



Technical Information:
Transition Width and Edge Steepness

Semrock edge filters – including our steepest RazorEdge® Raman filters as well as our EdgeBasic™ filters for application-specific Raman systems and fluorescence imaging – are specified with a guaranteed "Transition Width," or maximum allowed spectral width between the laser line, at which the blocking is guaranteed to have an optical density greater than 6 (OD > 6), and the 50% transmission point.

Transition Width = maximum allowed spectral width between the laser line (where OD > 6) and the 50% transmission point

Any given filter can also be described by its "Edge Steepness," which is the actual steepness of the filter, regardless of the precise wavelength placement of the edge. Different filter types have different typical Edge Steepness values.

Edge Steepness = actual steepness of a filter measured from the OD 6 point to the 50% transmission point

This note defines and illustrates Transition Width and Edge Steepness, using our RazorEdge Raman filters as an example. All RazorEdge filters provide unprecedented steepness to allow measurement of signals very close to the blocked laser line with high signal-to-noise ratio. However, the new "E" grade RazorEdge filters take closeness to an Extreme new level!

The graph at the right illustrates that "U" grade RazorEdge filters have a transition width that is 1% of the laser wavelength – thus a 785 nm filter is guaranteed to have > 50% transmission by 792.9 nm, corresponding to a maximum wavenumber shift of 126 cm⁻¹. The new "E" grade filters have a Transition Width that is twice as narrow, or 0.5% of the laser line! So a 785 nm filter is guaranteed to have > 50% transmission by 788.9 nm, corresponding to a maximum wavenumber shift of 63 cm⁻¹.

"Edge steepness" is the actual steepness of the filter, regardless of the precise wavelength placement of the edge. "U" grade RazorEdge filters are designed to have a steepness of 0.5% of the laser wavelength, or 3.9 nm (63 cm⁻¹) for a 785 nm filter. The new "E" grade filters are designed to have an edge steepness that 2.5x narrower – only 0.2% of the laser wavelength, or 1.6 nm (25 cm⁻¹) for a 785 nm filter!

