SANTEC OPTICAL INSTRUMENTS

Programmable Optical Tunable Filter

OTF-920

santec

The OTF-920 tunable bandpass filter achieves exceptional optical performance, while offering flexibility and ease of use. Utilizing multilayer dielectric interference filters, the OTF-920 features Santec's patented "linear sliding" tuning method. This unique tuning method allows the unit to cover a wide spectral range while maintaining constant optical properties including bandwidth, insertion loss, and PDL.

The OTF-920 can accommodate two optical "sliders", each of which is independently tunable. Each slider can be equipped with either a bandpass filter or a variable attenuator. A combination of two sliders can therefore provide: continuous tuning over an 80 nm bandwidth, 40 nm tuning over two separate bandwidths, 40 nm tuning with a variable bandpass, or simultaneous control of wavelength and power using a combination of filters and attenuators.

The OTF-920 features a peak search function which, combined with GPIB and RS-232C support, enables the filter to be used in a wide variety of applications.

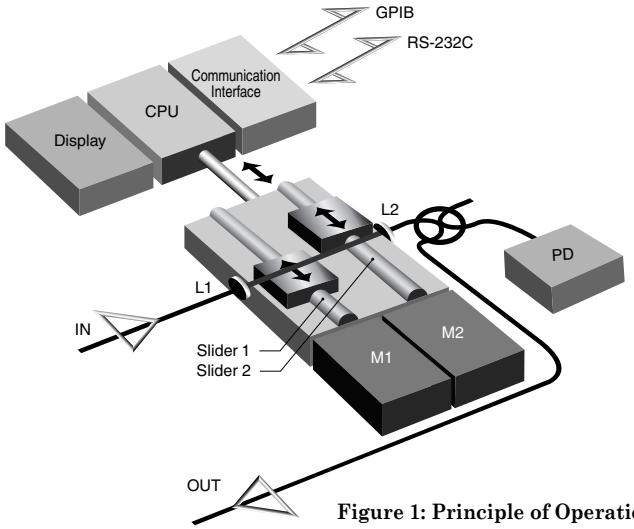
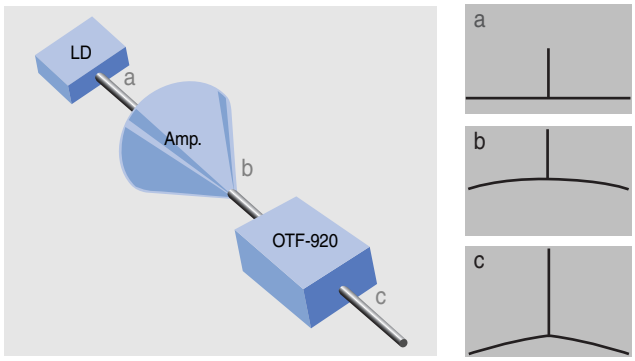


Figure 1: Principle of Operation

Applications

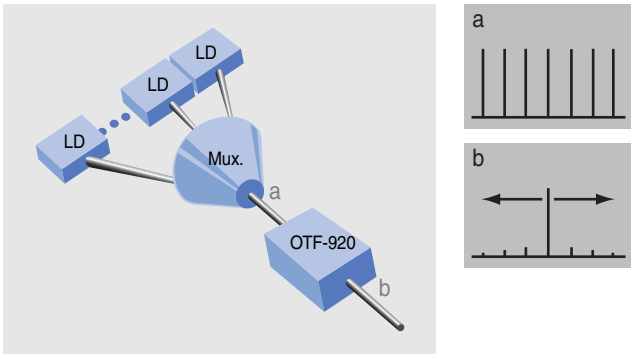
1. ASE Noise Suppression

When optical signals are amplified in EDFA's, unwanted levels of amplified spontaneous emission (ASE) can decrease the signal-to-noise ratio. The OTF-920 can be used to filter the ASE noise and improve the S/N ratio. Filters with 1.0 - 2.5 nm bandwidth are typically used for this purpose.



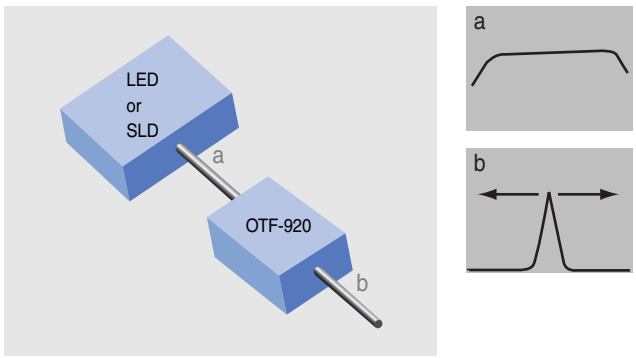
2. Wavelength Channel Selection

Using a combination of filters, the OTF-920 can select an individual wavelength channel from a multitude of signals. Narrow filters with bandwidth of 0.3 - 0.6 nm in a multi-stage arrangement are suitable to suppress adjacent- channel crosstalk.

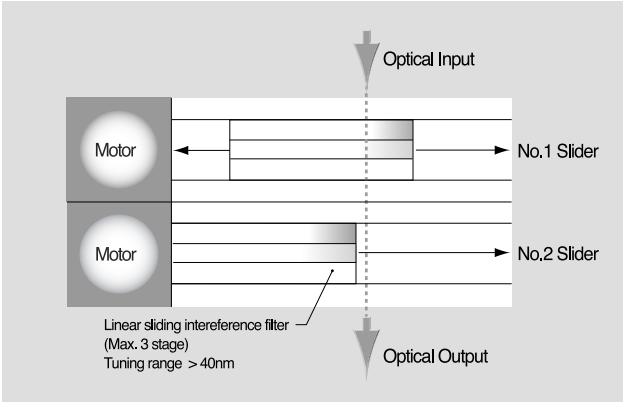


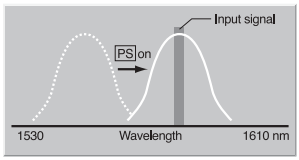
3. Incoherent Light Source

The OTF-920 can be configured as a tunable incoherent light source by coupling it with a broadband light source. While the output power of this configuration is relatively low (-30 to -20 dBm), a tunable incoherent source is especially useful for applications in which coherent resonance effects or nonlinear interference effects are non-negligible.



Dual Slider Configuration





Peak Search
Automatic searching of the signal
Virtual wavelength meter

Optical Power Control
(Attenuator Option Required)

Simultaneous Wavelength/Power Display

Optical Power Monitor
Optical power of the filted signal is monitored

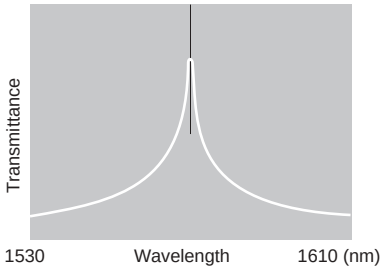
Wavelength Selection
Direct input from keypad
Automatic slider control enables "seamless"tuning

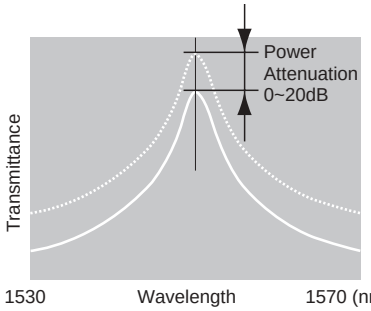
Example Configurations

Continuous wavelength tuning over a full 80 nm range using two filters

Slider 1: Filter with bandwidth 1.2 nm, Tuning range: 1530 - 1570 nm
Slider 2: Filter with bandwidth 1.2 nm, Tuning range :1570 - 1610 nm

When tuning to a wavelength in the 1530 ~ 1570 nm range, Slider 1 is automatically selected and set to the appropriate position in the optical path. Similarly, if the desired wavelength is in the 1570 - 1610 nm range, Slider 2 is automatically selected and positioned.





Wavelength and power control using one filter and one attenuator

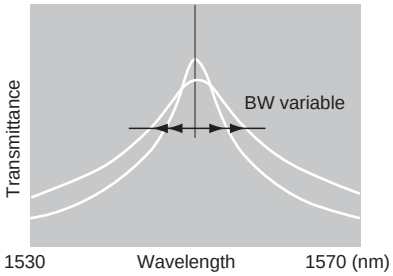
Slider 1: Filter with bandwidth 1.2 nm, Tuning range 1530 - 1570 nm
Slider 2: Attenuator, variable between 0 - 20 dB

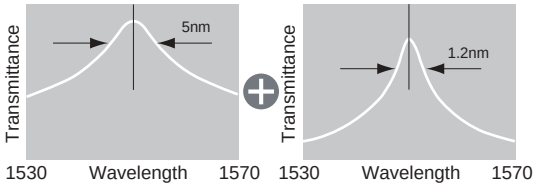
The two optical components are automatically adjusted to provide the requested wavelength and attenuation level. If desired, either the OBPF or the attenuator can be disabled (translated out of the optical path). The OTF-920 can be set to Automatic Power Control (APC) mode, which adjusts the attenuation to maintain a constant output power level.

Simultaneous wavelength and bandwidth control using two identical filters

Slider 1: Filter with bandwidth 1.2 nm, Tuning range 1530 - 1570 nm
Slider 2: Filter with bandwidth 1.2 nm, Tuning range 1530 - 1570 nm

Bandwidth is tuned by summing the two filters' spectral responses. For example, if the first and second sliders are equipped with 1.2nm bandwidth filters, OTF-920 can be got 2.0nm bandwidth(Typ.) by setting the two filters at 0.8nm intervals. After setting the bandwidth of the combined filters, the two filters can now be adjusted simultaneously to provide wavelength tuning while maintaining constant bandwidth.



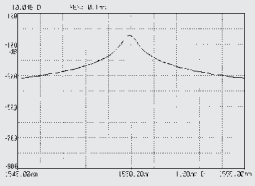
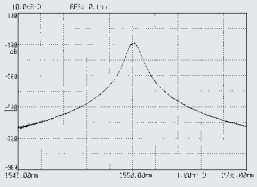
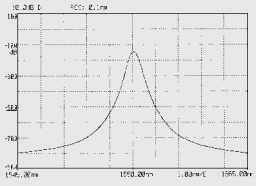


Channel selection using two filters with different bandwidths

Slider 1: Filter with bandwidth 5.0 nm, Tuning range 1530 - 1570 nm
Slider 2: Filter with bandwidth 1.2 nm, Tuning range 1530 - 1570 nm

This configuration allows for filtering of single or multiple channels in DWDM systems. For single-channel selection, both the broadband and narrowband filters are operational. To select multiple channels, the narrowband OBPF on Slider 2 can be disabled.

■ Filter Stage (Cascading)

Single Stage (S1)	Double Stage (S2)	Triple Stage (S3)
		

Filter Selections

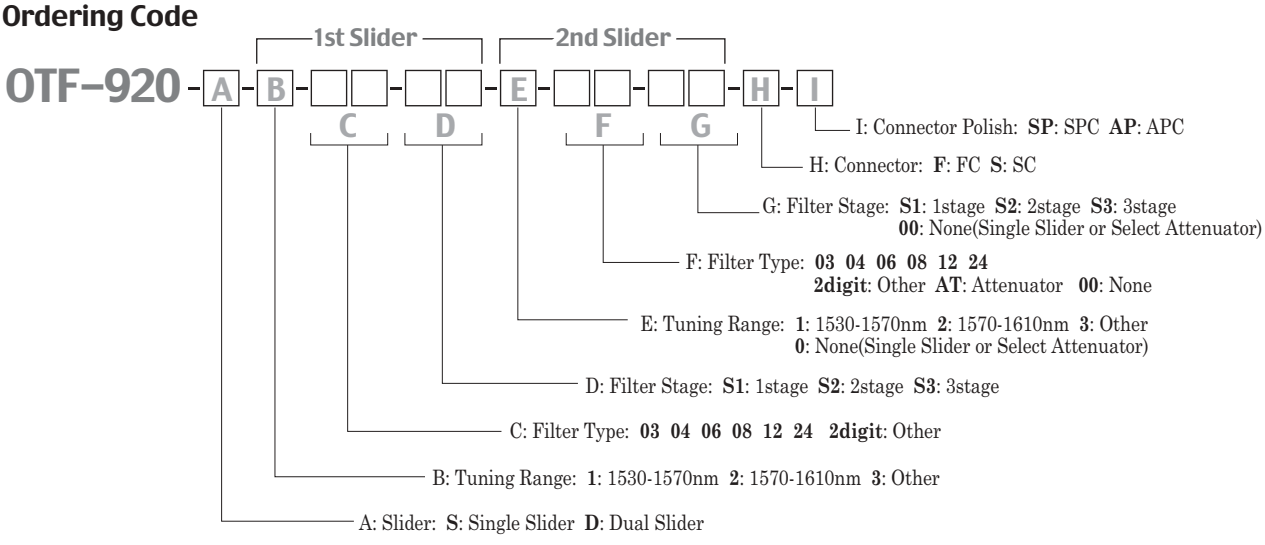
Filter type	03			04			06		
Stage	S1	S2	S3	S1	S2	S3	S1	S2	S3
Bandwidth @-3 dB (nm)(± 0.1 nm)	0.4	0.3	0.25	0.5	0.35	0.3	0.7	0.5	0.4
Bandwidth @-20 dB (nm)(typ.)	<3.8	<1.5	<1.2	<5.0	<1.7	<1.2	<7.5	<2.4	<1.5
Insertion loss (dB) (typ.)	<6.5(6.0)	<11.5(7.0)	<17.0(12.0)	<5.5(2.5)	<8.0(5.5)	<15.0(6.0)	<4.0(2.5)	<6.5(3.5)	<9.0(4.5)

Filter type	08			12			24		
Stage	S1	S2	S3	S1	S2	S3	S1	S2	S3
Bandwidth @-3 dB(nm)(± 0.1 nm)	0.95	0.65	0.5	1.35	0.95	0.7	2.9	1.95	ask
Bandwidth @-20 dB (nm)(typ.)	<9.8	<3.0	<2.2	<15.0	<4.5	<3.0	<32.0	<10.0	ask
Insertion loss (dB) (typ.)	<3.5(2.0)	<5.5(3.0)	<7.5(4.0)	<2.5(1.6)	<3.5(2.5)	<4.5(3.0)	<2.0(1.0)	<2.5(1.8)	ask

Specifications

Category	Parameter	Unit	Spec	Notes
Filter Characteristics 1st slider	-3dB Bandwidth	dB	-	Refer to "Filter Selections"
	-20dB Bandwidth	dB	-	Refer to "Filter Selections" (Typ.)
	Tuning range	nm	1530-1570 or 1570-1610	
Filter Characteristics 2nd slider	-3dB Bandwidth	dB	-	Refer to "Filter Selections"
	-20dB Bandwidth	dB	-	Refer to "Filter Selections" (Typ.)
	Tuning range	nm	1530-1570 or 1570-1610 or ATT	
Wavelength Characteristics	Wavelength Resolution	nm	0.01	Mechanical resolution
	Wavelength Accuracy	nm	<±0.1	
	Wavelength Repeatability	nm	<±0.05	n=50 / Measured at center wavelength of slider
	Wavelength Dependency	nm	<±0.1	
	Temp Characteristic	pm/ºC	2	
Power Characteristics	Input Power	dBm	<+20	
	PDL	dB	<0.1	Single stage (S1)
		dB	<0.2	Double stage (S2) and Triple stage (S3)
	Power Accuracy	dB	<±0.1	
	Insertion Loss	dB	-	Refer to "Filter Selections"
	Return Loss	dB	>45	
PMD	PMD	ps	<0.1	Design guaranteed performance
Environmental Conditions	Operating Tem. Range	ºC	20~30	
	Operating Humidity Range	%	<80	Non condensing
	Storage Temp. Range	ºC	10~40	
	Storage Humidity Range	%	<80	Non condensing
	Recommendation Calibration Period	Year	1	
Interface	Optical Connector	-	FC or SC	
	Connector Polish	-	SPC or APC	
	GP-IB & RS-232C	-	Yes	IEEE-488
Power supply	Voltage	V	AC100-240	
	Power Consumption	VA	11	(Typ.)
	Frequency	Hz	50/60	
	Max. Power Consumption	W	40	
Dimensions	Width x Height x Depth	mm	210 x 80 x 300	
	Weight	kg	4	

Ordering Code



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