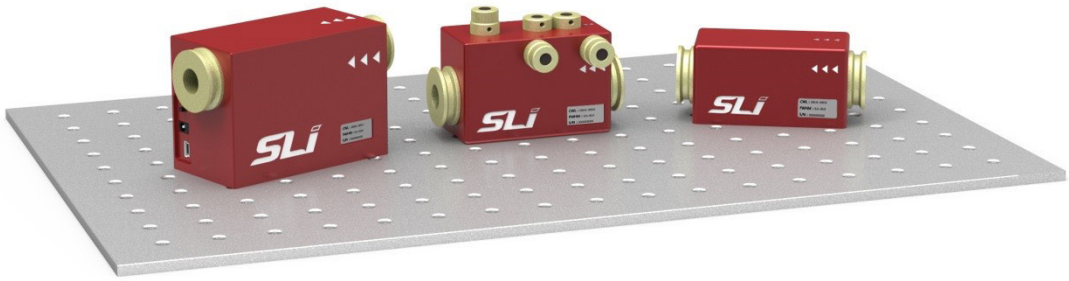

Fig. 1. Different models of Flexible Wavelength Selectors. From right: Auto, High Resolution and CenterLine.

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Table 1. Comparison table showing advantages and disadvantages of different tunable filters.

Tunable Filter	Advantages	Disadvantages
Liquid Crystal Tunable Filter	• Wide wavelength tuning range	• Poor transmission • Poor edge steepness • Poor out of band blocking • Low laser damage threshold • Polarization dependent
Acousto Optic Tunable Filter	• Wide wavelength tuning range • High tuning speed	• Poor compatibility for imaging • Poor edge steepness • Poor out of band blocking • Lack of adjustable bandwidth • Polarization dependent
Linear Variable Tunable Filter	• High transmission • High laser damage threshold • Polarization insensitive	• Poor edge steepness • Slow tuning speed
TwinFilm™ Technology Flexible Wavelength Selector	• High transmission • Steep spectral edge • High out of band blocking • Simultaneously tune center wavelength and bandwidth • Circular aperture ideal for imaging	• Limited wavelength tuning range