Edge Filters vs. Notch Filters for Raman Instrumentation

In Raman spectroscopy applications, Laser Blocking Filters inserted between the sample and the spectrometer are critical to block the Rayleigh (elastic) scattered light at the laser wavelength and hence allow the relatively weak Raman (inelastic) scattered light to be measured accurately. There are two main types of thin-film filters that can be used for laser blocking: Edge Filters and Notch Filters. So how does one answer the question, *"How do I choose between an Edge Filter and a Notch Filter for laser line blocking?"*

RazorEdge® Filters

Advantages:

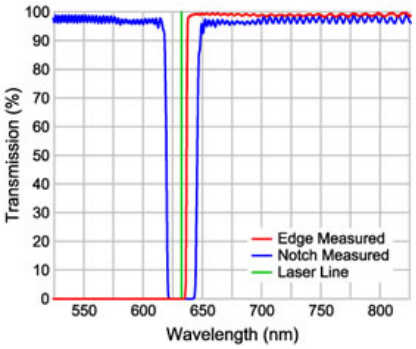
- Steepest possible edge for looking at the smallest Stokes shifts
- Largest blocking of the laser line for maximum laser rejection

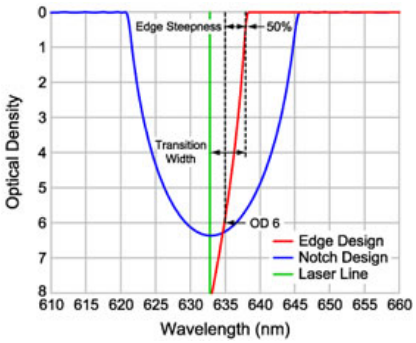
StopLine® Notch Filters

Advantages:

- Measure Stokes and Anti-Stokes signals simultaneously
- Greater tunability and bandwidth for accommodating variable laser lines

The graphs below illustrate the relative advantages of the edge and notch filters. The graph on the left shows filter transmission on a linear scale and illustrates the ability of a Long-Wave-Pass (LWP) edge filter to get extremely close to the laser line. The logarithmic graph on the right (where Optical Density (OD) is defined to be OD = -log10(Transmission)) shows the increased edge steepness of an edge filter relative to a notch filter. Increased edge steepness enables a narrower "transition width," which is defined to be the guaranteed maximum spectral separation between the laser line and the transmitting region of the filter spectrum for light normally incident on the filter. With transition widths below 1% of the laser wavelength (on Semrock U-grade edge filters), these filters don't need to be angle-tuned!





The graph on the right shows the relative tuning ranges that can be achieved for edge filters and notch filters. Semrock edge filters can be tuned up to 0.3% of the laser wavelength. The filters shift toward shorter wavelengths as the angle of incidence is increased from 0 degrees to about 8 degrees. Semrock notch filters can be tuned up to 1.0% of the laser wavelength. These filters also shift toward shorter wavelengths as the angle of incidence is increased from 0 degrees up to about 14 degrees.