VIAVI Solutions

Data Sheet

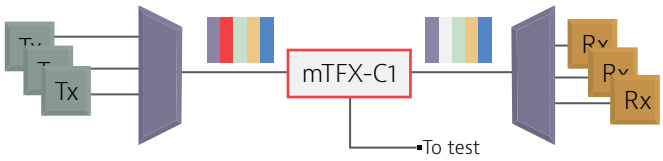
VIAVI

Multiport Tunable Filter Module (mTFX-C1)

100G+ Test Wavelength Management for MAP Series

The Multiple Application Platform (MAP series) multiport tunable filter module (mTFX-C1) dramatically simplifies test signal management for next-generation 100 G+ 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-C1 is a modular Ethernet or GPIB 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.



Drop and groom channel with ideal or stressed filter shape

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

- Tunable filter with bandwidth adjustment from 6.2 to 5100 GHz with 0.5 GHz resolution
- Low loss continuous extended C-band or L-band coverage with ±3.5 GHz wavelength accuracy
- Up to 120 independent filters, each with independent attenuation and output port assignment
- New filters can be added and removed without disturbing existing connections
- Internal power meter option with automated single and multiple peak find algorithms
- Automated peak tracking function without loss of transmitted power
- Fast, simple GUI and SCPI control interfaces for filter generation
- Optional SW license to enable up to 8 output ports

Applications

- Photonic communication test automation
- 100 G+ coherent interface testing
- ROADM node emulation
- Signal extraction or insertion during DWDM system testing
- Amplifier gain spectrum management and load tone generation

Compliance

- CE, CSA/UL/IEC61010–1, and LXI Class C requirements (when installed in a MAP chassis)

Light Direct

Based on next-generation liquid crystal on silicon (LCOS) technology, the mTFX-C1 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.

As part of the broader LightDirect family of MAP series modules, the mTFX-C1 can be deployed in the compact MAP-220C 2-slot chassis or the larger 3- and 8-slot MAP rack-mount chassis systems. Alongside the many other modules, such as amplifiers, precision attenuators, power meters, and spectrum analyzers, the MAP series is the ideal, modular photonics test platform for 100 G+ test applications.

Figure 2. MAP series LightDirect family of modules

Simplified Interface and Control

To simplify interaction and programming, control of the mTFX-C1 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 80 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).

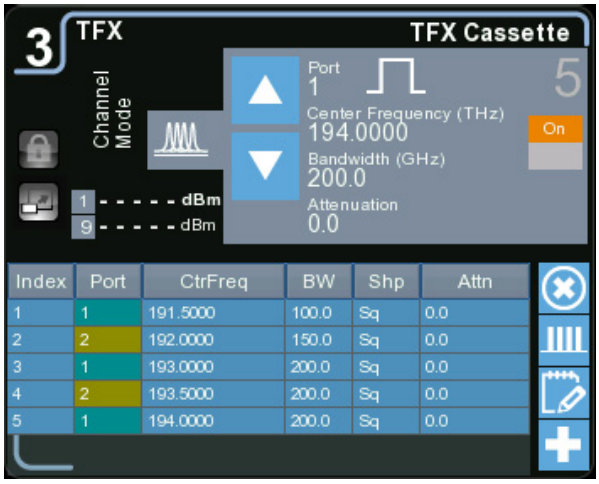


Figure 3. The MAP-220 GUI

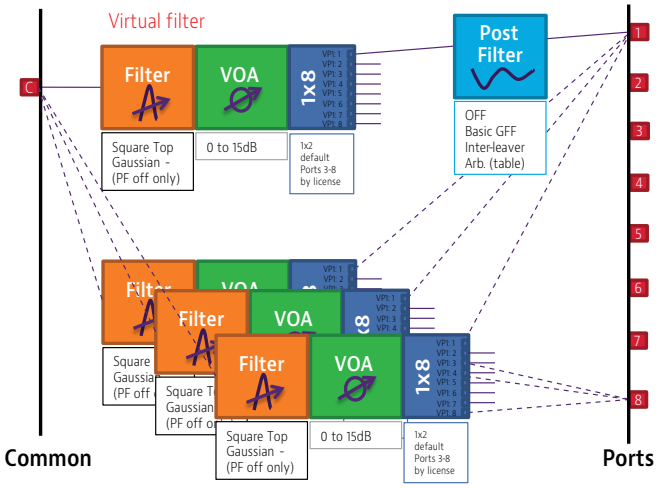


Figure 4. The mTFX-C1 showing individual control blocks

Modes

Three control modes are available to further simplify use and let a user tailor the level of complexity they require.

Channel Mode

Channel mode is the basic operation mode. 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.

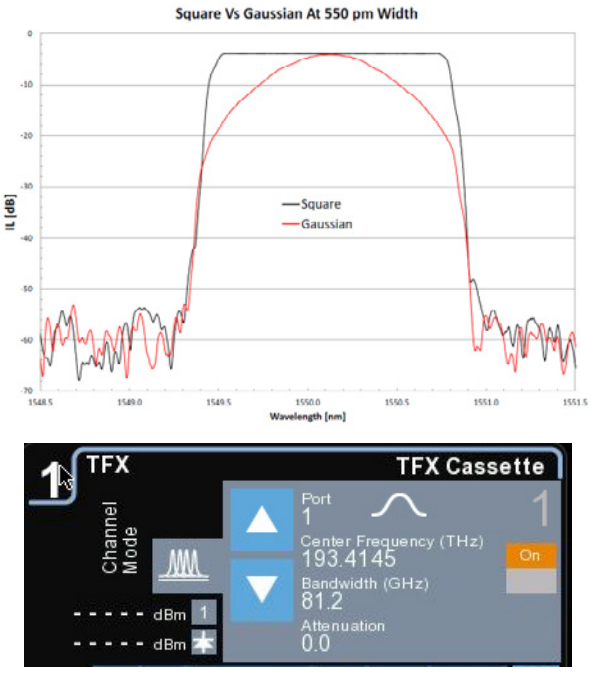


Figure 5. Channel-mode GUI control and the resulting filter shape

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

- **Peak Find:** find and report the center wavelength of all signals in the search range above a threshold; the signal is blocked while executing
- **Peak Search:** find the maximum power in the range AND establish an isolation filter around it
- **Peak Up:** optimize the placement of an isolation filter around a signal to maximize the transmitted power

Full Mode

Full 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.

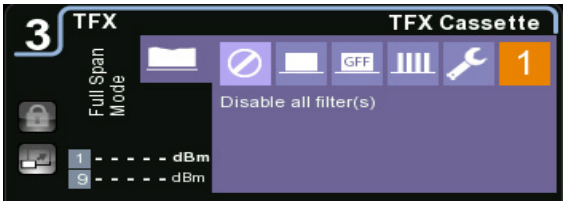


Figure 6. Full mode control

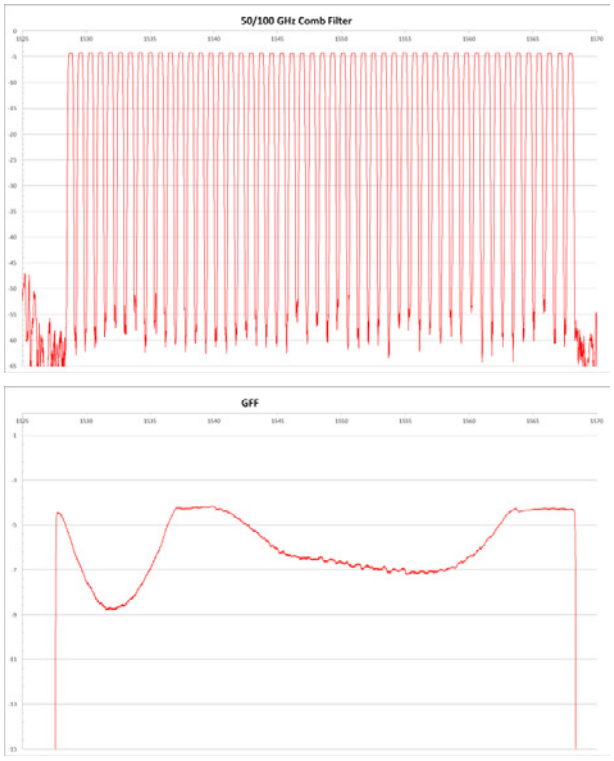


Figure 7. Examples of full span shapes: a comb filter (top) and gain flattening filter (bottom)

Shape Mode

Shape mode combines the power of Channel and Full 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.

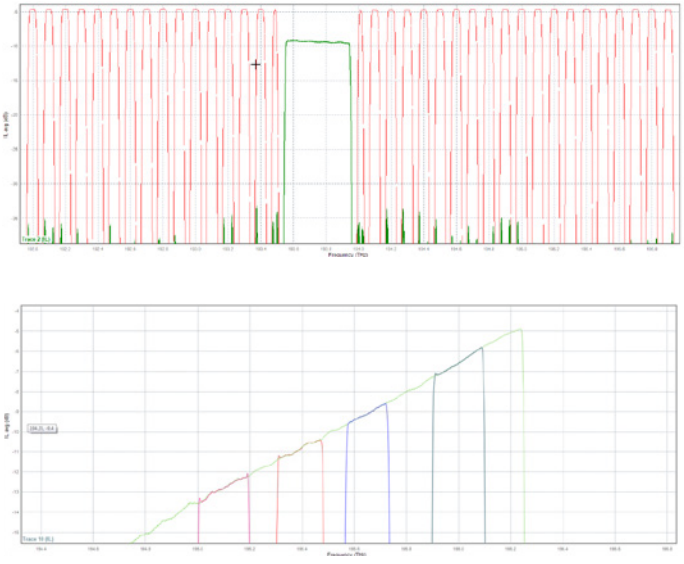


Figure 8. In the upper example, the comb pattern is interrupted to insert a test signal in the spectrum allocated by the green filter trace; the lower plot shows a single tunable filter being modified by the green slope filter (the slope filter shown is from a memory trace)

Specifications

Parameter	C-Band	L-Band
Frequency Range	191.15 to 196.25 THz 1527.61 to 1568.35 nm	186.30 to 191.05 THz 1569.19 to 1609.19 nm
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	< 5.5 dB	< 6.0 dB
Port 1 with power monitor option	< 6.0 dB	< 6.5 dB
Ports 2 to 8	< 6.0 dB	< 6.5 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]	6.2 to 5100 GHz	6.2 to 4800 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	13 dBm	9 dBm
Broad Band Source	24 dBm	
Max Attenuation Range		
Gaussian Profile	10 dB	
Square Top Profile	20 dB	15 dB
Attenuation Setting Resolution	0.1 dB	
Single Filter, Average Out of Band Rejection[8]	> 40 dB	
Group Delay Variations		
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	8.1 x 13.26x 37.03 cm	
Weight	2.4 kg (5.4 lbs)	

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 3 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.

Ordering Information

Category	Connector	C-Band		L-Band	
		Part Number	**Description**	**Part Number**	**Description**
Without Power Monitor	FC/APC	MTFX-C111C008C0-M100-MFA	C-band multiport tunable filter SMF FC/APC	MTFX-C111C008L0-M100-MFA	L-band multiport tunable filter SMF FC/APC
	FC/PC	MTFX-C111C008C0-M100-MFP	C-band multiport tunable filter SMF FC/PC	MTFX-C111C008L0-M100-MFP	L-band multiport tunable filter SMF FC/PC
	SC/PC	MTFX-C111C008C0-M100-MSU	C-band multiport tunable filter SMF SC/APC	MTFX-C111C008C0-M100-MSU	L-band multiport tunable filter SMF SC/APC
	SC/PC	MTFX-C111C008C0-M100-MSU	C-band multiport tunable filter SMF SC/PC	MTFX-C111C008L0-M100-MSU	L-band multiport tunable filter SMF SC/PC
With Power Monitor	FC/APC	MTFX-C111C008CM-M100-MFA	C-band multiport tunable filter SMF FC/APC with power monitor	MTFX-C111C008LM-M100-MFA	L-band multiport tunable filter SMF FC/APC with power monitor
	FC/PC	MTFX-C111C008CM-M100-MFP	C-band multiport tunable filter SMF FC/PC with power monitor	MTFX-C111C008LM-M100-MFP	L-band multiport tunable filter SMF FC/PC with power monitor
	SC/APC	MTFX-C111C008CM-M100-MSU	C-band multiport tunable filter SMF SC/APC with power monitor	MTFX-C111C008LM-M100-MSU	L-band multiport tunable filter SMF SC/APC with power monitor
	SC/PC	MTFX-C111C008CM-M100-MSU	C-band multiport tunable filter SMF SC/PC with power monitor	MTFX-C111C008LM-M100-MSU	L-band multiport tunable filter SMF SC/PC with power monitor

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