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THORLABS

FB450-40 - December 14, 2022

Item # FB450-40 was discontinued on December 14, 2022. For informational purposes, this is a copy of the website content at that time and is valid only for the stated product.

UV/VIS BANDPASS & LASER LINE FILTERS: 340 - 694.3 NM CENTER WAVELENGTH

- Pass Regions Between 1 nm and 40 nm FWHM
- Ø1/2" and Ø1" Mounted Filters
- <0.01% Transmission in Blocking Region

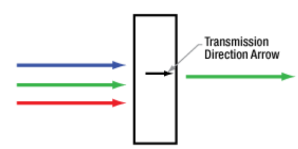
Hide Overview

OVERVIEW

Features

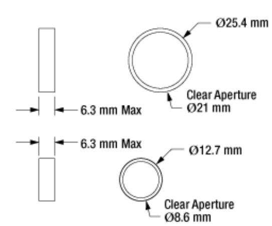
- Central Wavelengths from 340 nm to 694.3 nm
- 1, 3, 10, or 40 nm Bandpass Regions
- Ø1/2" or Ø1" Mounted Filters
- Edge Scribed for Superb Long-Term Stability
- Typical Transmission Plots Available for Every Filter
- Laser Line Filters for Popular Laser Diode, Argon, Krypton, HeCd, HeNe, and Nd:YAG Laser Lines

Click to Enlarge
FL532-1 Filter Mounted in a TRF90 Flip Mount Using a Retaining Ring



Please see the *Tutorial* tab for more information about the structure of the filter and the transmission direction arrow.

The bandpass and laser line filters shown on this page feature center wavelengths shorter than 700 nm. Transmission curves for individual filters are available by viewing the Spec sheet for an individual filter. Each filter is mounted in an unthreaded black anodized aluminum ring with an outer diameter of Ø1/2" or Ø1" and a maximum edge thickness of 6.3 mm. Please note that Ø1/2" filter options are highlighted in green in the tables below.



Thorlabs' bandpass filters provide one of the simplest ways to transmit a well-defined wavelength band of light, while rejecting other unwanted radiation. Their design is essentially that of a thin film Fabry-Perot Interferometer formed by vacuum deposition techniques and consists of two reflecting stacks, separated by an even-order spacer layer. These reflecting stacks are constructed from alternating layers of high and low refractive index materials, which can have a reflectance in excess of 99.99%. By varying the thickness of the spacer layer and/or the number of reflecting layers, the central wavelength and bandwidth of the filter can be altered.

This type of filter displays very high transmission in the bandpass region, but the spectral range of blocked light on either side of the bandpass region is narrow.

To compensate for this, an additional blocking component is added, which is either an all dielectric or a metal-dielectric depending on the requirements of the filter. Although this additional blocking component will eliminate any unwanted out-of-band radiation, it also reduces the filter's overall transmission throughput. For applications with demanding wavefront requirements, such as imaging, please consider our premium bandpass filters.

Each filter is housed in a black anodized aluminum ring that is labeled with an arrow indicating the design transmission direction. The ring makes handling easier and enhances the blocking OD by limiting scattering. These filters can be mounted in our extensive line of filter mounts and wheels. As the mounts are not threaded, retaining rings will be required to mount the filters in one of our internally-threaded lens tubes or filter mounts, as shown above. We do not recommend removing the filter from its mount, as the filter consists of several layers of glass that are held together with epoxy and the mounting ring. These glass layers are necessary to protect the dielectric coating from the atmosphere; exposure would significantly reduce the filter's transmission efficiency over time.

Please note that due to the gradual breakdown of the dielectric coatings, our bandpass filters have a typical lifetime of two years. Older filters will experience a decrease in overall transmission in the passband.

Additional Bandpass Filters				
UV/Visible Bandpass Filters 340 - 694.3 nm CWLs	NIR Bandpass Filters 700 - 1650 nm CWLs	MIR Bandpass Filters 1750 - 9500 nm CWLs	Premium Bandpass Filters 300 - 1550 nm CWLs	Bandpass Filter Kits
We also offer custom bandpass filters with other central wavelengths or FWHM. To request a quote, contact Tech Support.				

Hide Specs

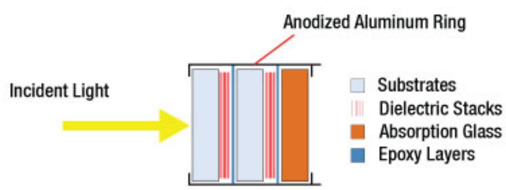
SPECS

Common Specifications	
Out of Band Transmission	<0.01%
Housing Diameter	1/2" (Laser Line) 1" (Bandpass)
Housing Diameter Tolerance	+0.0 / -0.2 mm
Clear Aperture	Ø8.6 mm (Min) for Ø1/2" Ø21 mm (Min) for Ø1"
Thickness	<6.3 mm
Surface/Coating Quality	80-50 Scratch-Dig
Edge Treatment	Mounted in Black Anodized Aluminum Ring
Edge Markings	CWL-FWHM ↑ Lot Number; The Arrow Points in the Direction of the light transmission
Substrates	Schott Borofloat and Soda Lime
Optimum Operating Temperature	23 °C
Operating Temperature	-50 to 80 °C

Hide Tutorial

TUTORIAL

Bandpass Filter Structure



Click to Enlarge

The number of layers shown in this schematic is not indicative of the number of layers in an actual bandpass filter. Also the drawing is not to scale.

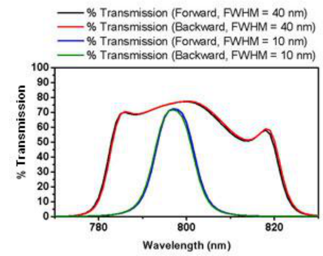
A bandpass filter is created by depositing layers of material on the surface of the substrate. Typically, there are several dielectric stacks separated by spacer layers. The dielectric stack is composed of a large number of alternating layers of low-index and high-index dielectric material. The thickness of each layer in the dielectric stack is $\lambda/4$, where λ is the central wavelength of the bandpass filter (i.e. the wavelength with the highest transmittance through the filter). The spacer layers are placed in between the dielectric stacks and have a thickness of $(n\lambda)/2$, where n is an integer. The spacer layers can be formed from colored glass, epoxy, dyes, metallic, or dielectric layers. A Fabry-Perot cavity is formed by each spacer layer sandwiched between dielectric stacks. The filter is mounted in an engraved metal ring for protection and ease of handling.

Filter Operation Overview

The constructive interference conditions of a Fabry-Perot cavity allow light at the central wavelength, and a small band of wavelengths to either side, to be transmitted efficiently, while destructive interference prevents the light outside the passband from being transmitted. However, the band of blocked wavelengths on either side of the central wavelength is small. In order increase the blocking range of the filter, materials with broad blocking ranges are used for or coated onto the spacer layers and the substrate. Although these materials effectively block out of band transmission of incident radiation they also decrease the transmission through the filter in the passband.

Filter Orientation

An engraved arrow on the edge of the filter is used to indicate the recommended direction for the transmission of light through the filter. Although the filter will function with either side facing the source, it is better to place the coated side toward the source. This will minimize any thermal effects or possible thermal damage that blocking intense out-of-band radiation might cause due to the absorption of the out-of-band radiation by the substrate or colored glass filter layers. The plot to the right was made by illuminating the filter with a low intensity broadband light and measuring the transmission as a function of wavelength. The plot shows that the transmission direction through the filter has very little effect on the intensity and the spectrum of the light transmitted through the filter. The minimal variation between the forward and backward traces is most likely due to a small shift in the incident angle of the light on the filter introduced when the filter was removed, flipped over, and replaced in the jig.



Previous-generation FB800-10 and FB800-40 filters were used to make the measurement that resulted in the plot above.

The filter is intended to be used with collimated light normally incident on the surface of the filter. For uncollimated light or light striking the surface and an angle not normally incident to the surface the central wavelength (wavelength corresponding to peak transmission) will shift toward lower wavelengths and the shape of the transmission region (passband) will change. Varying the angle of incidence by a small amount can be used to effectively tune the passband over a narrow range. Large changes in the incident angle will cause larger shifts in the central wavelength but will also significantly distort the shape of the passband and, more importantly, cause a significant decrease in the transmittance of the passband.

Filter Temperature

The central wavelength of the bandpass filter can be tuned slightly (~1 nm over the operating range of the filter) by changing the temperature of the filter. This is primarily due to the slight thermal expansion or contraction of the layers.

Hide 340 - 390 nm Bandpass Filters

340 - 390 nm Bandpass Filters

Item #	CWL[a]	FWHM[b]	T (Min)[c]	Blocking[d]	Transmission/ OD Data[e]	Laser Line	Size
FB340-10	340 ± 2 nm	10 ± 2 nm	25%	200 - 3000 nm		N/A	Ø1"
FL355-10	355 ± 2 nm	10 ± 2 nm	25%	200 - 1150 nm		Nd:YAG	Ø1"
FB360-10	360 ± 2 nm	10 ± 2 nm	25%	200 - 3000 nm		N/A	Ø1"
FB370-10	370 ± 2 nm	10 ± 2 nm	25%	200 - 3000 nm		N/A	Ø1"
FB380-10	380 ± 2 nm	10 ± 2 nm	25%	200 - 3000 nm		N/A	Ø1"
FB390-10	390 ± 2 nm	10 ± 2 nm	30%	200 - 3000 nm		N/A	Ø1"

- a. Center Wavelength
- b. Full Width Half Max
- c. Minimum Transmission at Center Wavelength
- d. <0.01% (<-40 dB)
- e. Click on for a plot and downloadable data. Measured data accounts for all losses including Fresnel reflections. Please note that transmission is only guaranteed for the specified center wavelength and that the data in the plots is typical. Performance may vary from lot to lot.

Part Number	Description	Price	Availability
FB340-10	Ï 1" Bandpass Filter, CWL = 340 Ñ2 nm, FWHM = 10 Ñ2 nm	$231.00	Today
FL355-10	Ï 1" Laser Line Filter, CWL = 355 Ñ2 nm, FWHM = 10 Ñ2 nm	$165.39	Today
FB360-10	Ï 1" Bandpass Filter, CWL = 360 Ñ2 nm, FWHM = 10 Ñ2 nm	$231.00	Today
FB370-10	Ï 1" Bandpass Filter, CWL = 370 Ñ2 nm, FWHM = 10 Ñ2 nm	$231.00	Today
FB380-10	Ï 1" Bandpass Filter, CWL = 380 Ñ2 nm, FWHM = 10 Ñ2 nm	$231.00	Today
FB390-10	Ï 1" Bandpass Filter, CWL = 390 Ñ2 nm, FWHM = 10 Ñ2 nm	$231.00	Today

Hide 405 - 490 nm Bandpass Filters

405 - 490 nm Bandpass Filters

Item #	CWL[a]	FWHM[b]	T (Min)[c]	Blocking[d]	Transmission/ OD Data[e]	Laser Line	Size
FB410-10	410 ± 2 nm	10 ± 2 nm	40%	200 - 3000 nm		N/A	Ø1"
FB440-10	440 ± 2 nm	10 ± 2 nm	45%	200 - 3000 nm		N/A	Ø1"
FL441.6-10	441.6 ± 2 nm	10 ± 2 nm	60%	200 - 1150 nm		HeCd	Ø1"
FB450-40	450 ± 8 nm	40 ± 8 nm	45%	200 - 1150 nm		N/A	Ø1"
FL457.9-10	457.9 ± 2 nm	10 ± 2 nm	65%	200 - 1150 nm		Argon	Ø1"
FB460-10	460 ± 2 nm	10 ± 2 nm	45%	200 - 3000 nm		N/A	Ø1"
FB480-10	480 ± 2 nm	10 ± 2 nm	45%	200 - 3000 nm		N/A	Ø1"
FL488-1	488 ± 0.2 nm	1 ± 0.2 nm	40%	200 - 1150 nm		Argon	Ø1"
FL488-3	488 ± 0.6 nm	3 ± 0.6 nm	45%	200 - 1150 nm		Argon	Ø1"
FB490-10	490 ± 2 nm	10 ± 2 nm	45%	200 - 3000 nm		N/A	Ø1"

- a. Center Wavelength
- b. Full Width Half Max
- c. Minimum Transmission at Center Wavelength
- d. <0.01% (<-40 dB)
- e. Click on for a plot and downloadable data. Measured data accounts for all losses including Fresnel reflections. Please note that transmission is only guaranteed for the specified center wavelength and that the data in the plots is typical. Performance may vary from lot to lot.

Part Number	Description	Price	Availability
FB410-10	**Ï 1" Bandpass Filter, CWL = 410 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FB440-10	**Ï 1" Bandpass Filter, CWL = 440 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FL441.6-10	**Ï 1" Laser Line Filter, CWL = 441.6 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FB450-40	**Ï 1" Bandpass Filter, CWL = 450 Ñ8 nm, FWHM = 40 Ñ8 nm**	**$162.75**	**Lead Time**
FL457.9-10	**Ï 1" Laser Line Filter, CWL = 457.9 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FB460-10	**Ï 1" Bandpass Filter, CWL = 460 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FB480-10	**Ï 1" Bandpass Filter, CWL = 480 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FL488-1	**Ï 1" Laser Line Filter, CWL = 488 Ñ0.2 nm, FWHM = 1 Ñ0.2 nm**	**$367.50**	**Lead Time**
FL488-3	**Ï 1" Laser Line Filter, CWL = 488 Ñ0.6 nm, FWHM = 3 Ñ0.6 nm**	**$367.50**	**Today**
FB490-10	**Ï 1" Bandpass Filter, CWL = 490 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**

Hide 500 - 580 nm Bandpass Filters

500 - 580 nm Bandpass Filters

Item #	CWL[a]	FWHM[b]	T (Min)[c]	Blocking[d]	Transmission/ OD Data[e]	Laser Line	Size
FB500-10	500 ± 2 nm	10 ± 2 nm	50%	200 - 1200 nm		N/A	Ø1"
FB500-40	500 ± 8 nm	40 ± 8 nm	70%	200 - 1150 nm		N/A	Ø1"
FL508.5-10	508.5 ± 2 nm	10 ± 2 nm	65%	200 - 1150 nm		Argon	Ø1"
FL05514.5-1	514.5 ± 0.2 nm	1 ± 0.2 nm	45%	200 - 1100 nm		Argon	Ø1/2"
FL514.5-1	514.5 ± 0.2 nm	1 ± 0.2 nm	45%	200 - 1150 nm		Argon	Ø1"
FL514.5-3	514.5 ± 0.6 nm	3 ± 0.6 nm	55%	200 - 1150 nm		Argon	Ø1"
FL05532-1	532 ± 0.2 nm	1 ± 0.2 nm	40%	200 - 1100 nm		Nd:YAG	Ø1/2"
FL532-1	532 ± 0.2 nm	1 ± 0.2 nm	40%	200 - 1150 nm		Nd:YAG	Ø1"
FL532-3	532 ± 0.6 nm	3 ± 0.6 nm	60%	200 - 1150 nm		Nd:YAG	Ø1"
FB540-10	540 ± 2 nm	10 ± 2 nm	50%	200 - 3000 nm		N/A	Ø1"
FL543.5-10	543.5 ± 2 nm	10 ± 2 nm	70%	200 - 1150 nm		HeNe	Ø1"
FB550-40	550 ± 8 nm	40 ± 8 nm	70%	200 - 1150 nm		N/A	Ø1"
FB560-10	560 ± 2 nm	10 ± 2 nm	50%	200 - 3000 nm		N/A	Ø1"

FB570-10	570 ± 2 nm	10 ± 2 nm	50%	200 - 3000 nm		N/A	Ø1"
FB580-10	580 ± 2 nm	10 ± 2 nm	50%	200 - 3000 nm		N/A	Ø1"

- a. Center Wavelength
- b. Full Width Half Max
- c. Minimum Transmission at Center Wavelength
- d. <0.01% (<-40 dB)
- e.Click on for a plot and downloadable data. Measured data accounts for all losses including Fresnel reflections. Please note that transmission is only guaranteed for the specified center wavelength and that the data in the plots is typical. Performance may vary from lot to lot.

Part Number	Description	Price	Availability
FB500-10	**Ï 1" Bandpass Filter, CWL = 500 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FB500-40	**Ï 1" Bandpass Filter, CWL = 500 Ñ8 nm, FWHM = 40 Ñ8 nm**	**$162.75**	**Lead Time**
FL508.5-10	**Ï 1" Laser Line Filter, CWL = 508.5 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FL05514.5-1	**Ï 1/2" Laser Line Filter, CWL = 514.5 Ñ0.2 nm, FWHM = 1 Ñ0.2 nm**	**$162.75**	**Today**
FL514.5-1	**Ï 1" Laser Line Filter, CWL = 514.5 Ñ0.2 nm, FWHM = 1 Ñ0.2 nm**	**$367.50**	**Today**
FL514.5-3	**Ï 1" Laser Line Filter, CWL = 514.5 Ñ0.6 nm, FWHM = 3 Ñ0.6 nm**	**$160.71**	**Today**
FL05532-1	**Ï 1/2" Laser Line Filter, CWL = 532 Ñ0.2 nm, FWHM = 1 Ñ0.2 nm**	**$162.75**	**Today**
FL532-1	**Ï 1" Laser Line Filter, CWL = 532 Ñ0.2 nm, FWHM = 1 Ñ0.2 nm**	**$367.50**	**Today**
FL532-3	**Ï 1" Laser Line Filter, CWL = 532 Ñ0.6 nm, FWHM = 3 Ñ0.6 nm**	**$160.71**	**Today**
FB540-10	**Ï 1" Bandpass Filter, CWL = 540 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FL543.5-10	**Ï 1" Laser Line Filter, CWL = 543.5 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FB550-40	**Ï 1" Bandpass Filter, CWL = 550 Ñ8 nm, FWHM = 40 Ñ8 nm**	**$162.75**	**Today**
FB560-10	**Ï 1" Bandpass Filter, CWL = 560 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FB570-10	**Ï 1" Bandpass Filter, CWL = 570 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**Today**
FB580-10	**Ï 1" Bandpass Filter, CWL = 580 Ñ2 nm, FWHM = 10 Ñ2 nm**	**$162.75**	**7-10 Days**

Hide 600 - 694.3 nm Bandpass Filters

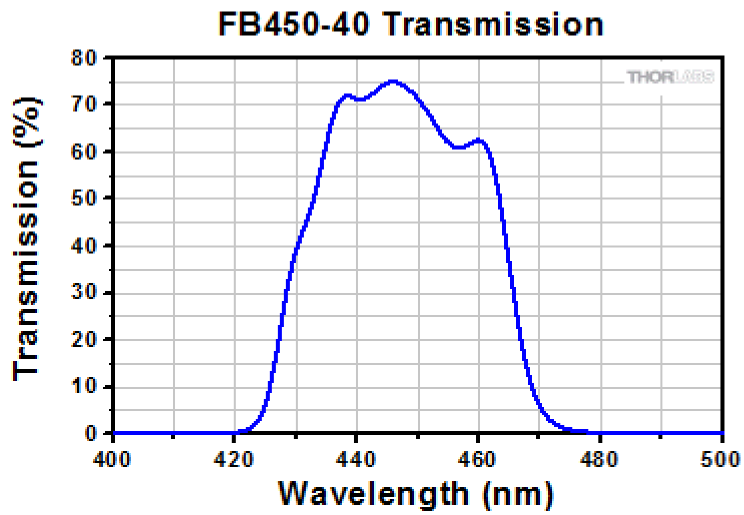
600 - 694.3 nm Bandpass Filters

Item #	CWL[a]	FWHM[b]	T (Min)[c]	Blocking[d]	Transmission/ OD Data[e]	Laser Line	Size
FB600-40	600 ± 8 nm	40 ± 8 nm	70%	200 - 1150 nm		N/A	Ø1"
FB610-10	610 ± 2 nm	10 ± 2 nm	50%	200 - 3000 nm		N/A	Ø1"
FL05632.8-1	632.8 ± 0.2 nm	1 ± 0.2 nm	50%	200 - 1100 nm		HeNe	Ø1/2"
FL632.8-1	632.8 ± 0.2 nm	1 ± 0.2 nm	50%	200 - 1150 nm		HeNe	Ø1"
FL632.8-3	632.8 ± 0.6 nm	3 ± 0.6 nm	65%	200 - 1150 nm		HeNe	Ø1"
FL05635-10	635 ± 2 nm	10 ± 2 nm	70%	200 - 1100 nm		Diode	Ø1/2"
FL647.1-10	647.1 ± 2 nm	10 ± 2 nm	70%	200 - 1150 nm		Krypton	Ø1"
FB660-10	660 ± 2 nm	10 ± 2 nm	50%	200 - 1200 nm		N/A	Ø1"
FB670-10	670 ± 2 nm	10 ± 2 nm	50%	200 - 1200 nm		N/A	Ø1"
FL670-10	670 ± 2 nm	10 ± 2 nm	70%	200 - 1150 nm		Diode	Ø1"
FB680-10	680 ± 2 nm	10 ± 2 nm	50%	200 - 1200 nm		N/A	Ø1"
FB690-10	690 ± 2 nm	10 ± 2 nm	50%	200 - 1200 nm		N/A	Ø1"
FL694.3-10	694.3 ± 2 nm	10 ± 2 nm	70%	200 - 1150 nm		Ruby	Ø1"

- a. Center Wavelength
- b. Full Width Half Max
- c. Minimum Transmission at Center Wavelength
- d. <0.01% (<-40 dB)
- e. Click on for a plot and downloadable data. Measured data accounts for all losses including Fresnel reflections. Please note that transmission is only guaranteed for the specified center wavelength and that the data in the plots is typical. Performance may vary from lot to lot.

Part Number	Description	Price	Availability
FB600-40	Ø1" Bandpass Filter, CWL = 600 ± 8 nm, FWHM = 40 ± 8 nm	$162.75	Today
FB610-10	Ø1" Bandpass Filter, CWL = 610 ± 2 nm, FWHM = 10 ± 2 nm	$162.75	Today
FL05632.8-1	Ø1/2" Laser Line Filter, CWL = 632.8 ± 0.2 nm, FWHM = 1 ± 0.2 nm	$162.75	Today
FL632.8-1	Ø1" Laser Line Filter, CWL = 632.8 ± 0.2 nm, FWHM = 1 ± 0.2 nm	$367.50	Today
FL632.8-3	Ø1" Laser Line Filter, CWL = 632.8 ± 0.6 nm, FWHM = 3 ± 0.6 nm	$160.71	Today
FL05635-10	Ø1/2" Laser Line Filter, CWL = 635 ± 2 nm, FWHM = 10 ± 2 nm	$68.25	Today
FL647.1-10	Ø1" Laser Line Filter, CWL = 647.1 ± 2 nm, FWHM = 10 ± 2 nm	$162.75	7-10 Days
FB660-10	Ø1" Bandpass Filter, CWL = 660 ± 2 nm, FWHM = 10 ± 2 nm	$162.75	Today
FB670-10	Ø1" Bandpass Filter, CWL = 670 ± 2 nm, FWHM = 10 ± 2 nm	$162.75	Today
FL670-10	Ø1" Laser Line Filter, CWL = 670 ± 2 nm, FWHM = 10 ± 2 nm	$162.75	Today
FB680-10	Ø1" Bandpass Filter, CWL = 680 ± 2 nm, FWHM = 10 ± 2 nm	$162.75	Today
FB690-10	Ø1" Bandpass Filter, CWL = 690 ± 2 nm, FWHM = 10 ± 2 nm	$162.75	Today
FL694.3-10	Ø1" Laser Line Filter, CWL = 694.3 ± 2 nm, FWHM = 10 ± 2 nm	$162.75	Today


FB450-40 ↓
CWL = 450nm FWHM = 40nm


FB450-40 Transmission
Transmission (%)
Wavelength (nm)
0
10
20
30
40
50
60
70
80
400
420
440
460
480
500
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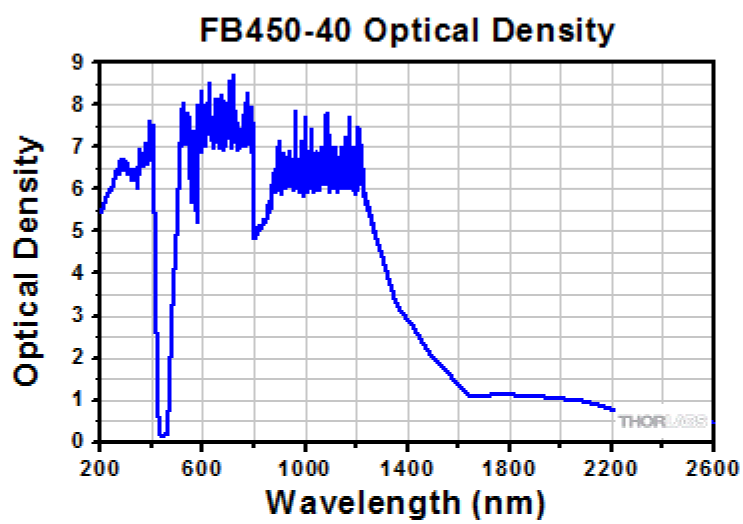
FB450-40 Optical Density
Optical Density
Wavelength (nm)
0
1
2
3
4
5
6
7
8
9
200
600
1000
1400
1800
2200
2600
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