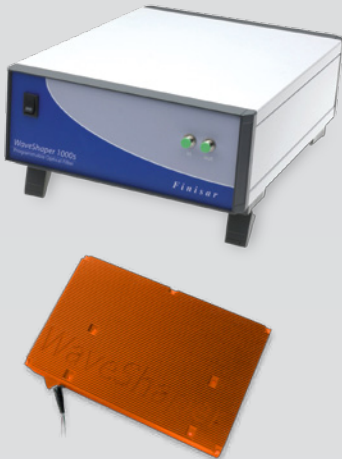


PRODUCT BRIEF



WaveShaper 1000S/SP (top) and 1000M/SP (bottom)

KEY FEATURES

- ▶ Polarization Maintaining (PM) Operation
- ▶ PM Fiber connection
- ▶ Based on High Resolution Liquid Crystal on Silicon (LCoS) technology
- ▶ Programmable amplitude and phase
- ▶ Group Delay adjustable up to +/-25 ps
- ▶ Wavelength resolution: <0.1 nm
- ▶ Arbitrary Filter Shape
- ▶ No manual tweaking of Group Delay anymore!
- ▶ Available in both bench-top (1000S/SP) and OEM (1000M/SP) form factors

APPLICATIONS

- ▶ Laser pulse shaping
- ▶ Laser pulse generation
- ▶ Laser pulse compression
- ▶ Signal filtering in Polarization-Multiplexed Communication Systems

OVERVIEW

The WaveShaper 1000/SP is a Polarization Maintaining (PM) programmable filter which provides full control of the amplitude and phase spectra across the entire C-band. Typical applications include the creation and shaping of short pulses down to the femtosecond regime as well as programmable filtering for developing and testing of single-polarization and polarization-multiplexed optical communication systems.

The WaveShaper 1000/SP transmits and processes the signal which is launched into the slow axis of the input PM fiber. The signal launched into the fast axis is not transmitted and will be extinguished by more than 20 dB. This instrument is available as a bench-top unit (1000S/SP) as well as an OEM module which can be integrated into customers' equipment (1000M/SP).

SINGLE-POLARIZATION FILTERING FOR OPTICAL COMMUNICATIONS

In investigations of polarization-multiplexed and coherent communication systems, the ability to precisely control the filtering of a single polarization state allows the assessment of polarization-dependent channel characteristics on system performance.

PULSE SHAPING

Femtosecond pulses are required in a large variety of applications, including marking and surface treatment in material processing, manufacturing of medical appliances and as a communications signal source. Shaping of such short optical pulses requires fine adjustment of the phase and the amplitude of an optical signal with high spectral resolution. The WaveShaper 1000/SP allows rapid, precise setting of these characteristics of optical signals with a spectral resolution of 10 GHz across the entire C-band. Pulses as short as 500 fs or pulses with a special shape, e.g. rectangular (Figure 1) can be created just by programming the WaveShaper 1000/SP.

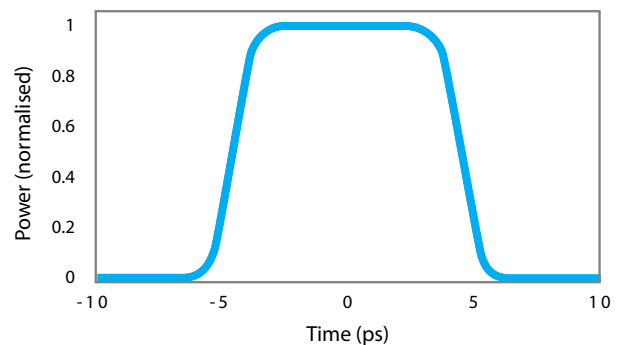


Figure 1: Rectangular pulse

PULSE SHIFTING AND PULSE CREATION

Pulses entering the WaveShaper can be shifted in time up to about +/-25 ps. Also they can be copied and pasted to a different position in time. Figure 2 shows an example of a variety of pulse bursts which have been generated from a single input pulse.

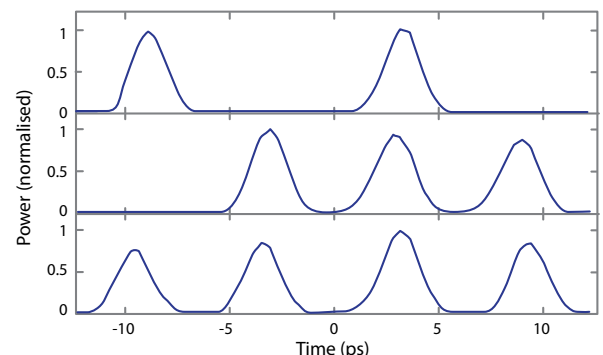


Figure 2: Creation of pulse patterns: pulse sequences of 1010, 0111, 1111 have been created from a single input pulse

WaveShaper 1000/SP Programmable Single Polarization Filter

WAVESHAPER 1000S/SP, WAVESHAPER 1000M/SP


Operating Wavelength Range	Wavelength Range			
	1000S/SP, 1000M/SP	1527.4 - 1567.5 nm (191.250 to 196.275 THz)		
Loss and Dispersion (Note 1)	Typ		Max	
	Insertion Loss (Note 2)	4.5 dB	6.5 dB	
	Insertion Loss Non-Uniformity (Note 2)	0.5 dB	0.7 dB	
	Return Loss		25 dB	
	Group Delay Ripple		±0.75 ps	
	Chromatic Dispersion		±10 ps/nm	
Polarization Extinction Ratio	1000S/SP 1000M/SP	>20 dB >25 dB		
Filter Control (Note 1)	Min		Max	
	Filter Shape	Arbitrary		
	Filter Bandwidth	10 GHz	full range	
	Center Frequency Setting Resolution		1 GHz	
	Center Frequency Setting Accuracy		±2.5 GHz	
	Bandwidth Setting Resolution		1 GHz	
	Bandwidth Setting Accuracy		±5 GHz	
	Bandwidth Setting Repeatability		±2.5 GHz	
	Group Delay Control Range		-25 ps to +25 ps	
	Group Delay Setting Resolution		< 0.5 ps	
	Settling Time		500 ms	
	Attenuation Control	Attenuation Control Range		0-30 dB
Attenuation Resolution			0.01 dB	
Attenuation Accuracy			±1 dB from 0 to -10 dB ±10% from -10 dB to -20 dB ±15% from -20 dB to -30 dB	
Optical Power	Total Input Optical Power		+27 dBm	
	Per 50 GHz spectral slice		+13 dBm	
Mechanical, Electrical and Environmental	Operating Temperature	15°C	35°C	
	Operating Humidity	10%	90%	
	Communications Interface	USB 2.0		
	Power Consumption	1000S/SP 1000M/SP	100-240 V, 50 VA 5 V, 50 VA	
	Connector Type	1000S/SP 1000M/SP	FC/APC no connectors, bare fiber ends	
	Fiber type	PM (Corning Panda PM 1550) signal in slow axis		
	Size	1000S/SP 1000M/SP	316 mm x 241 mm x 88 mm 220 mm x 140 mm x 37 mm	

Notes: 1. Measured over 0.5 dB passband on a 100 GHz band-pass filter unless specified
2. Measured on signal in slow axis

Part Numbers: WaveShaper 1000S/SP, C-Band, FC-APC Connectors: WS-AA-1000S-SP-H
WaveShaper 1000M/SP, C-Band, bare fiber: WS-AA-1000M-SP-N

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