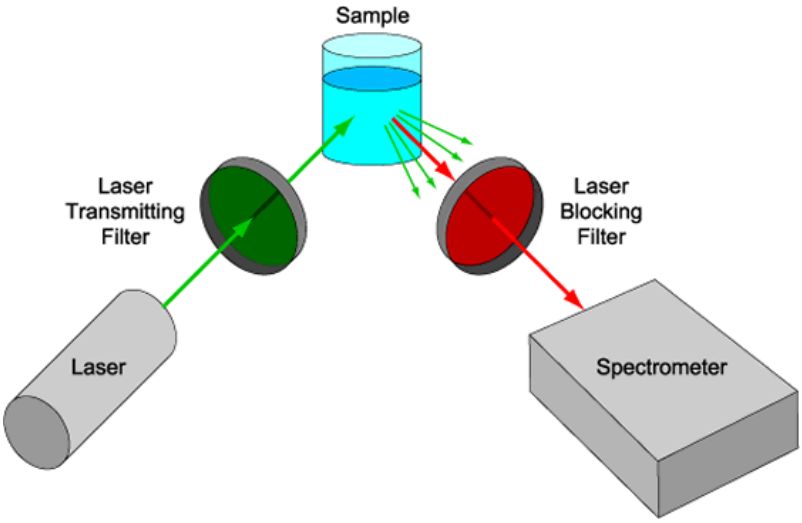
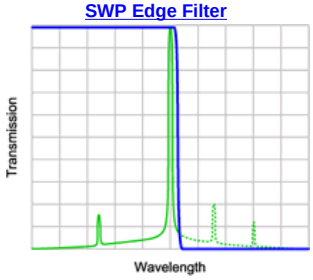
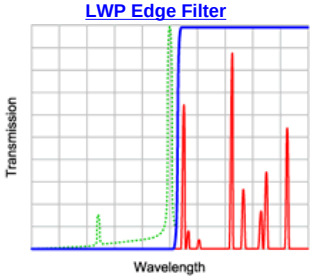
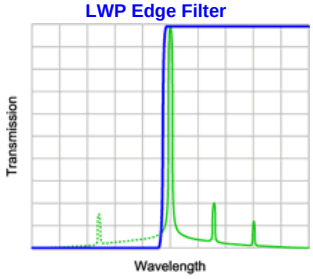
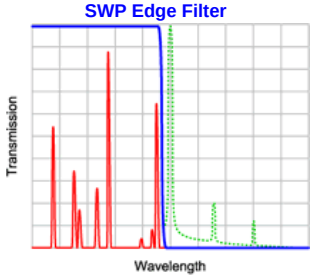
Filter Types for Raman Spectroscopy Applications

In Raman spectroscopy applications, an intense laser beam is used to create Raman (inelastic) scattered light from a sample under test. The Raman "finger print" is measured by a dispersive or Fourier Transform spectrometer. Optical filters are critical components in Raman spectroscopy systems to prevent all undesired light from reaching the spectrometer and swamping the relatively weak Raman signal. Laser Transmitting Filters inserted between the laser and the sample block all undesired light from the laser (such as broadband spontaneous emission or plasma lines) as well as any Raman scattering or fluorescence generated between the laser and the sample (as in a fiber-probe system). Laser Blocking Filters inserted between the sample and the spectrometer block the Rayleigh (elastic) scattered light at the laser wavelength.

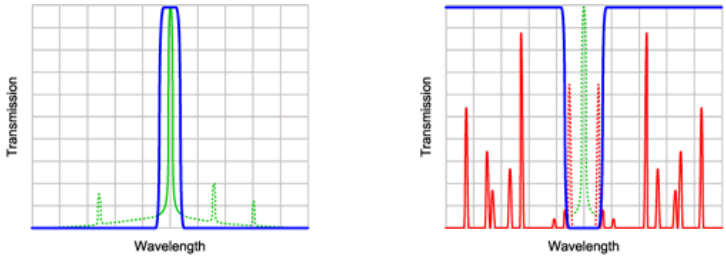


There are four basic types of filters to choose from: a Long-Wave-Pass (LWP) Edge Filter, a Short-Wave-Pass (SWP) Edge Filter, a Notch Filter, and a Laser-Line Filter. Laser-Line Filters are an obvious choice for Laser Transmitting Filters, and Notch Filters are an obvious choice for Laser Blocking Filters. In systems using these two filter types, both Stokes and Anti-Stokes Raman scattering can be measured simultaneously. However, in many cases Edge Filters provide a superior alternative for both Transmitting and Blocking filters. Edge filters offer better transmission, higher laser-line blocking, and the steepest edge performance to see Raman signals extremely close to the laser line. For more details on choosing between edge filters and notch filters, see Edge Filters vs. Notch Filters for Raman instrumentation.

The examples below show how the various filters are used. In these graphs the blue lines represent the filter transmission spectra, the green lines represent the laser spectrum, and the red lines represent the Raman signal.

	Laser Transmitting Filters	**Laser Blocking Filters**
Filters for only Stokes measurements	**SWP Edge Filter**  	**LWP Edge Filter** 
Filters for only Anti-Stokes measurements	**LWP Edge Filter**  	**SWP Edge Filter** 
	Laser-Line Filter	**Notch Filter**

Filters for simultaneous Stokes and Anti-Stokes measurements



Semrock stocks MaxLine™ laser-line filters for laser transmission and RazorEdge® LWP filters and StopLine® notch filters for laser blocking, all as standard catalog products. Non-standard wavelengths for these filters as well as SWP filters are routinely manufactured for volume OEM applications.