ModBox

# ModBox-SB-NIR

## Near Infra Red Spectral Broadening Unit

The Spectral Broadening ModBox achieves the broadening of an optical signal by modulating its phase via the mean of a very efficient $LiNbO_3$ 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 2220 nm
- Alternative synthetizer frequencies
- Rack-mount or module version

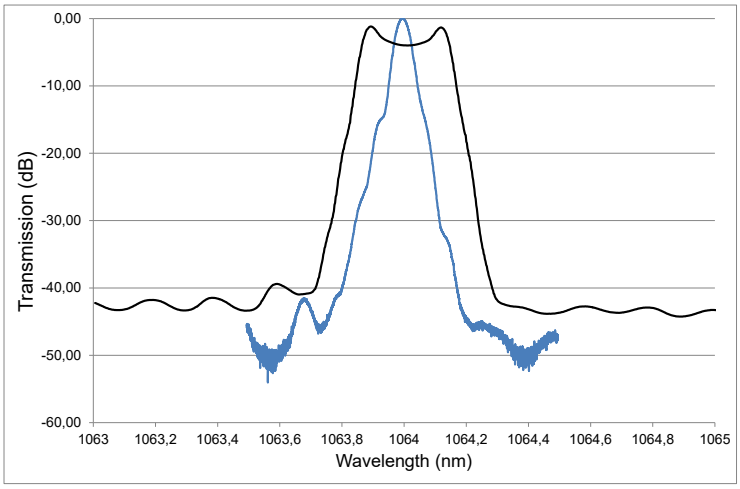
### RELATED EQUIPMENTS

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

### PERFORMANCE HIGHLIGHTS

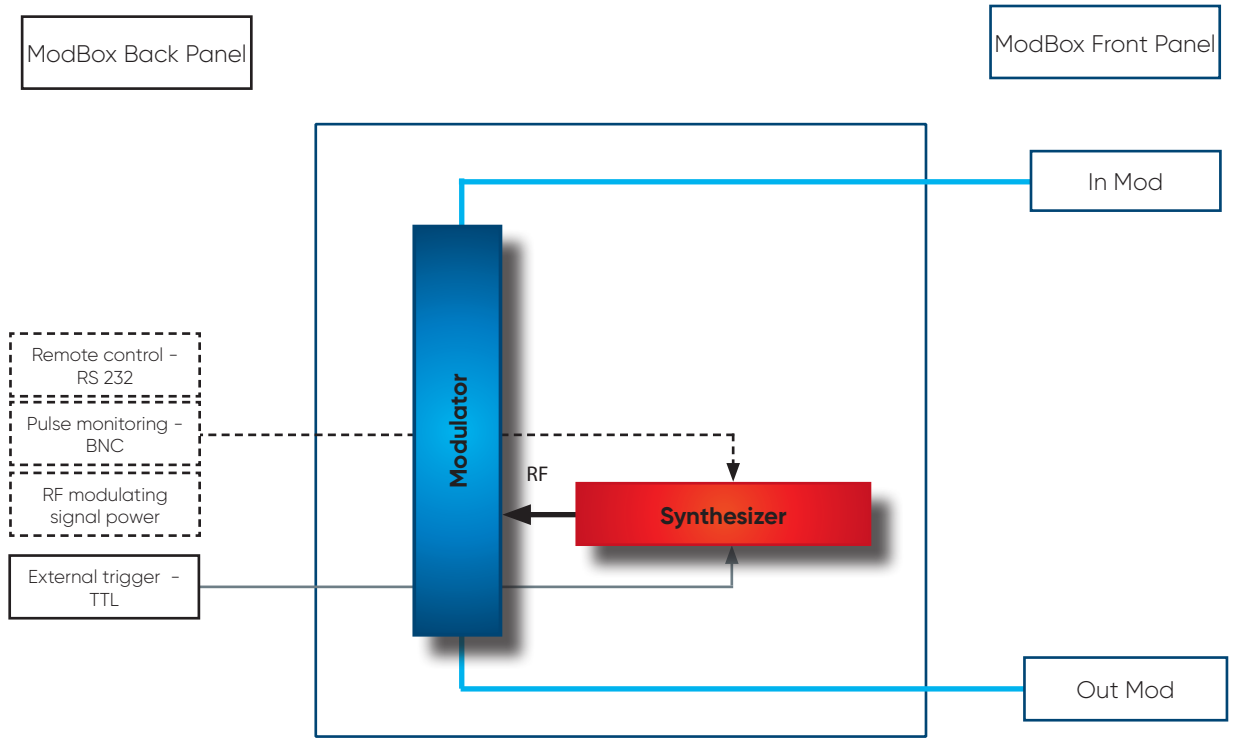
| | |
|---|---|
| Operating wavelength | 980 nm / 1053 nm / 1150 nm |
| Spectrum broadening | 0.3 nm / 1.5 nm |
| RF Source frequency | 2 GHz / 14.25 GHz |
| Insertion loss | 3 dB |

### BROADENED SPECTRUM




Typical 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 $LiNbO_3$ Mach-Zehnder phase modulator,
- a synchrone and pulsed sine wave 2 GHz / 14.25 GHz oscillator with power control.

The RF generator delivers a pulsed sine wave signal to the internal phase modulator. This RF generator can also be synchronized by a 10 MHz external reference clock. 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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Operating wavelength | λ | - | 980 | 1053 | 1150 | nm |
| Optical input power | $OP_{in}$ | Average, CW | - | - | 100 | mW |
| Polarization extinction ratio | PER | Polarization is linear and controlled | 25 | - | - | dB |

## ELECTRICAL SPECIFICATIONS

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Frequency | F | Sine wave pulsed | - | 2 / 14.25 | - | GHz |
| External trigger input signal | - | From Modbox-Pulse shaper | - | TTL | - | - |
| External trigger repetition rate | - | From Modbox-Pulse shaper | 1 | - | 200 k | Hz |
| Ref Clock Input | Frequency | Sine wave | - | 10 | - | MHz |
| | Amplitude | Sine wave | - | 500 | - | mVpp |

## OPTICAL OUTPUT SPECIFICATIONS

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Spectral broadening | SP | With 2 GHz synthetizer | 0.2 | 0.3 | - | nm |
| | | With 14.25 GHz synthetizer | - | 1.5 | - | nm |
| Polarization extinction ratio | PER | - | 25 | 29 | - | dB |
| Insertion loss | IL | - | - | 2.5 | 3.3 | dB |
| Optical return loss | $S_{11}$ | - | - | -40 | - | dB |

# ModBox-SB-NIR

## PANELS

| Parameter | | Condition |
|---|---|---|
| | **Front panel** | |
| Optical ports | Input and output | FC/APC, SC/APC |
| Optical fiber | - | Polarization maintaining fiber, Corning PM98-U25A |
| | **Rear panel** | |
| External trigger input | - | BNC - TTL |
| Ref Clock In | - | BNC |
| Pulse monitoring output | - | BNC |
| RF source control & monitoring | - | RS 232 - SubD9 female |

## COMPLIANCE AND SAFETY

| Parameter | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Compliance | - | BS EN 60825 | - CE certified | | |
| Interlock response time | From laser system | - | - | 10 | ms |
| Remote interlock | Laser emission authorized only when 24 V TTL applied on ModBox Interlock input.<br>Laser emission is produced only when specific instructions sent through Ethernet port of the ModBox.<br>Laser status emission is available on a dry contact: open during laser emission, closed when there is no laser emission. | | | | |

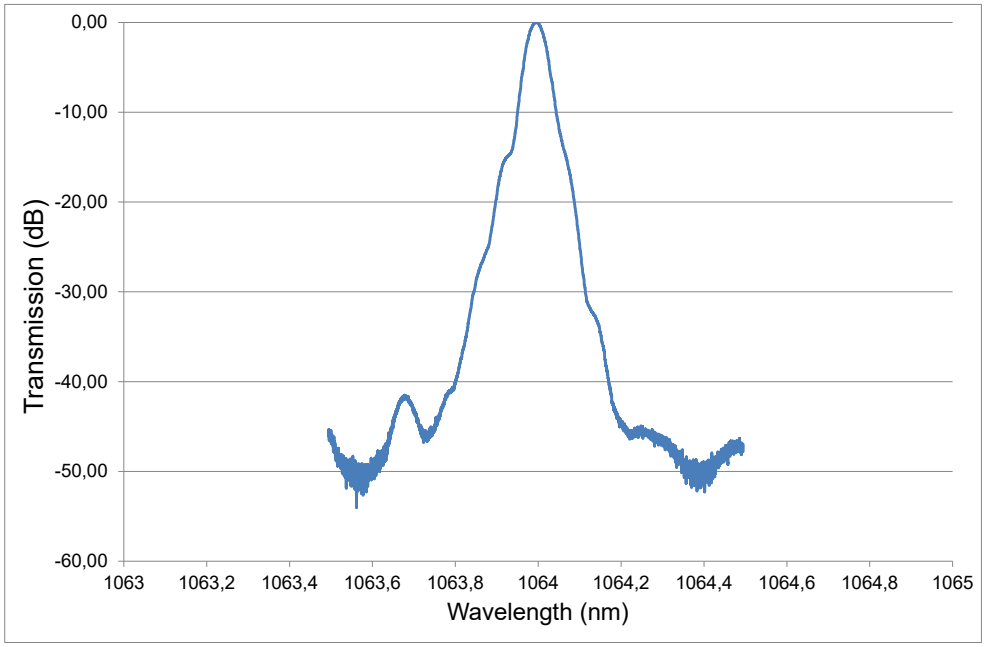
## DIMENSIONS

| Parameter | |
|---|---|
| Size | 19 inches 2U or 3U |
| Weight | 3 kg |
| Power supply | 100 - 120 V / 220 - 240 V automatic switch, 50 - 60 Hz |

## ENVIRONMENT

| Parameter | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Operating / storage Temp | - | +20 / -10 | - | +25 / +30 | °C |
| Operating / storage humidity | - | 30 to 60 / 30 to 80 | | | % |

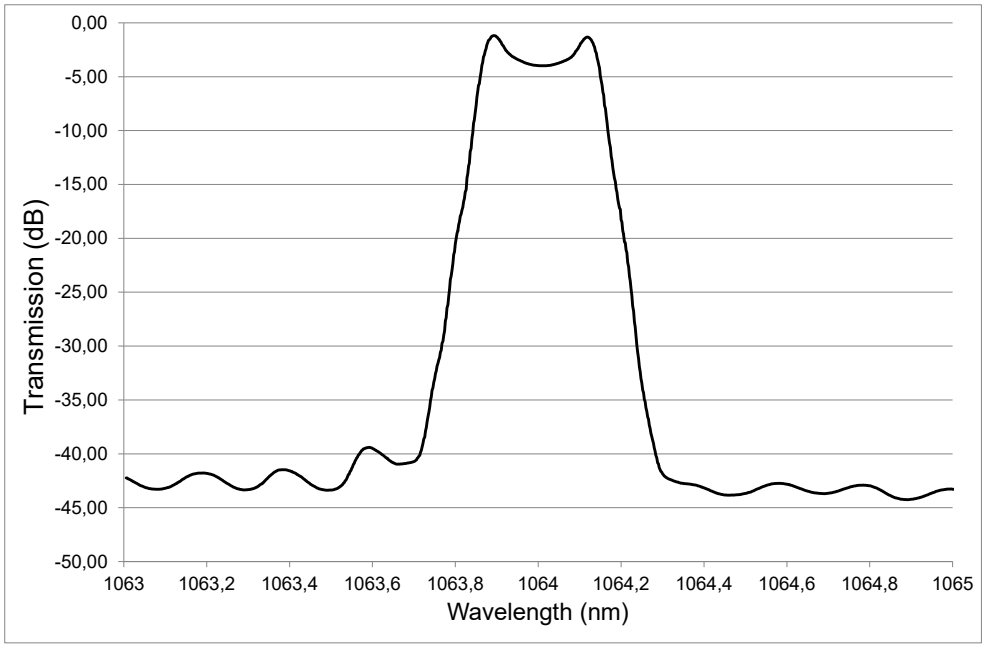
## OPTICAL SIGNAL WITH INTERNAL 2 GHZ RF SOURCE




The curve shows the spectrum 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 Anritsu MS9710C resolution (0,05 nm = 13 GHz)




The curve shows the spectrum 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 Anritsu MS9710C resolution (0,05 nm = 13 GHz)

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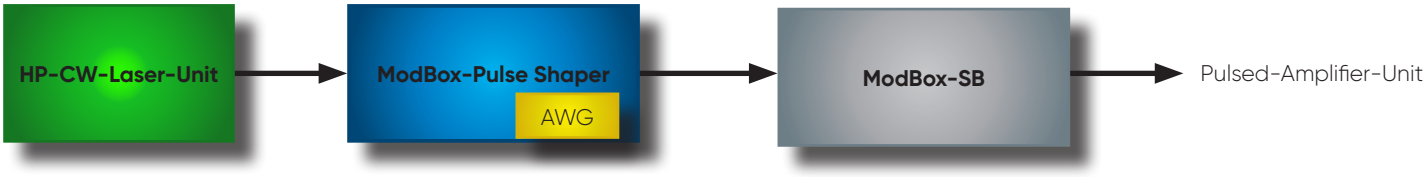
## RELATED EQUIPMENTS




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 Exail 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-SP

SB = Optical Spectrum Broadening Unit
WL = Wavelength: 1030nm, 1053nm, 1064nm
SP = Spectral broadening: 0.3nm, 1.5nm

### Opt-YY

YY = Output connectors, FA : FC/APC - SA : SC/APC





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