

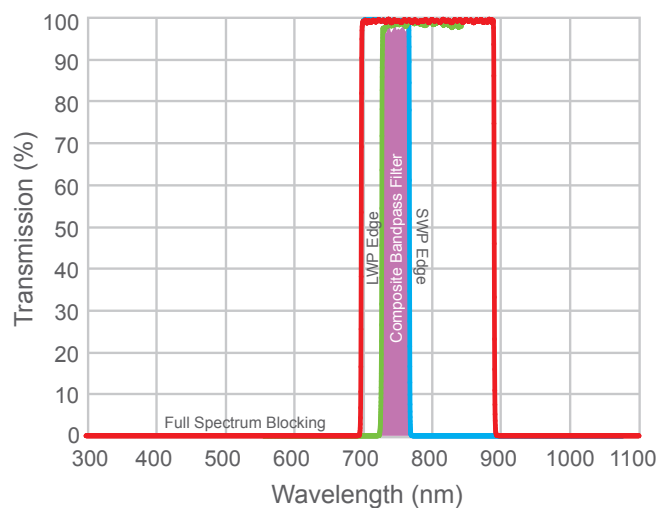
VersaChrome® & VersaChrome Edge™ Filters

Unlimited Tunable
Spectral Flexibility

Tunable Bandpass and Edge Filters

VersaChrome tunable bandpass and VersaChrome Edge tunable filters do what no other thin-film has done before: offer angle tuning capabilities over a wide range with essentially no loss in spectral performance.

By using proprietary & patented (U.S. Patent No. 8,441,710 and 9,304,237) advanced design techniques, Semrock has created optical filters that are insensitive to polarization splitting from 0° to 60° AOI, allowing angle-tuning over a wide range while maintaining edge steepness, high transmission and OD blocking. The popular VersaChrome tunable bandpass filters allow you to shift center wavelength (CWL) with a fixed bandwidth by up to 11% to the blue through angle-tuning, and are offered in center wavelengths (CWL) tuning from 449 to 900 nm.



A tunable bandpass filter created with VersaChrome TLP and TSP filters, matched with the appropriate full spectrum blocking filter. The effective composite bandpass filter created is shown in solid purple. See next page for system layout.

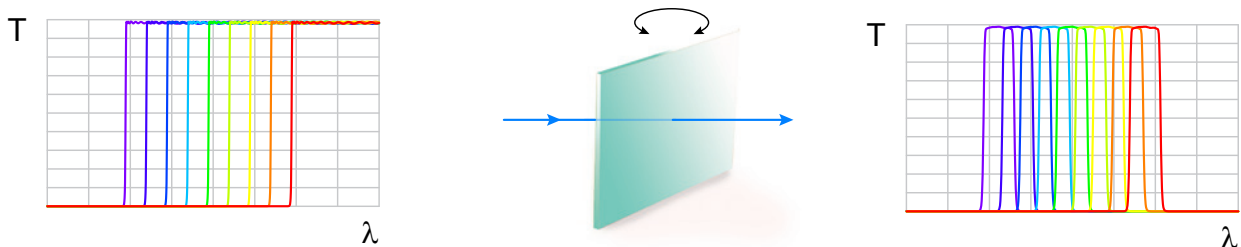


The VersaChrome Edge tunable filters further allow users to dynamically tune the LWP or SWP edge for tunable Raman spectroscopy applications. Deep blocking and steep edge transitions allow improved collection of Raman spectra while tuning to block lasers over energy range 2.21 eV to 1.25 eV. Additionally a user can create a custom bandpass filter for fluorescence applications providing flexibility to not only vary the CWL of the bandpass filter created, but also to independently control each edge to generate the exact passband required with edge wavelengths from 561 nm to beyond 995 nm.

Maximize Flexibility within Instrument Design

Until now, customers unable to find an off-the-shelf bandpass filter to meet their needs had to choose between using a suboptimal filter or purchasing a prototype run of a custom filter specification at significant cost. With the VersaChrome Edge Tunable Filters, Semrock is offering an alternate way to create unlimited bandpass configurations. Our three families of filters (TLP, TSP, and Full Spectrum Blocking) are designed to work together to create the equivalent of a single passband filter in the visible or near infrared. This allows researchers and instrument designers alike to not only create the bandpass they need, but also fine-tune edge positions and to maximize brightness and contrast/signal-to-noise in real time, within their instrument.

Learn More at www.semrock.com/versachrome-edge-tunable-filters.aspx



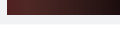
These thin-film optical filters are tunable over a very wide range of wavelengths by adjusting the angle of incidence with essentially no change in spectral performance. As the diagrams (above) indicate, both edge filters and bandpass filters with wide tunability are available.

Extended Overlap Tunable Bandpass Filters

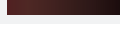
Between 4-12 nm of additional overlap designed to allow for system variations such as AOI accuracy, cone-half angles, etc.
OD 6 blocking over full tuning range for the most sensitive of measurements.

Tunable Color Range	At 60° CWL <	Average Transmission / Bandwidth	At 0° CWL >	Average Transmission / Bandwidth	Size (L x W x H)	Part Number
	448.8	> 85% over 15 nm	501.5	> 90% over 15 nm	25.2 x 35.6 x 2.0 mm	TBP01-501/15-25x36
	501.5	> 85% over 14 nm	561.0	> 90% over 14 nm	25.2 x 35.6 x 2.0 mm	TBP01-561/14-25x36
	561.0	> 85% over 14 nm	627.7	> 90% over 14 nm	25.2 x 35.6 x 2.0 mm	TBP01-628/14-25x36
	627.7	> 85% over 13 nm	703.8	> 90% over 13 nm	25.2 x 35.6 x 2.0 mm	TBP01-704/13-25x36
	703.8	> 85% over 12 nm	790.0	> 90% over 12 nm	25.2 x 35.6 x 2.0 mm	TBP01-790/12-25x36
	790.0	> 85% over 11 nm	900.0	> 90% over 11 nm	25.2 x 35.6 x 2.0 mm	TBP01-900/11-25x36

VersaChrome Edge Tunable Longpass Filters

Tunable Color Range	At 60° Edge ≤	Avg. Transmission / Bandwidth	At 0° Edge ≥	Avg. Transmission / Bandwidth	OD _{avg} ≥ 6	Part Number
	561.0	> 90% over 82 nm	628.0	> 93% over 82 nm	488 nm to edge	TLP01-628-25x36
	628.0	> 90% over 82 nm	704.0	> 93% over 92 nm	547 nm to edge	TLP01-704-25x36
	704.0	> 90% over 92 nm	790.0	> 93% over 103 nm	613 nm to edge	TLP01-790-25x36
	790.0	> 90% over 101 nm	887.0	> 93% over 114 nm	687 nm to edge	TLP01-887-25x36
	887.0	> 90% over 114 nm	995.0	> 93% over 127 nm	772 nm to edge	TLP01-995-25x36

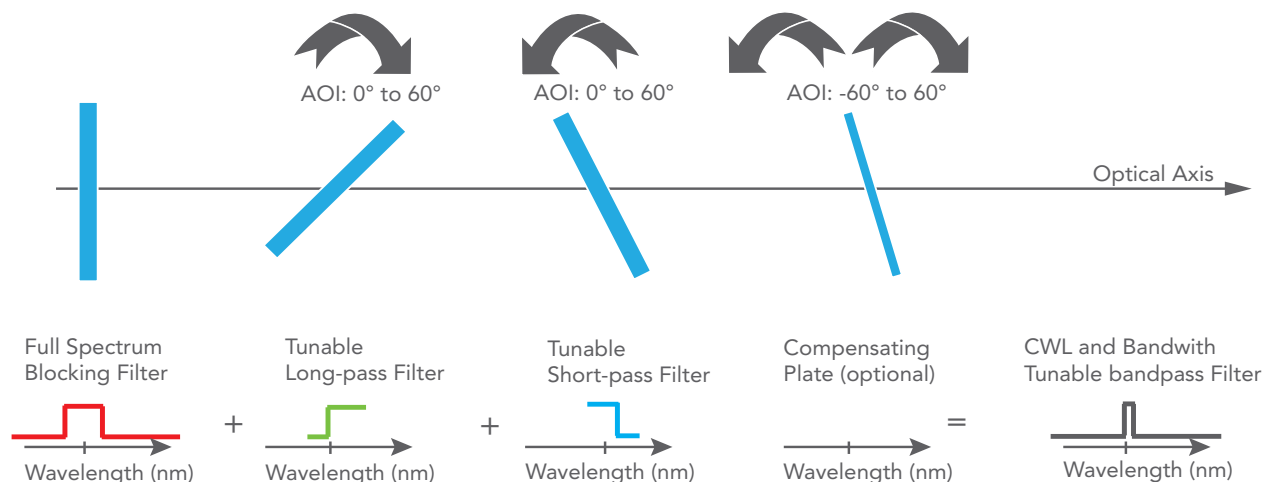
VersaChrome Edge Tunable Shortpass Filters

Tunable Color Range	At 60° Edge ≤	Avg. Transmission / Bandwidth	At 0° Edge ≥	Avg. Transmission / Bandwidth	OD _{avg} ≥ 6	Part Number
	561.0	> 90% over 66 nm	628.0	> 93% over 74 nm	Edge to 720 nm	TSP01-628-25x36
	628.0	> 90% over 82 nm	704.0	> 93% over 83 nm	Edge to 808 nm	TSP01-704-25x36
	704.0	> 90% over 92 nm	790.0	> 93% over 93 nm	Edge to 907 nm	TSP01-790-25x36
	790.0	> 90% over 89 nm	887.0	> 93% over 100 nm	Edge to 1017 nm	TSP01-887-25x36
	887.0	> 90% over 100 nm	995.0	> 93% over 112 nm	Edge to 1140 nm	TSP01-995-25x36

BrightLine® Full Spectrum Blocking Single-band Bandpass Filters – pair with TLP and TSP filters

Center Wavelength	UV-VIS Blocking Band	Avg. Transmission / Bandwidth	VIS-IR Blocking Band	Housed Size (Diameter x Thickness)	Glass Thickness	Part Number
505 nm	250 – 436 nm	> 93% 445 – 561 nm	575 – 1200 nm	25 mm x 3.5 mm	2.0 mm	FF01-505/133-25
565 nm	250 – 488 nm	> 93% 498 – 631 nm	644 – 1200 nm	25 mm x 3.5 mm	2.0 mm	FF01-565/133-25
632 nm	250 – 547 nm	> 93% 558 – 706 nm	720 – 1200 nm	25 mm x 3.5 mm	2.0 mm	FF01-632/148-25
709 nm	250 – 613 nm	> 93% 625 – 792 nm	808 – 1200 nm	25 mm x 3.5 mm	2.0 mm	FF01-709/167-25
795 nm	250 – 687 nm	> 93% 701 – 889 nm	907 – 1200 nm	25 mm x 3.5 mm	2.0 mm	FF01-795/188-25
893 nm	250 – 772 nm	> 93% 788 – 997 nm	1017 – 1700 nm	25 mm x 3.5 mm	2.0 mm	FF01-893/209-25

CREATING A VERSACHROME TUNABLE BANDPASS FILTER SET
www.semrock.com/versachrome-calculator.aspx



All VersaChrome Filters Common Specifications

Property	Value	Comments
Substrate Material	Fused Silica	
Coating Type	Sputtered	
Transverse Dimensions and Tolerance	25.2 mm x 35.6 mm ± 0.1 mm	
Thickness and Tolerance	2.0 mm ± 0.1 mm	
Clear Aperture	> 80%	Elliptical, for all optical specifications
Transmitted Wavefront Error	< $\lambda/4$ RMS at $\lambda = 633$ nm	Peak-to-valley error < 5 x RMS
Beam Deviation	≤ 10 arcseconds	Measured per inch
Surface Quality	60-40 scratch-dig	Measured within clear aperture
Orientation	Coating (text) towards light	

Extended Overlap Tunable Bandpass Filter Common Specifications

Property	Value	Comments
Guaranteed Transmission	See table on previous page	Averaged over the passband centered on the CWL
Blocking	OD _{avg} > 6 UV - 1100 nm (0°) OD _{avg} > 6 UV - 925 nm (60°)	Excluding passband
Nominal Effective Index of Refraction (n_{eff})	1.83	Nominal value, see website for specific n_{eff}

VersaChrome Edge™ Filter Common Specifications

Property	Value	Comments
Guaranteed Transmission	See tables on previous page	Averaged over the passband, beginning 0.5% away from 50% transmission edge
LWP Blocking	OD _{avg} > 6 from λ_{Short} to 98% of λ_{Edge} (0°) OD _{avg} > 6 from λ_{Short} to 97.5% of λ_{Edge} (60°)	OD = $-\log_{10}$ (transmission) λ_{Edge} & λ_{Short} listed in Tunable Longpass table
SWP Blocking	OD _{avg} > 6 from 102% of λ_{Edge} to λ_{Long} (0°) OD _{avg} > 6 from 102.5% of λ_{Edge} to λ_{Long} (60°)	OD = $-\log_{10}$ (transmission) λ_{Edge} & λ_{Long} listed in Tunable Shortpass table
Nominal Effective Index of Refraction (n_{eff})		See website for specific filter n_{eff}