ModBox Spectral Broadening

Near Infra Red Spectral Broadening Modulation Unit

Delivering Modulation Solutions

ModBox

The Spectral Broadening ModBox achieves the broadening of an optical signal by modulating its phase via the mean of a very efficient $LiNb0_3$ phase modulator. A number of side bands are created over a spectral width that can reach several hundreds GHz.

The spectral broadening of optical signals is a 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. When the temporal coherence of the signal is destroyed, the SBS power threshold is significantly increased and thus its effects can be eliminated.

FEATURES

- Suppress Stimulated Brillouin Scattering
- Externally triggered
- Low insertion loss

APPLICATIONS

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

OPTIONS

- Wavelength from 780 nm up to 2 220 nm
- Alternative synthesizer frequencies
- Rack-mount or module version

RELATED EQUIPMENTS

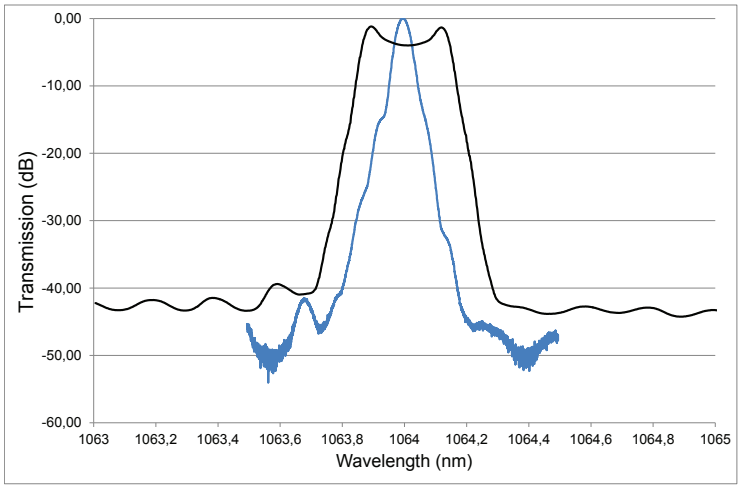
- ModBox Pulse-Shaper
- CW high power laser
- Pulsed amplifiers
- Complete Front-End System

Performance Highlights

Parameter	Min	Typ	Max
Operating wavelength	1030 nm, 1053 nm, 1064 nm		
Spectral broadening	-	0.3 nm	1.5 nm (1)
RF source frequency	-	2 GHz	-
Insertion loss	-	3 dB	-

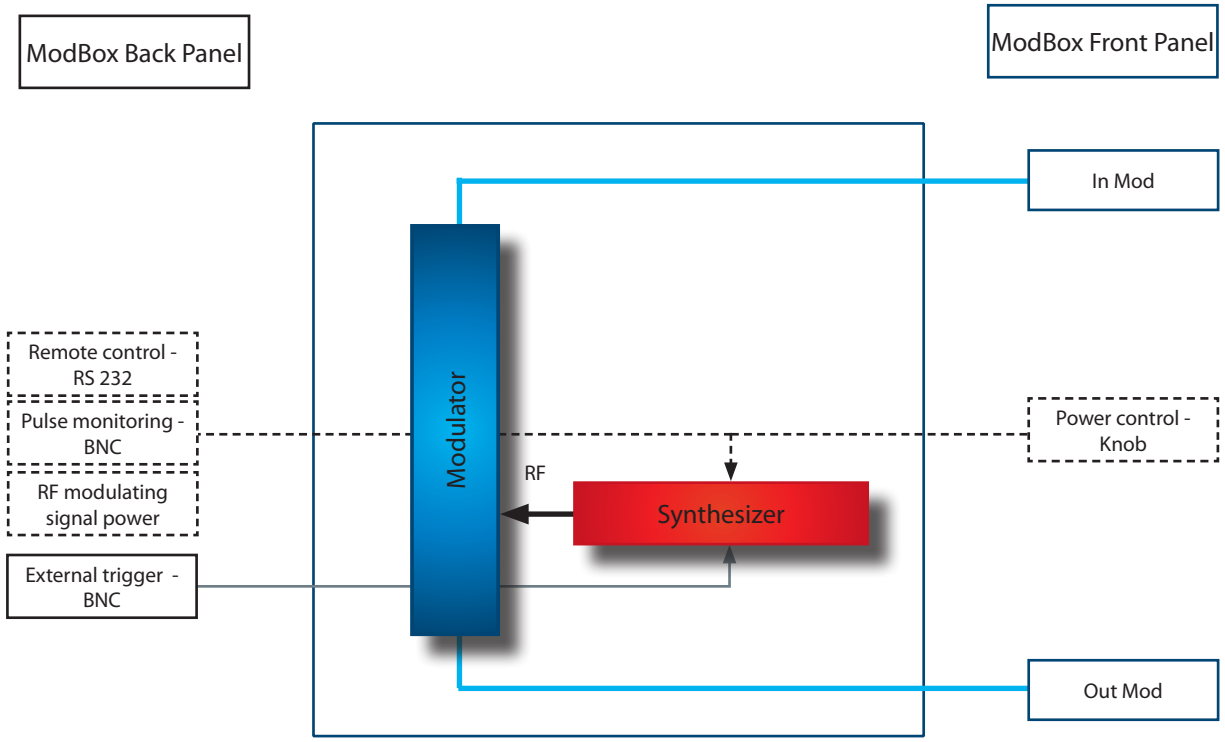
(1) With 14.25 GHz RF synthesizer

Broadened Spectrum



ModBox responses : the blue curve is the optical analyzer impulse response, the black curve is the broadened spectrum.

Functional Block Diagram



The ModBox Spectrum Broadening integrates :

- a high RF power handling $LiNb0_3$ Mach-Zehnder phase modulator,
- a pulsed sine wave 2 GHz (or 14.25 GHz) oscilator with power control.

The RF generator delivers a pulsed sine wave signal to the internal phase modulator. This signal is gated by the ModBox-Pulse-Shaper (external trigger) and is applied to the phase modulator only in presence of an optical pulse. A number of side bands with a frequency spacing equal to the RF frequency appears and the optical spectrum is strongly widened.

Optical Input Specifications User supplied, not a ModBox specification

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operating wavelength	λ	-	1030 nm, 1053 nm, 1060 nm, 1064 nm			
Optical input power	OP_{in}	Average, CW	-	-	100	mW
Polarization extinction ratio	PER	Polarization is linear and controlled	20	25	-	dB

Electrical Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Frequency	F	Sine wave pulsed	-	2 (1)	-	GHz
External trigger input signal	-	From ModBox-Pulse-Shaper	-	TTL	-	-
External trigger repetition rate	-	From ModBox-Pulse-Shaper	1	-	200 k	Hz

(1) 14.25 GHz RF synthesizer also available

Output Modulated Signal with Internal 2 GHz synthesizer

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Spectral broadening	SP_{2GHz}	-	0.2	0.3 (1)	-	nm
			53	79	-	GHz
Polarization extinction ratio	PER	-	20	25	-	dB
Insertion loss	IL	-	-	2.5	3.3	dB
Optical return loss	S_{11}	-	-	-40	-	dB

(1) Spectral broadening of 1.5 nm using 14.25 GHz internal RF synthesizer

Panels

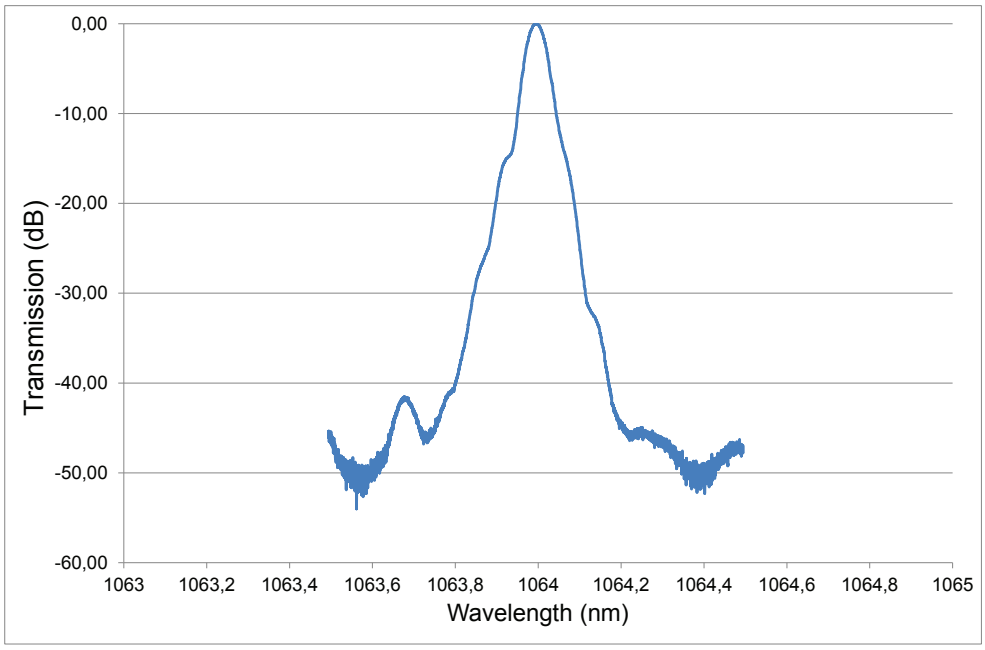
Parameter	Condition	Min	Typ	Max	Unit
Front panel					
RF modulating signal power	-		Rotary knob		
Optical ports	Input and output		FC/APC, SC/APC, bare fibers		
Optical fiber	-		Polarization maintaining fiber, Corning PM 98-U25A		

Parameter	Condition	Min	Typ	Max	Unit
Rear Panel					
External trigger input	-		BNC		
Pulse monitoring output	-		BNC		
RF source monitoring	-		RS 232 - SubD9 female		

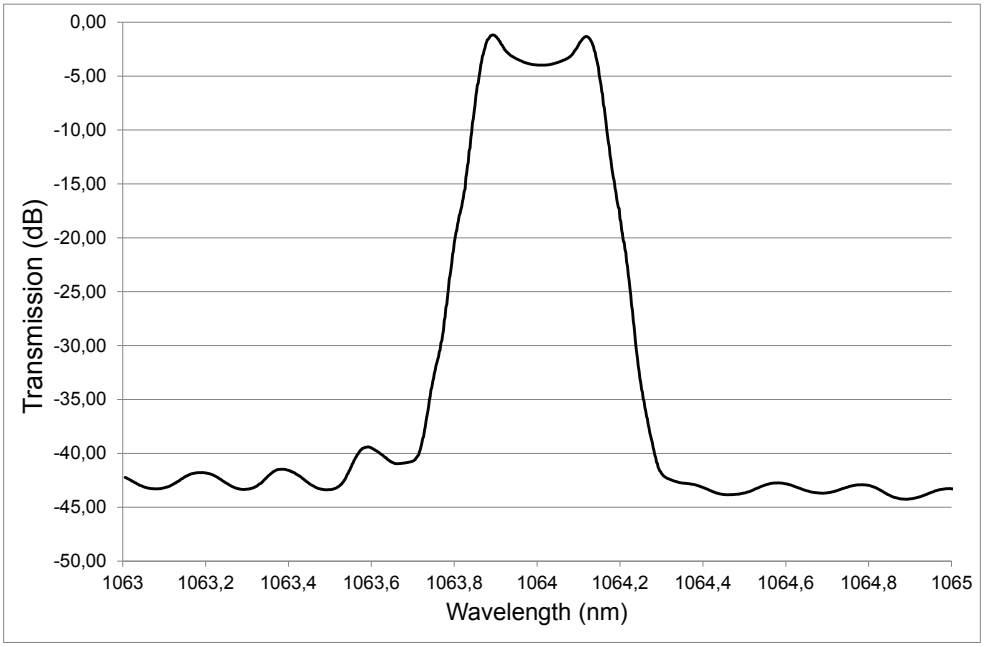
Dimensions - Compliance

Parameter	
Size	19 inches 2U or 3U
Weight	3 kg
Power supply	100 - 120 V / 220 - 240 V automatic switch, 50 - 60 Hz
Compliance	
Safety	EN 60625-1
Marking	CE

Optical Signal With Internal 2 GHz RF source

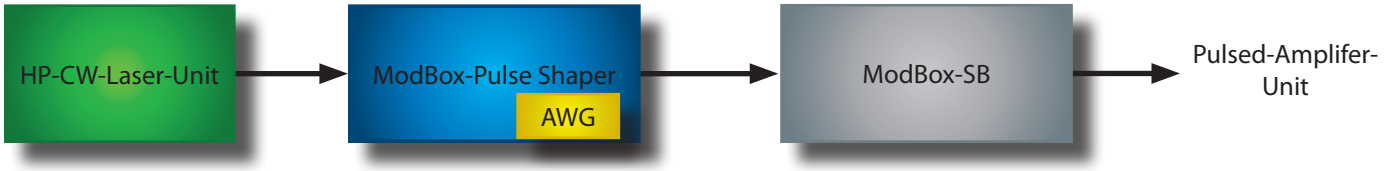


The curve shows the spectra of the input optical signal.
In regards of OSA resolution, bandwidth and sampling characteristics, the repetition rate was increased up to 100 kHz to obtain a better rendering.
NB : input laser spectrum is limited by the OSA Agilent 86142B resolution (0,06 nm = 16 GHz)



The curve shows the spectra of the output optical signal, spectrally broadened optical signal.
In regards of OSA resolution, bandwidth and sampling characteristics, the repetition rate was increased up to 100 kHz to obtain a better rendering.
NB : input laser spectrum is limited by the OSA Agilent 86142B resolution (0,06 nm = 16 GHz)

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 Photline Modbox-Pulse-Shaper is an Optical Modulation Unit to generate short bespoke 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.

Ordering information

ModBox-SB-WL-RF-AB-CD

WL = Wavelength : 1030nm, 1053nm, 1064nm
RF = Internal RF source frequency : 2GHz, 14.25GHz, 20GHz
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-SB-1053nm-2GHz-FA-FA is a Spectral Broadening modulation unit for 1053 nm with 2 GHz internal synthesizer and 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 $LiNbO_3$ 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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ZI Les Tilleroyes - Trépillot
16, rue Auguste Jouchoux - 25 000 Besançon - FRANCE
tél. : +33 (0) 381 853 180 - fax : + 33 (0) 381 811 557