Edge Steepness and Transition Width

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."

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.

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

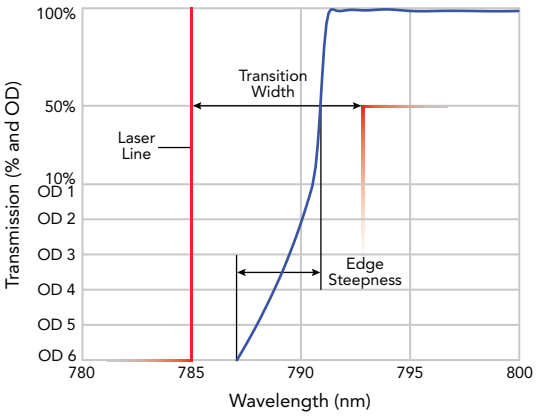

Figure 1: Transition width and edge steepness illustrated.

Figure 1 illustrates Transition Width and Edge Steepness for an edge filter designed to block the 785 nm laser line (example shows a "U-grade" RazorEdge filter). Table 1 below lists the guaranteed Transition Width, typical Edge Steepness, and price (for 25 mm diameter parts) for Semrock edge filters.

Edge Filter Type	Guaranteed Transition Width (% of laser wavelength)	Typical Edge Steepness (% of laser wavelength)	Price* (25 mm)
RazorEdge "E-grade"	< 0.5% (< 90 cm^{-1} for 532)	0.2% (1.1 nm for 532)	$895
RazorEdge "U-grade"	< 1.0% (< 186 cm^{-1} for 532)	0.5% (2.7 nm for 532)	$695
RazorEdge "S-grade"	< 2.0% (< 369 cm^{-1} for 532)	0.5% (2.7 nm for 532)	$420
EdgeBasic	< 2.5% (< 458 cm^{-1} for 532)	1.5% (8 nm for 532)	$295

* except UV filters

All RazorEdge filters provide exceptional steepness to allow measurement of signals very close to the blocked laser line with high signal-to-noise ratio. However, the state-of-the-art "E-grade" RazorEdge filters take closeness to an Extreme 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}. "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 "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.

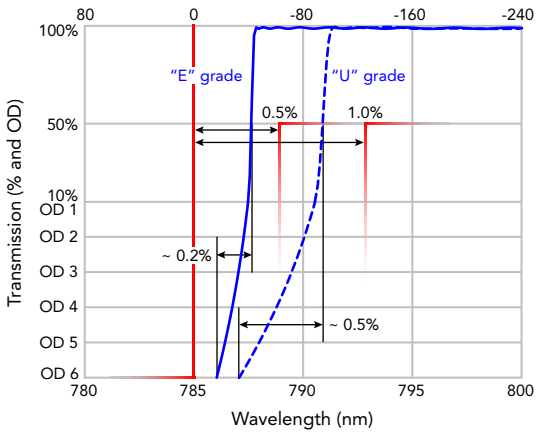

Figure 2: Transition widths and edge steepnesses for LP02-785RE