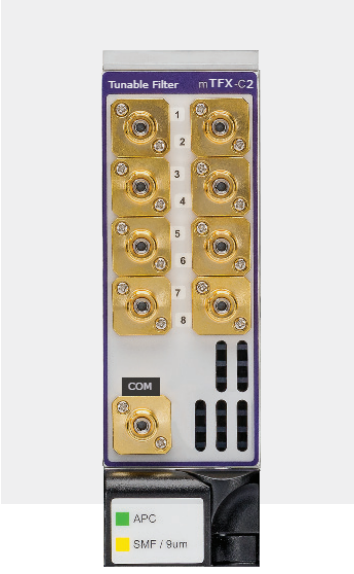
Multiport Tunable Filter Module (mTFX)

MAP Series 100G+ Wavelength Management Filter

The Multiple Application Platform (MAP series) multiport tunable filtermodule (mTFX) dramatically simplifies test signal management for next-generation coherent interfaces, sub-systems, and system test.

Get the right wavelengths to the right test port with the right power—quickly. Flexibly isolate, groom, manage, and route any wavelength or group of wavelengths with a simple, intuitive GUI and/or SCPI based remote commands. The mTFX is a modular instrument and can be directly managed from your PC-based automation system. It eliminates the need to re-purpose optical network technology or use complex libraries with specialized interface cards.



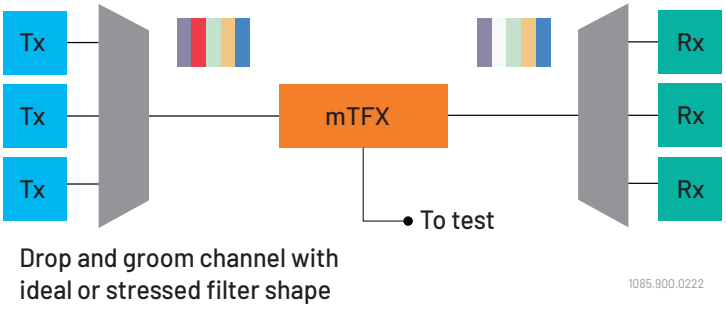


Figure 1 - Example application: isolate (drop) a signal from a DWDM test system and route to a test application while expressing all other wavelengths to other receivers

Key Features and Benefits

- Adjustable 6.2 to 5100 GHz bandwidth (0.5 GHz resolution) with low loss and ±3.5 GHz accuracy in C- and L-band
- Automated peak tracking with no power loss
- Supports up to 120 L-band and 180 C-band filters, each with independent control; seamless filter changes
- Internal power meter with <10 pm precision for center frequency/ bandwidth
- Fast GUI and SCPI control, optional 8-port license, in a compact single-slot C- and L-band cassette

Applications

- Transmitter dispersion, eye mask, and receiver sensitivity testing
- Automated photonic communication testing
- ROADM node emulation for network simulation
- Signal extraction/insertion during DWDM system testing
- Amplifier gain spectrum management and OSNR measurements

Safety Information

- Complies with CE, CSA/UL/IEC61010-1, plus LXI class C requirements when installed in a MAP chassis

Functional Description

Based on next-generation liquid crystal on silicon (LCOS) technology, the mTFX is much more than a tunable filter. It combines variable attenuator, switch, power meter, and DWDM multiplexer functions to dramatically simplify photonic testing of coherent interfaces, amplifier, and DWDM systems. Leveraging TrueFlex™ technology, filters are continuously tunable in center wavelength and bandwidth and are not locked to the ITU grid.

Multiple parallel wavelength paths can be created without disrupting already established connections—all with sub-GHz resolution. Industry leading specifications for loss and out-of-band rejection ensure minimal impairments on your test signals. The tunable filter is offered in the C- and L-bands variant with the option of power monitoring.

To simplify interaction and programming, control of the mTFX has been divided into simple, easy-to-visualize functional blocks. A "virtual filter" is defined by a center wavelength, bandwidth, shape, and attenuation. A virtual filter can be easily moved anywhere in the C-band or L-band through assignment of the center wavelength. The virtual switch allows the filter to be expressed to a physical output port. Up to 180 (C-band) or 120 (L-band) virtual filters can be created and independently controlled. To manage assignment conflicts, a slice of spectrum may only be assigned to one output port at a time (although multiple independent slices can go to the same port).

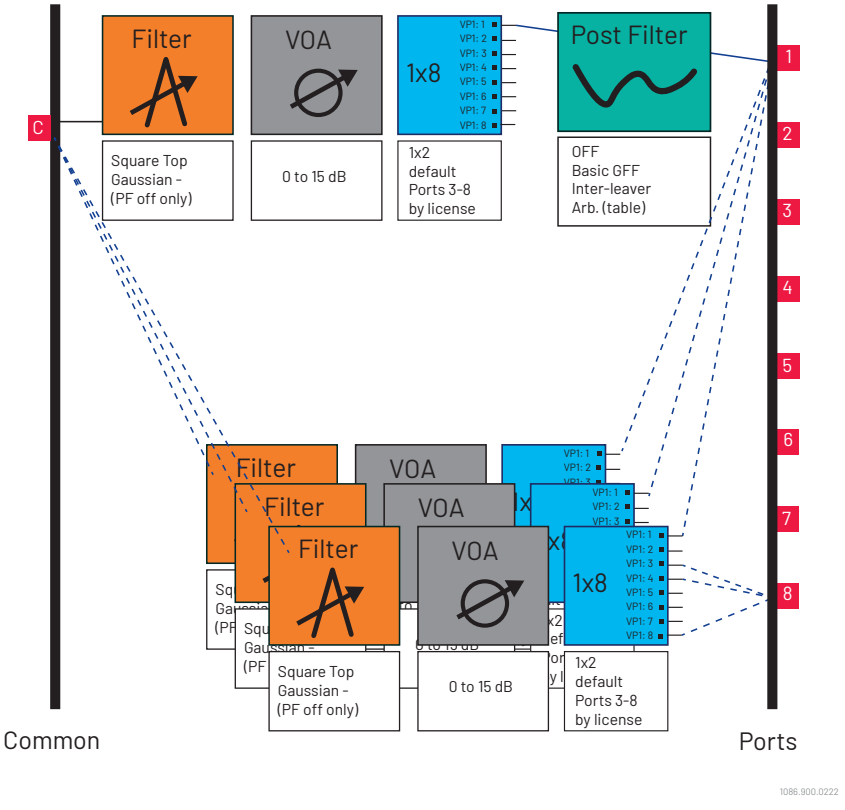


Figure 2 - The mTFX showing individual control blocks

An intuitive graphical user interface (GUI) is optimized for use in either a laboratory or a manufacturing environment. Efficient transition between summary and detailed views (figure 3 and figure 4) allow users to operate at a system level or access the full power of a module. The mTFX has a more complex GUI than many of VIAVI's other modules due to its three modes of operations, channel mode, full mode and shape mode.

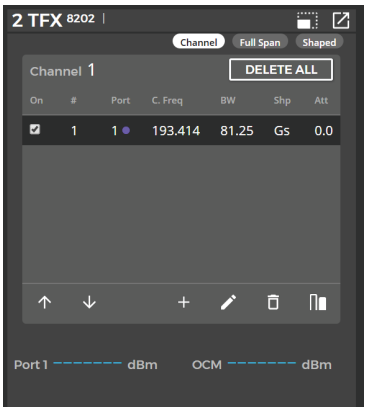


Figure 3 - mTFX MAP-300 summary view GUI

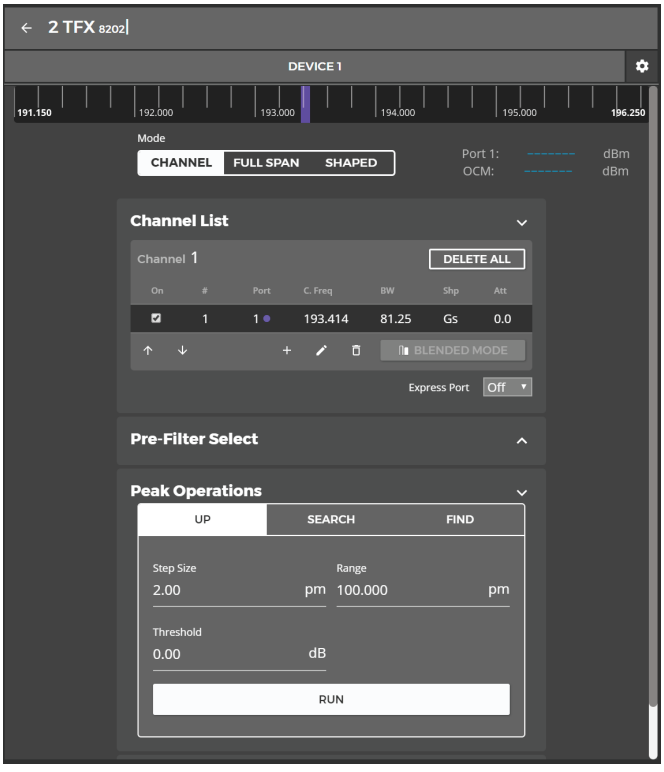


Figure 4 - mTFX MAP-300 detailed view GUI

Tunable Filter Modes

Three control modes are available to further simplify use and allow users to tailor the level of complexity they require.

1) Channel mode

Channel mode is the basic mode of operation. In this mode, the post-filter has been disabled. This allows for powerful yet simple control of individual virtual filters. This mode supports both square and Gaussian shaped filters. Square top modes are ideal for ROADM emulation and systems employing multiple carriers in the channel. Gaussian shapes are ideal where it is critical to have the filter center wavelength and the carrier tightly aligned. Any drift in the carrier results in an unambiguous decrease in the power of the signal. Channel mode also includes an automated express capability. In a single command, the unfiltered spectrum is automatically routed to the selected port.

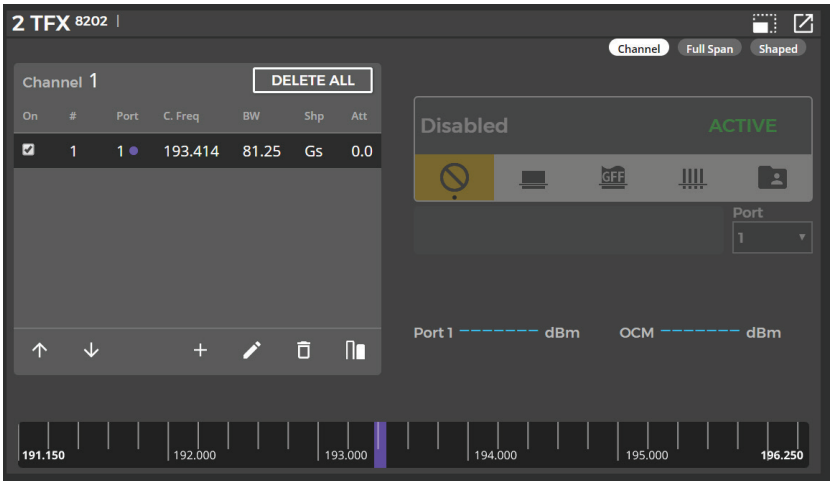


Figure 5 – Channel mode displayed on the MAP-300 GUI

If the internal power meter option is selected, three powerful peak-signal detection functions become available.

- Peak Find: Measures the center frequency of a peak with a power level above a threshold; the signal is blocked while executing.
- Peak Search: Searches for the highest power signal within user defined start, stop and step wavelengths. A Gaussian channel centered on the peak frequency is created.
- Peak Up: Optimizes the placement of an isolation filter around a signal to maximize the transmitted power and minimizing the insertion loss.

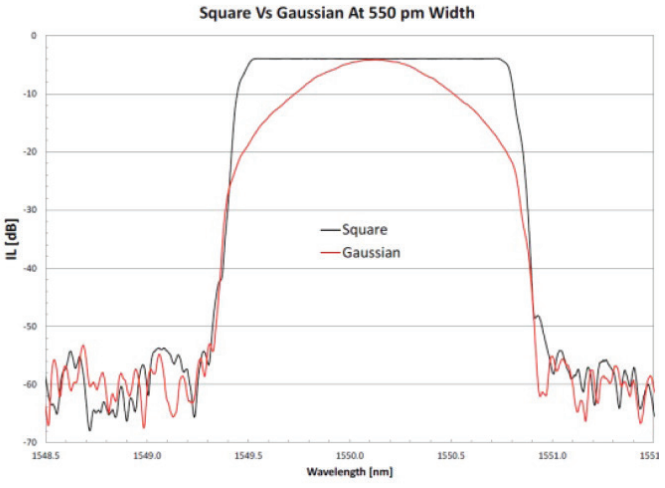


Figure 6 – Square and Gaussian filter using the mTFX

2) Full Span Mode

Full span mode disables the virtual filters and allows the unit to be operated like a simple single-port programmable filter. The primary intention of this mode is to shape the full transmitted spectrum and it is an ideal tool to generate frequency combs, gain tilt, and gain shape corrections. Standard programmable shapes are available, and users may upload up to five custom shapes. Prefilters include a loss flattening filter, an EDFA gain-flattening filter and a comb filter.

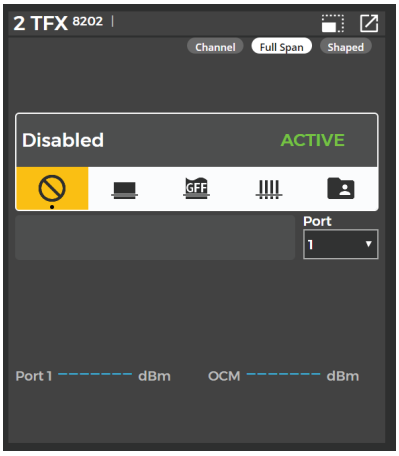


Figure 7 – Full-span mode displayed on the MAP-300 GUI

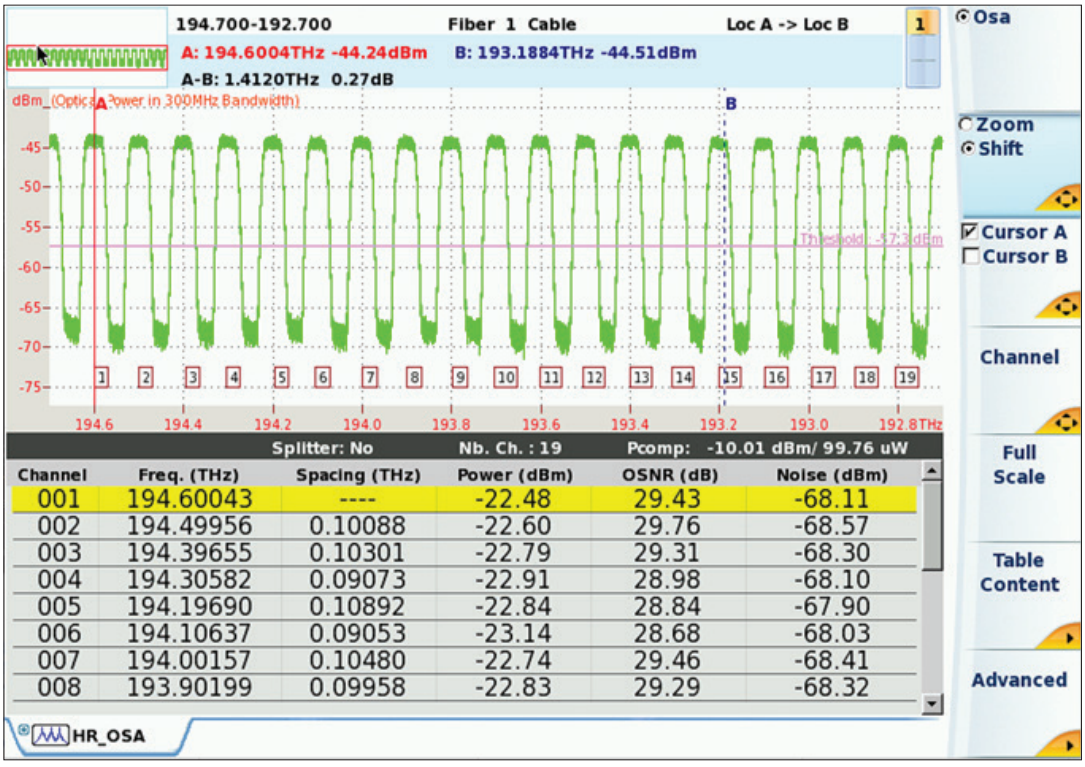


Figure 8 – Example of a mTFX comb filter displayed on the HROSA

3) Shaped Mode

Shaped mode combines the power of Channel and Full span mode. Together, they enable the generation of more complex filtering patterns while retaining a simple and intuitive interface. In this mode, the virtual filter attenuation profile is modified by the presence of the Full mode attenuation shape.

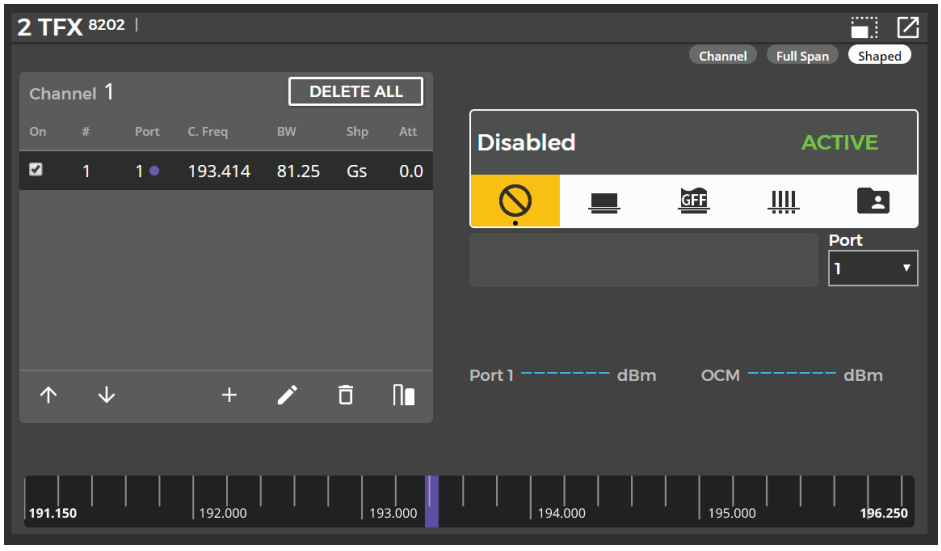


Figure 9 – Shape mode displayed on the MAP-300 GUI

Figure 10 – Using the shape mode in the mTFX to combine a comb filter and a low pass and high pass filter to remove a single channel. Displayed on the HROSA

Power Monitor

By default, the mTFX cassette provides two output ports; however, four or eight output ports are available with optional software licenses.

The ninth port on the mTFX cassette is an embedded power monitor (optical channel monitor, or OCM) that is offered as a variant. This OCM is connected to an output port through a tap or direct connection. This enables the power through a filter to be monitored which supports the automated peak search and optimization functions.

Chassis and Modular Family

The VIAVI Multiple Application Platform (MAP) is a modular, rack mountable or benchtop, optical test and measurement platform with chassis' that can host 2, 3 or 8 application modules. The LightDirect family of modules are characterized by their simple control and single-function nature. Individually or together they form the foundation of a diverse array of optical test applications. The web enabled multiuser interface is simple and intuitive. LXI compliant with a full suite of SCPI based automation drivers and PC based management tools, the VIAVI MAP is optimized for both lab and manufacturing environments.

The mTFX is part of the LightDirect module family. Alongside the many other modules, such as light sources, attenuators, polarization scramblers, power meters, and spectrum analyzers, the MAP series is the ideal, modular platform for photonic system and module testing.

LightDirect

Specifications C-Band and Extended C-Band

Parameter	C-Band	Extended C-Band
Frequency Range	191.15 to 196.25 THz 1527.61 to 1568.35 nm	190.55 to 196.675 THz 1524.304 to 1573.301 nm
Slot width	Single slot	
Number of Active Output Ports	2 Note: 4 or 8 ports available with additional software license.	
Number Independent User Defined Filters	180 (maximum)	120 (maximum)
Standard Filter Shapes	Square top and Gaussian top (valid up to 20 dB attenuation)	
Insertion Loss[1]		
Port 1 standard configuration	< 6.0 dB	
Port 1 with power monitor option	< 6.5 dB	
Ports 2 to 8	< 6.5 dB	
Short-term Insertion Loss Stability[2]		
Averaging time < 10 ms	± 0.05 dB	
Averaging time > 10 ms	± 0.01 dB	
Insertion Loss Repeatability[3]	± 0.025 dB	
PDL[4]	< 0.3 dB (typical) from 0 to 10 dB attenuation	
Return Loss[5]	> 30 dB	
Square Top Filter Bandwidth[6]	6.25 to 5100 GHz	
Maximum Bandwidth for Gaussian Filter Shape	250 GHz	
Center Wavelength and Bandwidth Resolution	0.5 GHz	
Center Frequency Accuracy[7]	± 3.5 GHz (typical) ± 5 GHz (maximum)	
Maximum Input Power		
For single 12.5 GHz channel	9 dBm	
Broad Band Source	24 dBm	
Max Attenuation Range		
Gaussian Profile	10 dB	
Square Top Profile	20 dB	
Attenuation Setting Resolution	0.1 dB	
Single Filter, Average Out of Band Rejection[8]	> 35 dB	> 40 dB
Group Delay Variations		
Gaussian Top, over 3 dB bandwidth	< 5.0 ps	
Square Top, over 80% of bandwidth	< 4.0 ps	

Specifications C-Band and Extended C-Band continued

Parameter	C-Band	Extended C-Band
Differential Group Delay		
Gaussian Top, over 3 dB bandwidth	< 2.0 ps	
Square Top, over 80% of bandwidth	< 0.3 ps	
Warm-up Time	60 min	
Operating Temperature	0 to 45°C	
Storage Temperature	-30 to 60°C	
Operating Humidity	Maximum 85% Relative Humidity, non-condensing from 10 to 40°C	
Dimensions	4.1 x 13.3 x 37.0 cm	
Weight	1.44 kg (3.174 lbs)	
Calibration period	1 Year	
MAP mainframe compatibility	MAP-300 and MAP-220	

[1] Includes one optical connector. Measured using depolarized light source. For filters with bandwidth >20 GHz.

[2] Measured using a depolarized light source. Values at center wavelength with no attenuation applied. Values reported are 3σ measured over 20,000 samples at the indicated averaging time.

[3] Min-max, Insertion Loss variation measured using depolarized source at the center wavelength. Measured by activating and deactivating filter at the same wavelength on the same output port.

[4] PDL is valid at the Gaussian minimum loss or over 80% of square top bandwidth.

[5] Excludes directivity. Measured into a common port when all other channels are routed to outputs.

[6] Bandwidth is specified at 0.2 dB loss level relative to the minimum filter insertion loss. Allocated spectrum based on square top filter definition. Selection of Gaussian profile will reduce the effective bandwidth of the channel.

[7] Center wavelengths is measured at 3 dB and 10 dB levels relative to minimum loss in the filter.

[8] Ratio of filter minimum IL to background maximum from a spectrum ranges that would represent a higher and lower frequency adjacent channel.

Single-slot mTFX Module

Specifications L-Band

Parameter	L-Band
Frequency Range	186.10 to 191.05 THz 1569.19 to 1610.92 nm
Slot width	Single slot
Number of Active Output Ports	2 Note: 4 or 8 ports available with additional software license.
Number Independent User Defined Filters	120 (maximum)
Standard Filter Shapes	Square top and Gaussian top (valid up to 20 dB attenuation)
Insertion Loss[1]	
Port 1 standard configuration	< 7.2 dB
Port 1 with power monitor option	< 7.2 dB
Ports 2 to 8	< 7.2 dB
Short-term Insertion Loss Stability[2]	
Averaging time < 10 ms	± 0.05 dB
Averaging time > 10 ms	± 0.01 dB
Insertion Los Repeatability[3]	± 0.025 dB
PDL[4]	< 0.3 dB (typical) from 0 to 10 dB attenuation
Return Loss[5]	> 30 dB
Square Top Filter Bandwidth[6]	6.25 to 5100 GHz
Maximum Bandwidth for Gaussian Filter Shape	250 GHz
Center Wavelength and Bandwidth Resolution	0.5 GHz
Center Frequency Accuracy[7]	± 3.5 GHz (typical) ± 5 GHz (maximum)
Maximum Input Power	
For single 12.5 GHz channel	9 dBm
Broad Band Source	24 dBm
Max Attenuation Range	
Gaussian Profile	10 dB
Square Top Profile	15 dB
Attenuation Setting Resolution	0.1 dB
Single Filter, Average Out of Band Rejection[8]	> 35 dB
Group Delay Variations	

Specifications L-Band continued

Parameter	L-Band
Gaussian Top, over 3 dB bandwidth	< 5.0 ps
Square Top, over 80% of bandwidth	< 4.0 ps
Differential Group Delay	
Gaussian Top, over 3 dB bandwidth	< 2.0 ps
Square Top, over 80% of bandwidth	< 0.3 ps
Warm-up Time	60 min
Operating Temperature	0 to 45°C
Storage Temperature	-30 to 60°C
Operating Humidity	Maximum 85% Relative Humidity, non-condensing from 10 to 40°C
Dimensions	4.1 x 13.3 x 37.0 cm (1.6 x 5.24 x 14.6 in)
Weight	1.44 kg (3.174 lbs)
Calibration period	1 Year
MAP mainframe compatibility	MAP-300 and MAP-220

[1] Includes one optical connector. Measured using depolarized light source. For filters with bandwidth >20 GHz.

[2] Measured using a depolarized light source. Values at center wavelength with no attenuation applied. Values reported are 3σ measured over 20,000 samples at the indicated averaging time.

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[7] Center wavelengths is measured at 3 dB and 10 dB levels relative to minimum loss in the filter.

[8] Ratio of filter minimum IL to background maximum from a spectrum ranges that would represent a higher and lower frequency adjacent channel.

Ordering Information

For more information on this or other products and their availability, please contact your local VIAVI account manager or VIAVI directly at 1-844-GO-VIAVI (1-844-468-4284) or to reach the VIAVI office nearest you, visit viavisolutions.com/contacts.

Category	C-Band and Extended C-Band	
	Part Number	Description
Without Power Monitor	MTFX-C211C008C0-M100-MYY	C-band multiport tunable filter SMF
	MTFX-C311C008C0-M100-MYY	Extended C-band multiport tunable filter SMF
With Power Monitor	MTFX-C211C008CM-M100-MYY	C-band multiport tunable filter SMF with power monitor
	MTFX-C311C008CM-M100-MYY	Extended C-band multiport tunable filter SMF with power monitor

Category	L-Band	
	Part Number	Description
Without Power Monitor	MTFX-C311C008L0-M100-MYY	L-band multiport tunable filter SMF
With Power Monitor	MTFX-C311C008LM-M100-MYY	L-band multiport tunable filter SMF with power monitor

Table 1

YY Code	Connector Type
MFP	FC/PC
MFA	FC/APC
MSC	SC/PC
MSU	SC/APC

Accessories

Accessories (Optional)	Product and description	
Inspection and cleaning tool	CleanBlastPRO	The patented VIAVI Solutions® CleanBlastPRO fiber end-face cleaning system provides a fast, effective, and cost-efficient solution for removing dirt and debris from connectors in most common applications.
	FiberChek probe microscope	One-button FiberChek Probe delivers a reliable, fully autonomous, handheld inspection solution for every fiber technician.
	P5000i fiber microscope	Automated Fiber Inspection & Analysis Probe provides PASS/FAIL capability to PC, laptops, mobile devices and VIAVI test solutions.
Replacement Parts	Mating sleeves	AC500;FC/PC-FC/PC Universal Connector Adapter
		AC501;FC/PC-SC/PC Universal Connector Adapter
		AC502;FC/APC-FC/APC Universal Connector Adapter
		AC503;FC/APC-SC/APC Universal Connector Adapter
Add-On Licenses	MTFX4PORT	Expansion License from 2 TO 4 PORTS
	MTFX8PORT	Expansion License from 2 TO 8 PORTS

A wider range of inspection tools are available at VIAVI. More information about the products and accessories can be accessed through our website at www.viavisolutions.com. For further assistance please contact your local VIAVI account manager or VIAVI directly at 1-844-GO-VIAVI (1-844-468-4284) or to reach the VIAVI office nearest you, visit viavisolutions.com/contacts.

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Features

*5-year plans only

Plan	Objective	Technical Assistance	Factory Repair	Priority Service	Self-paced Training	5 Year Battery and Bag Coverage	Factory Calibration	Accessory Coverage	Express Loaner
BronzeCare	Technician Efficiency	Premium	✓	✓	✓				
SilverCare	Maintenance & Measurement Accuracy	Premium	✓	✓	✓	✓*	✓		
MaxCare	High Availability	Premium	✓	✓	✓	✓*	✓	✓	✓

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