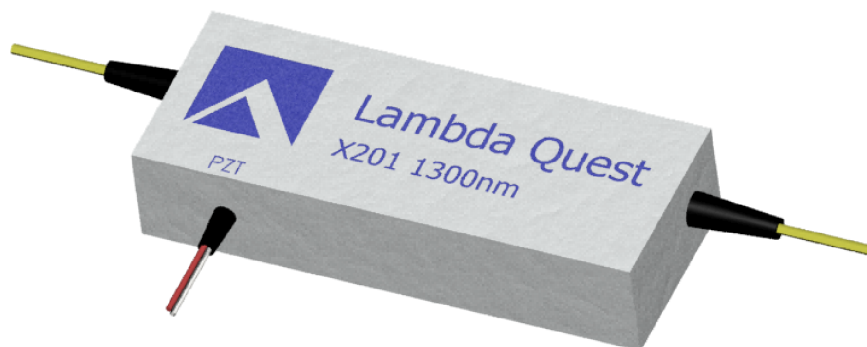


High Speed Optical Tunable Filter



Applications

Fiber swept laser source
Optical sensor application
Optical coherence tomography

Features

Ultra high speed scan rate
Temperature tuned
Wide tuning range
Small form factor
Simple design
Encapsulated

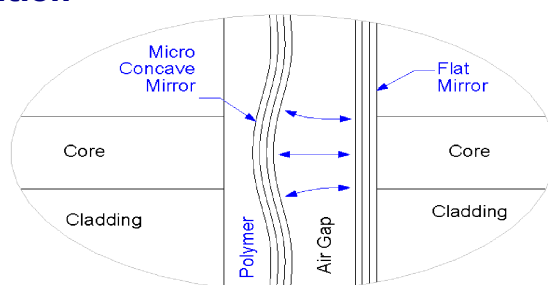
Description

The simple high speed optical tunable filter has a micro concave polycarbonate lens that forms a cavity without guiding optics or optical collimation, resulting in robust and vibration-resistant filters with minimal parts count. The filters are encapsulated in a proprietary temperature tuned package.

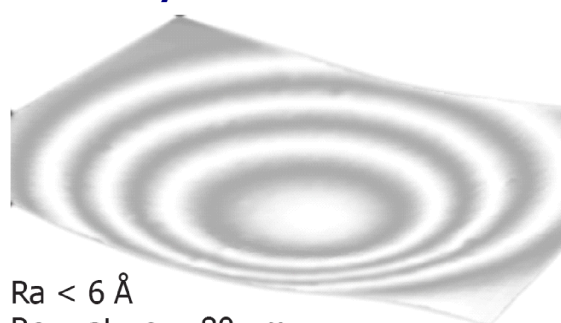
Typical Data

Operation Wavelength	1050/1310/1550nm
Loss	2.5 dB
Fixed Free Spectral Range	50 to 160nm
Finesse	300 to 700
Side Band Rejection	<23 dB
Maximum Input power	50/80/100mW/nm
Temperature Coefficient	<1 nm/°C (1550/60nm)
Capacitance	0.4 uF
Tuning Voltage @DC	13/16/19 V/FSR
Tuning Voltage Range	-20 to 50 V
Scan Frequency	DC ~ 40 kHz
Connector	FC/UPC Spliced
Dimensions	0.4"x0.7"x1.8"
4x #2-56 Mounting Taps	0.54" x 1.64" Center

Configuration

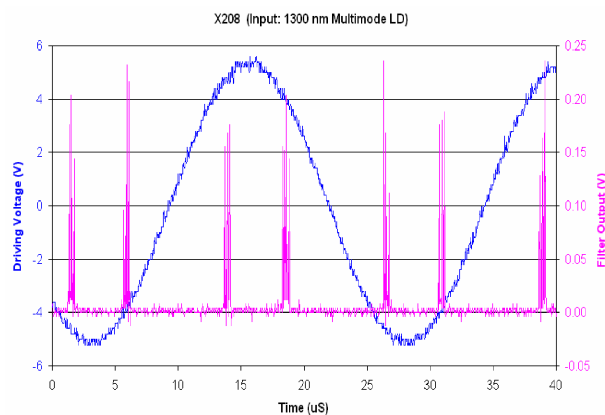


Micro Concave Polycarbonate Lens Profile



$R_a < 6 \text{ \AA}$
 $R_{\text{curvature}} = 80 \text{ \mu m}$

40 kHz Response, 9V/FSR @1300nm



www.lambdaquest.com

LambdaQuest LLC

5410 Isabella Ct.
Agoura Hills, CA 91301

Tel/Fax: 818-337-2935
info@lambdaquest.com

Fiber Fabry-Perot Tunable Filter | FFP-TF



Description

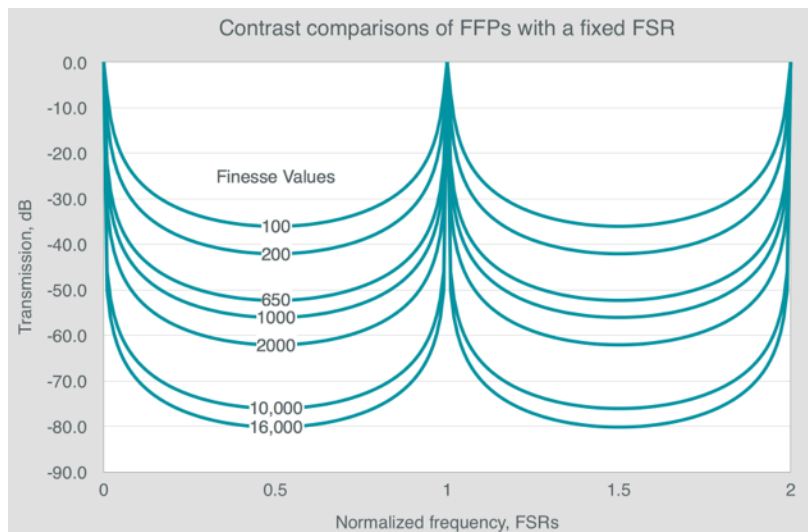
Micron Optics' patented FFP-TF, fiber Fabry-Perot (FFP) Tunable Filter achieves high finesse and maintains low loss in a rugged package.

The key to the simple and elegant design of the FFP tunable filter is the lensless all-fiber construction. There are no collimating optics or lenses, thus with the FFP tunable filter Micron Optics has eliminated the pitfalls of other Fabry-Perot component technologies, including misalignment, environmental sensitivity, and extraneous modes.

The FFP tunable filter follows the Airy function so closely that engineers can design it into the opto-electronic OEM systems knowing that it will provide results that match to the theoretical mathematical model.

For more than two decades, the Micron Optics FFP-TF has proven its capabilities in WDM applications, and has satisfied the ever-increasing performance demands of the telecom market including optical network monitoring, signal conditioning and dynamic networking and transport. Additionally, the filter continually proves itself as the key enabling technology for world-class test instruments.

An all-fiber Fabry-Perot
super-cavity
in a robust, fast tuning
Telcordia qualified
package.



Key Features

All-fiber platform

High resolution and **low loss design**

Super-cavity finesse

Vibration and **shock resistant**

Thermally stable

Fast scanning permits fast, accurate measurements

Ideal for OEM applications

Customizable center wavelength, free spectral range, finesse & bandwidth

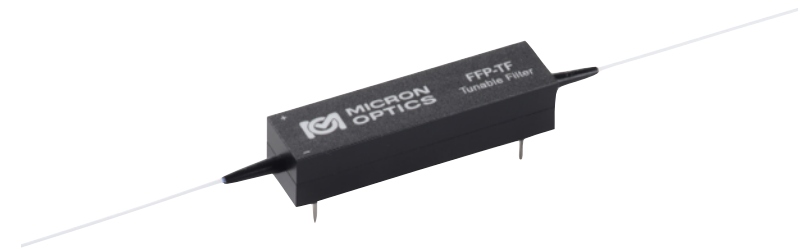
Center wavelength bands from 800 to 2000 nm

Small footprint

Low power requirements

Telcordia GR 2883 qualified

Proven reliability over decades of use



OEM Applications

Optical Coherence Tomography (see OCT datasheet)

Optical performance monitoring

Spectrum analysis

Tunable optical noise filtering

Tunable channel drop for ultra DWDM

Tunable sources

Optical sensing

Fiber Fabry-Perot Tunable Filter | FFP-TF



Optical Properties

Standard¹ FFP-TFs

Operating wavelength range	1520-1570 nm	1520-1570 nm	1520-1570 nm	1460-1620 nm	1460-1620 nm
Free spectral range ²	15 THz (120 nm)	15 THz (120 nm)	15 THz (120 nm)	27.5 THz (220 nm)	27.5 THz (220 nm)
Finesse	500	1,000	2,000	2,000	10,000
Bandwidth, (FWHM or 3dB) ³	30 GHz (240 pm)	15 GHz (120 pm)	7.5 GHz (60 pm)	13.8 GHz (110 pm)	2.8 GHz (22 pm)
Insertion loss	< 2.5 dB	< 3 dB	< 3 dB	< 3 dB	< 4 dB
Polarization dependent loss	< 0.2 dB				
Input power	50 mW	30 mW	15 mW	15 mW	3 mW

Electrical Properties

Tuning voltage/FSR	< 12 V				
Tuning rate/FSR ⁴	2,500 Hz				
Capacitance	< 3 uF				
Tuning voltage, maximum	70 V				

Mechanical Properties

Dimension; weight	12.7 mm x 14.3 mm x 57.2 mm; 28 g				
Mounting holes	(4) #1-72 UNF x 0.16" deep				
Cable jacket	900 um loose buffer tubing				
Cable length	~ 1 m				

Environmental Properties⁵

Operating temperature	-20 to 80 C				
Change in voltage	< 12 V				
Change in insertion loss	< 0.5 dB				

Custom and OEM Options

Contact Micron Optics for configuration details

Wavelength bands: from 800 to 2000 nm

Free spectral range²: 100 to 27,500 GHz

Finesse: up to 16,000

Bandwidth³: from MHz to GHz

Ordering Information

FFP-TF ~~www-wwww-bbbu-ffff-ii-ccc~~

www Operating wavelength range
For example, 1520-1570

bbb Bandwidth
For example, 015 = 15 GHz

u Bandwidth unit
G GHz
M MHz

ffff Finesse
For example, 01000 = finesse of 1000

ii Insertion loss
For example, 2.5 = 2.5 dB loss

ccc 000 Unconnectorized
061 FC/APC (fusion spliced)
063 SC/APC (fusion spliced)
065 FC/APC (connectorized)
070 Side terminal configuration

Notes

¹ Standard specifications are fixed configurations. Please contact Micron Optics for custom specifications.

² FSRs are fixed but customizable within these ranges.

³ Bandwidth tolerances are typically +/-20%

⁴ Tuning rate/FSR are recommended maximums. Experimental rates of >200 KHz have been achieved on the FFP-TF.

⁵ Complies to Telcordia GR 2883.



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Specifications subject to change without further notice.

Fiber Fabry-Perot Tunable Filter | FFP-TF2



Description

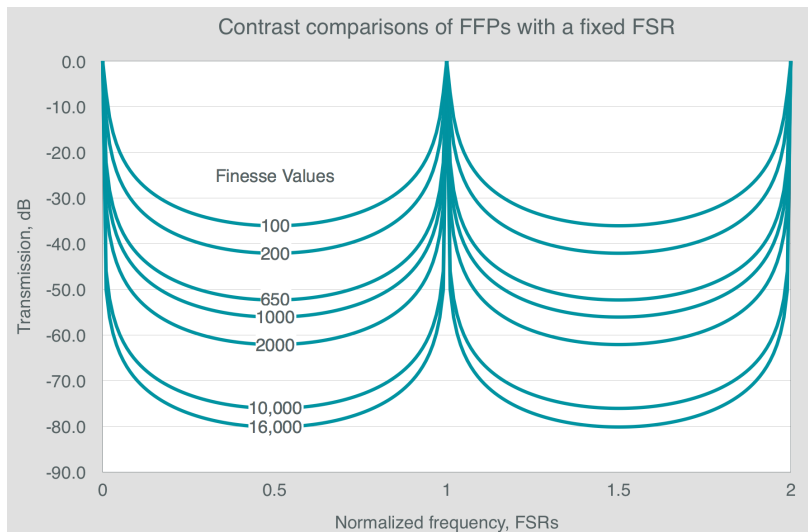
Micron Optics' patented FFP-TF2, Fiber Fabry-Perot (FFP) Tunable Filter achieves high finesse and maintains low loss in a rugged package.

The key to the simple and elegant design of the FFP tunable filter is the lensless all-fiber construction. There are no collimating optics or lenses, thus with the FFP tunable filter Micron Optics has eliminated the pitfalls of other Fabry-Perot component technologies, including misalignment, environmental sensitivity, and extraneous modes.

The FFP tunable filter follows the Airy function so closely that engineers can design it into the opto-electronic OEM systems knowing that it will provide results very close to the theoretical mathematical model.

The FFP-TF2 design provides improved etalon alignment for stable long-term, high reliability, and Telcordia-qualified performance at a more attractive price. Several standard low-cost configurations are readily available for quick delivery. Custom high performance multi-band configurations are also available for special uses including sensing, biotech, and scientific applications.

An all-fiber Fabry-Perot
super-cavity
in a robust, Telcordia
qualified package.



Key Features

All-fiber platform

High resolution and **low loss design**

Super-cavity finesse

Vibration and **shock resistant**

Thermally stable

Large dynamic range permits accurate measurements

Ideal for OEM applications

Customizable center wavelength, free spectral range, finesse & bandwidth

Center wavelength bands from 800 to 2000 nm

Small footprint

Low power requirements

Telcordia GR 2883 qualified



OEM Applications

Optical Performance Monitoring

Spectrum Analysis

Tunable Optical Noise Filtering

Tunable Channel Drop for Ultra DWDM

Tunable Sources

Optical Sensing

Fiber Fabry-Perot Tunable Filter | FFP-TF2



Optical Properties

Standard¹ FFP-TF2s

Operating Wavelength Range	1520-1570 nm	1520-1570 nm	1520-1570 nm	1460-1620 nm	1460-1620 nm
Free Spectral Range ²	12.5 THz (100 nm)	15 THz (120 nm)	15 THz (120 nm)	27.5 THz (220 nm)	27.5 THz (220 nm)
Finesse	650	1,000	2,000	2,000	10,000
Bandwidth, (FWHM or 3dB) ³	19 GHz (152 pm)	15 GHz (120 pm)	7.5 GHz (60 pm)	13.8 GHz (110 pm)	2.8 GHz (22 pm)
Insertion Loss	< 2.5 dB	< 3 dB	< 3 dB	< 3 dB	< 4 dB
Polarization Dependent Loss	< 0.2 dB				
Input Power	50 mW	30 mW	15 mW	15 mW	3 mW

Electrical Properties

Tuning Voltage/FSR	< 18 V				
Tuning Rate/FSR ⁴	800 Hz				
Capacitance	< 3 uF				
Tuning Voltage, Maximum	70 V				

Mechanical Properties

Dimension; Weight	13.5 x 25.8 x 57.2 mm; 53 g				
Mounting Holes	(4) #1-72 UNF x 0.16" deep				
Cable Jacket	900 um loose buffer tubing				
Cable Length	~ 1 m				

Environmental Properties⁵

Operating Temperature	-20 to 80 C				
Change in Voltage	< 18 V				
Change in Insertion Loss	< 0.5 dB				

Custom and OEM Options

Contact Micron Optics for configuration details

Wavelength bands: from 800 to 2000 nm

Free spectral range²: 100 to 45,000 GHz

Finesse: up to 16,000

Bandwidth³: from MHz to GHz

Ordering Information

FFP-TF2 www-wwwww-bbbu-ffff-ii-ccc

www Operating wavelength range
For example, 1520-1570

bbb Bandwidth
For example, 015 = 15 GHz

u Bandwidth unit
G GHz
M MHz

ffff Finesse
For example, 01000 = finesse of 1000

ii Insertion loss
For example, 2.5 = 2.5 dB loss

ccc 000 Unconnectorized
061 FC/APC (fusion spliced)
063 SC/APC (fusion spliced)
065 FC/APC (connectorized)
070 Side terminal configuration

Notes

¹ Standard specifications are fixed configurations. Please contact Micron Optics for custom specifications.

² FSRs are fixed but customizable within these ranges.

³ Bandwidth tolerances are typically +/-20%

⁴ Tuning rate/FSR are recommended maximums.

⁵ Complies to Telcordia GR 2883.

Fiber Fabry-Perot Interferometer | FFP-I



Description

Micron Optics' FFP-I, Fiber Fabry-Perot Interferometer family of products is based on a fixed interferometer design with smooth, uniformly spaced transmission peaks.

FFPI

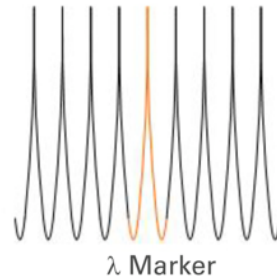
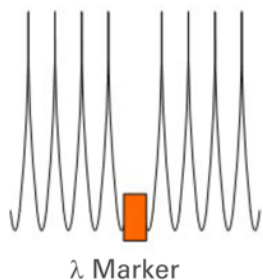
The FFP-I consists of a lensless, plane Fabry-Perot Interferometer with a single-mode optical fiber waveguide between two highly reflective multilayer mirrors. The FFP-I is manufactured directly with optical fibers so no alignment or mode-matching is required. The free spectral range (FSR) may be manufactured exactly to customer specifications and a TEC package is available for thermal stability and minor adjustments of center bandpass frequency.

A smooth, uniformly spaced λ reference with or without a wavelength marker.

picoWave®

The *picoWave*® is Micron Optics' patented multi-wavelength reference that enables real time wavelength calibration to picometer accuracy. Combining the uniform frequency spacing of the FFP-I, a wavelength marker of a Fiber Bragg Grating, and a built-in TEC for thermal stability, the *picoWave*® makes an ideal calibrated wavelength reference. The FFP-I and FBG can be configured in Series or in Parallel (see diagrams below).

picoWave® (Serial Configuration) *picoWave*® (Parallel Configuration)



Key Features

Spectrum Sliced Source

ITU Filter

Calibrated Wavelength Reference

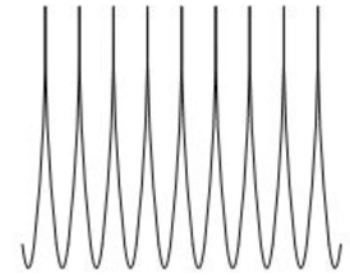
Laser Stabilization

WDM Emulation

Optical Sensing



FFP-I, FFP-ITU, *picoWave*®



FFP-I

OEM Applications

Optical Performance Monitoring

Spectrum Analysis

Tunable Optical Noise Filtering

Tunable Channel Drop for Ultra DWDM

Tunable Sources

Optical Sensing

Fiber Fabry-Perot Interferometer | FFP-I



Optical Properties	FFP-I	picoWave®
Operating wavelength range ¹	1260 - 1620 nm	
Free spectral range	0.01 to 10,000 GHz	10 - 100 GHz
Finesse	10, 40, 100, 200, 500, 1000, 2000	10
Bandwidth, (FWHM or 3dB)	FSR/Finesse	
Insertion loss ²	< 3 dB	
Maximum input power ³	100 mW (for finesse < 200)	
Thermal Coefficient	~ 1.6 GHz/C	n/a
Wavelength marker placement	n/a	User defined

Electrical Properties (optional for FFP-I with FSR > 10 GHz, standard for picoWave®)

TEC	Melcor Epoxy Filled 04OT2.0-30-F2-EP
TEC drive current	< 2 A
TEC Q_{\max} ($T_H = 25^\circ\text{C}$)	< 4 W
TEC V_{\max} ($T_H = 25^\circ\text{C}$)	< 3.4 V
TEC ΔT_{\max} ($T_H = 25^\circ\text{C}$)	67 C
Thermistor	10 K Ω NTC
Thermal tuning speed	1 GHz/sec, typical
Stability	+/- 0.125 GHz, laboratory conditions
FSR variation over tuning range	0.05% of FSR

Special OEM Options

Contact Micron Optics

Wavelength Range: 780 - 1640 nm

Finesse: up to 4,000

Bandwidth: from KHz to GHz

ITU Tolerance: from 0.5 to 0.05%

Ordering Information

FFP-I	www	bbb	u	fff	ii	ccc
	1310	(1260-1360 nm)				
	1550	(1520-1570 nm)				
www	1420	(1360-1480 nm)				
	1600	(1570-1620 nm)				
	1500	(1480-1520 nm)				
	1580	(1520-1620 nm)				
bbb	Specify bandwidth For example, 040 = 40 GHz					
u	Bandwidth unit G GHz M MHz K KHz					
fff	Specify finesse For example, 0650 = finesse of 650					
ii	Specify insertion loss For example, 2.5 = 2.5 dB loss					
ccc	Unconnectorized 061 FC/APC (fusion spliced) 063 SC/APC (fusion spliced) 065 FC/APC (connectorized) 080 TEC Equipped					

Notes

- Each useful spectral range defined by mirror pass band.
- High resolution (BW < 2 GHz) FFP-Is are generally polarization sensitive. However, polarization properties are stable and can be adjusted by a polarization controller at the FFP-I input.
- Maximum input power level depends on finesse value.