Fiber Optics

PHOTLINE AN IXBLUE COMPANY

LASER COMPONENTS

ModBox Pulse Shaper

Arbitrary Optical Waveform Generator

Delivering Modulation Solutions

ModBox

The Photline Modbox-Pulse-Shaper is an Optical Modulation Unit to generate short shaped pulses with high extinction ratio at 1030 nm, 1053 nm or 1064 nm. It allows dynamic extinction ratio from 35 dB to above 55 dB with user adjustable pulse duration, repetition rate and temporal pulse shape. One benefit of the Photline Modbox-Pulse-Shaper is to pre-compensate the pulse distorsion that occurs in the amplifiers chains that operate in (a highly) saturated regime .

When combined with properly selected high power CW laser, pulsed optical amplifier, and Pulse Broadening ModBox, the Photline Modbox-Pulse-Shaper makes up a complete Front End System that can deliver custom pulses with energy of several uJ.

Photline has accumulated a strong experience in such systems and successfully installed them in many Intense Laser Facilities all over the world.

FEATURES

- Optical waveform flexibility
- Low jitter
- Low rise & fall times
- Very high extinction ratio (35 dB, 55 dB)
- Proven solution

APPLICATIONS

- Inertial confinement fusion
- Interaction of intense light with matter
- Laser plasma interaction
- Laser implosion
- Interaction of ion beam with HP laser

OPTIONS

- Complete Front-End System
- Extinction ratio value
- Choise of electrical pulse generator

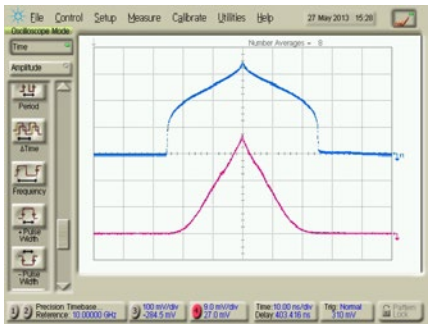
RELATED EQUIPMENTS

- ModBox Spectrum Broadening
- CW high power laser
- Pulsed optical amplifiers

Performance Highlights

Parameter	Min	Typ	Max
Operating wavelength		1030 nm, 1053 nm, 1064 nm	
Pulse contrast		35 dB, or > 55 dB	
Pulse waveform		Arbitrary, user adjustable	
Pulse width		> 125 ps	
Rise / Fall times		< 50 ps	
Jitter		< 10 ps	

Electrical & Optical Pulse Diagrams



Electrical pulse from AWG (blue curve) with corresponding Optical output (pink curve)

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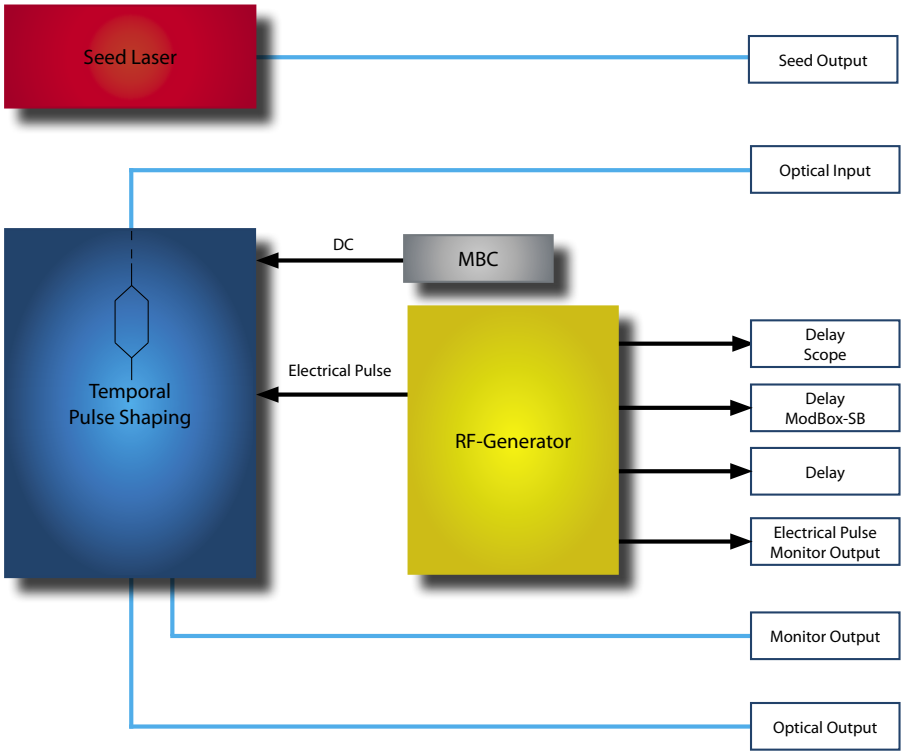
Functional Block Diagram



The ModBox Pulse Shaper integrates :

- a temporal pulse shaping block based on a modulators set to ensure a very high optical pulse extinction ratio (35 dB, or 55 dB) and flexible pulse shaping,
- an automatic Modulator Bias Control circuitry (MBC) to garantee high extinction ratio stability over long periods of time,
- an RF-Generator with an arbitrary waveform capability

The ModBox offers several electrical outputs :

- "Delay scope" : for scope synchronization,
- "Delay ModBox-SB" : for pulse synchronization with the ModBox-Spectrum-Broadening,
- "Monitor output" : an optical monitoring output.

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Optical Input Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operating wavelength	λ	-	1030 nm, 1053 nm, 1060 nm, 1064 nm			
Line-width	Δλ	-	-	1	3	MHz
Optical input power	OP_{in}	-	-	-	5	W

Electrical Output Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Delay scope / Delay ModBox-SB / Delay outputs						
Delay range	-	-	0	-	10	s
Delay resolution	R	-	-	1	-	ps
Delay RMS jitter	J_{RMS}	Internal trigger w/o additional delay	-	10	15	ps
		External trigger w/o additional delay	-	-	25	ps
Delay accuracy	-	-	-	-	150	ps
Trigger delay	-	(Insertion delay)	-	-	100	ns
External trigger rate input	-	+1 V on 50 Ω with positive slop	0	-	1	MHz
Output pulse amplitude	-	In step of 10 mV, on 50 Ω	2.5	-	10	V

Optical Output Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Output pulse shapes	-	-	Arbitrary, user adjustable			-
Sample rate	-	-	8	-	-	Gsample/s
Number of samples	-	Per pulse	-	800	-	-
Pulse width	PW	Remotly adjustable	100 p	-	10 n	s
Frequency repetition rate	FRR	Adjustable by the trigger frequency	1	-	100 k	Hz
Rise time / Fall time	t_r/t_f	20 % - 80 %	-	35	50	ps
Pulse extinction ratio	SER	ModBox-PS-WL-AWG-35dB	33	35	-	dB
		ModBox-PS-WL-AWG-55dB	53	55	-	dB
Extinction ratio stability	ΔSER	Over 12 hours	-	-	1	%rms
Pulse energy stability	ΔE	Based on rectangular pulse shape	-	-	1	%rms
Polarisation extinction ratio	PER	-	15	20	-	dB
RMS jitter	J_{RMS}	-	-	-	10	ps
Optical return loss	ORL	-	40	-	-	dB
Insertion loss	IL	ModBox-PS-WL-AWG-35dB	-	8	10	dB
		ModBox-PS-WL-AWG-55dB	-	13	15	dB

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Panels

Parameter	Condition	Min	Typ	Max	Unit
Front panel					
Interface	AWG, Delay, MBC		LCD interface with keypad		
Optical ports	Main & Monitor		FC/APC, SC/APC, bare fibers		
Optical fiber	-		Polarization maintaining fiber, Corning PM 98-U25A		

Parameter	Condition	Min	Typ	Max	Unit
Rear Panel					
Delay output connectors	-		SMA		
Trigger input connector	-		BNC		
AWG monitor output connector	-		SMA		
Remote control connector	Rf Generator (AWG & Delay) Seed laser MBC		USB		

Dimensions - Compliance

Parameter	
Size	19 inches 3U or 4U
Weight	5 kg
Power supply	100 - 120 V / 220 - 240 V automatic switch, 50 - 60 Hz
Compliance	
Safety	EN 60625-1
Marking	CE

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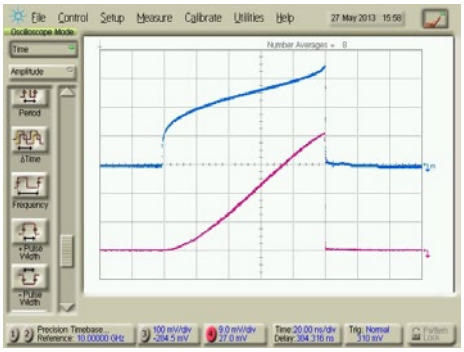
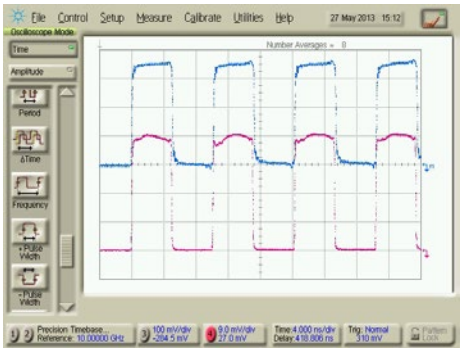
ModBox Electrical and Optical Outputs

The following equipment was used to obtain below results :
- ModBox-Pulse-Shaper with built-in AWG
- Oscilloscope Agilent 86100B
- Tektronix CSA 8000 oscilloscope



Electrical pulse from AWG (blue curve) with corresponding Optical output (pink curve)



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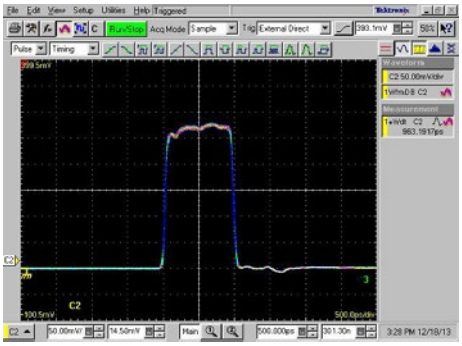
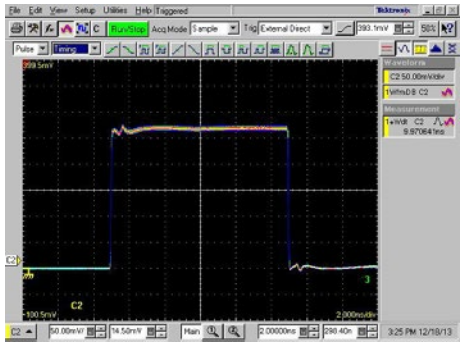
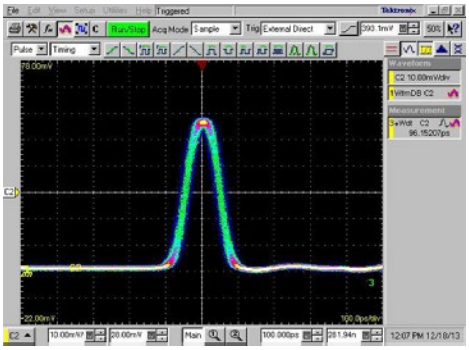


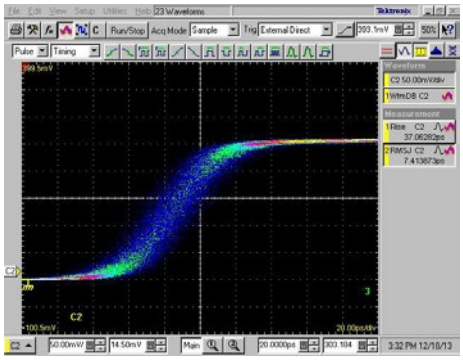
1 ns optical square pulse



10 ns optical square pulse



100 ps optical pulse



Jitter and rise time measurements,
@ 10 ns and 10 kHz repetition rate

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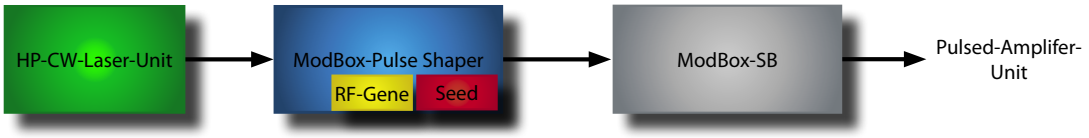
Related equipments



The HP-CW-Laser-Unit is a fiber laser featuring a single narrow line-width seed laser combined with an high output power amplifier. The high power laser delivers up to 5 W at 1053 nm, 1064 nm, and up to 2 W at 1030 nm.

The ModBox-SB is spectral broadening solution to suppress the Stimulated Brillouin Scattering (SBS) caused in optical fibers by high fluxes of highly coherent light. The SBS degrades the signal integrity and prevents the proper transmission through the fiber. Under certain conditions, when amplification occurs for instance, the SBS can lead to the destruction of the fiber and the optical components along or forward the fiber.
The ModBox-SB is electrically triggered with the the ModBox-Pulse-Shaper.

Ordering information

ModBox-PS-WL-AWG-ER-AB-CD

WL = Wavelength : 1030nm, 1053 nm, 1064nm
AWG = AWG Option, omit if no electrical AWG
ER = Pulse Extinction Ratio : 35dB, 55dB
AB = Input connector : 00 bare fiber FA FC/APC, SA SC/APC
CD = Output connector : 00 bare fiber FA FC/APC, SA SC/APC
Note : optical connectors are Senko with narrow key or equivalent

Example : ModBox-SP-1053nm-AWG-55dB-FA-FA is a Pulse Shapping ModBox operating at 1053 nm which allows 55 dB pulse extinction ratio and equipped with FC-APC connectors.

About us

Photline is a member of the iXBlue group of companies and a provider of Fiber Optics Modulation Solutions based on the company $LiNb0_3$ modulators and high-speed electronics modules. Photline Technologies offers high speed and high data rate modulation solutions for the telecommunication industry and the defense, aerospace, instruments and sensors markets. The products offered by the company include : comprehensive range of intensity and phase modulators (800 nm, 1060 nm, 1300 nm, 1550 nm, 2000 nm), RF drivers and modules, transmitters and modulation units.

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