ModBox

# ModBox-CBand-CS-SSB

ModBox CBand and Carrier Suppression modes

The ModBox-CBand-CS-SSB is an Optical Transmitter Frequency shifter based on high order optical Carrier Suppressed and Residual Carrier Single Side Band modulation. The ModBox operates in the full C band and up to 8 GHz.

The ModBox-CBand-CS-SSB is dedicated to applications that require a coarse tuning and very fine tuning frequency shift. Tunablility and accurate control of your wavelength can be useful for precision laser spectroscopy, quantum optics, cold-atom inertial sensors and atomic clocks, optical measurements, and optical fiber sensors.

The ModBox-CBand-CS-SSB is a fully optimized CS-SSB optical transmitter based on one $LiNbO_3$ IQ modulator and its automatized bias controller. It generates one (CS-SSB, Carrier Suppressed Single Side Band) or two RF sidebands (Carrier Suppressed Dual Side Band) that can be independently controlled in frequency and power.


Non contractual picture

## FEATURES

- Versatile Optical Transmitter
- High side band & carrier suppressions
- Preregistered mode: CS-SSB
- Proven solution
- Carrier power level controllable

### Option

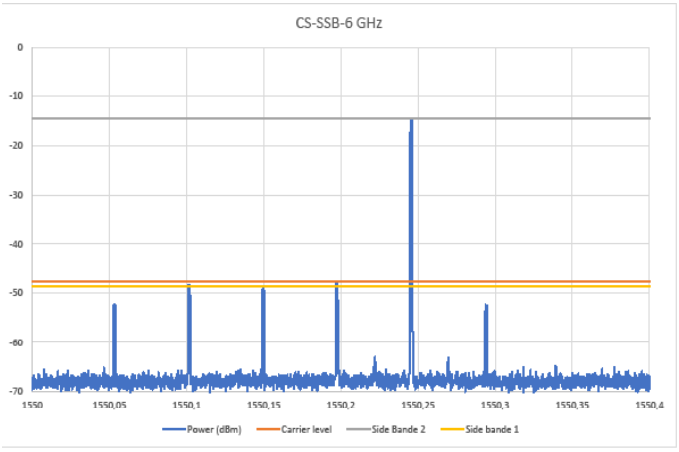
- Offset SSB modulation frequency: from 100 MHz, or up to 15 GHz

## PERFORMANCE HIGHLIGHTS

| Parameter | Nominal |
|---|---|
| Operating wavelengh | C-Band |
| Modulation formats | CS-SSB, CS-DSB |
| Offset SSB modulation frequency | Up to 8 GHz [1] |
| Optical carrier attenuation | > 30 dB |
| Side band attenuation | > 30 dB |

[1] Other «Offset SSB modulation frequency» bandwidth is available on request.

### Optical CS-SSB ModBox Response




Example of Carrier Suppressed Single Side Band signal

*Ordering Information:*

XSoptix
800 Village Walk #316
Guilford, CT 06437
Ph: 203-401-8093
Email orders to: sales@xsoptix.com
Fax orders to: 800-878-7282



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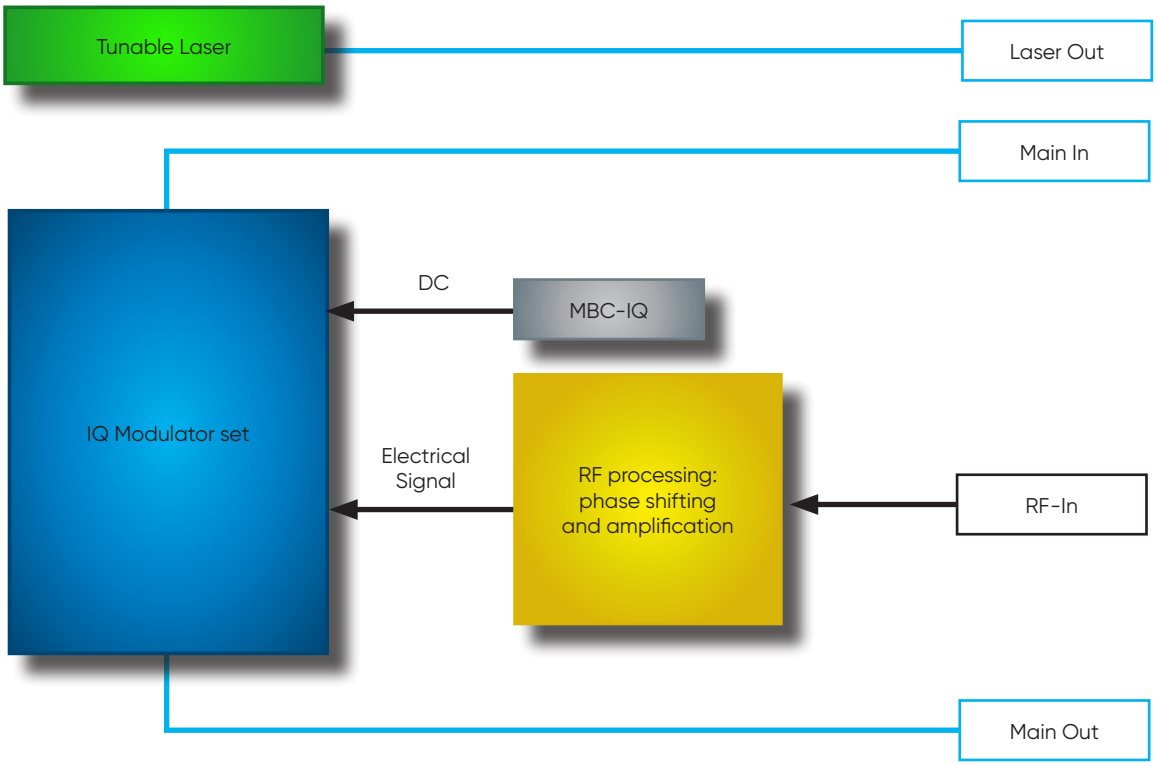
# ModBox-CBand-CS-SSB

## FUNCTIONAL BLOCK DIAGRAM




The ModBox-CBand-CS-SSB is designed around a set of Dual Parallel Mach-Zehnder Modulators, an automatic bias control circuitry and RF signal processing. The equipment operates with a user supplied RF signal. The ModBox embeds a high purity C-band tunable laser source.

The equipment incorporates an input RF coupler that splits the RF signal toward the I and Q sub-Mach-Zehnders RF input, tunable delay lines and RF driver. The carrier attenuation and the side band attenuation are depending on several factors including the RF power driven to the modulator, the RF power balance between the two sub-Mach-Zehnders, the wavelength of the optical signal, the frequency of the RF modulation signal and the I/Q phase shift (that one is set with the DC3 voltage).

The ModBox will be fully preset with fine adjustments of the RF driver gain, delay line and DC3 bias voltage in order to obtain the maximum extinction of the carrier and the side band at 1550 nm.

# ModBox-CBand-CS-SSB

## ELECTRICAL INPUT SPECIFICATIONS

User supplied, not a Modbox specification.

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Signal type | $RF_{IN}$ | - | | | sine | |
| Level | $V_{RFIN}$ | 50 Ω - Single ended | 200 | 600 | 1000 | mVpp |
| Impedance matching | $Z_{RFIN}$ | - | - | 50 | - | Ω |
| Frequency [1] | $F_{RFIN}$ | - | 2 [2] | - | 8 [3] | GHz |

[1] Other «Offset SSB modulation frequency» bandwidth is available on request. [2] On request from 100 MHz. [3] On request up to 15 GHz.

## OPTICAL INPUT SPECIFICATIONS

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Operation | λ | CW | 1530 | - | 1675 | nm |
| Polarisation | Pol | PM FIBER - FC / APC | Linear and controlled | | | - |
| Power | $P_{IN}$ | - | 10 | - | 20 | dBm |
| Side mode suppression ratio | SMSR | Intrinsic laser value | 30 | - | - | dB |
| Spectrum linewidth | Δλ | Intrinsic laser value | - | 1 | 20 | MHz |

## OPTICAL OUTPUT SPECIFICATIONS

| Parameter | Symbol | Condition | Min | Typ | Max | Unit | Test |
|---|---|---|---|---|---|---|---|
| Laser mode of operation | - | - | | CW, tunable | | | |
| SSB mode control | - | - | | Automatic bias control | | | |
| Modulation formats | MF | - | | CS-SSB | | - | OK |
| Operating wavelength | λ | - | 1527.6 | 1550 | 1565.5 | nm | OK |
| Linewidth | Δλ | - | - | - | 100 | kHz | - |
| Relative intensity noise | RIN | - | - | - | -145 | dB/Hz | - |
| Side mode suppression ratio | SMSR | - | 40 | 55 | - | dB | - |
| SSB output power | SSB | - | - | -4 | -3 | dBm | OK |
| Output power | Main Out | Max mode | - | 10 | 11 | dBm | OK |
| Offset SSB frequency [1] | SSB | - | 2 [2] | - | 8 [3] | GHz | - |
| Optical carrier attenutation | CS | Test 4 & 6 GHz, @1550 nm | 30 | 35 | - | dB | OK |
| CS stability | ΔCS | Over 12 hours | - | 1 | - | dBrms | OK |
| Side band attenuation | SSB | Test 4 & 6 GHz, @1550 nm | 30 | 35 | - | dB | OK |
| SSB stability | ΔSSB | Over 12 hours | - | 1 | - | dBrms | OK |
| Polarisation extenction ratio | PER | - | 20 | 23 | - | dB | - |
| Optical return loss | ORL | - | 40 | - | - | dB | - |

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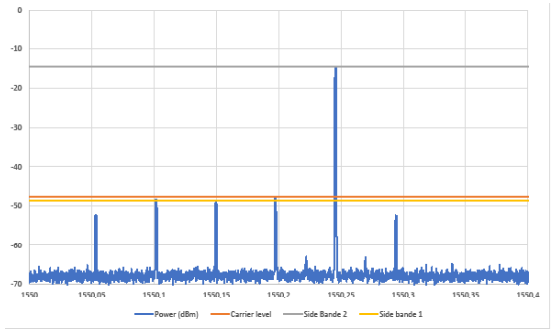
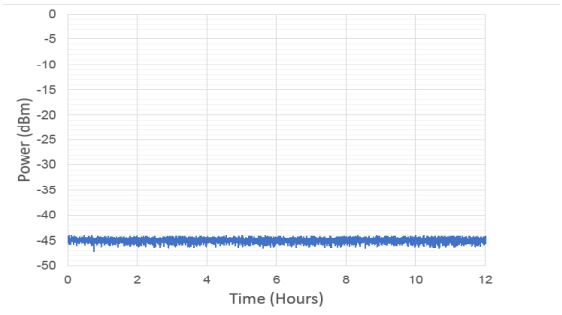



1550 nm - 6 GHz - CS-SSB




Carrier suppression stability

# ModBox-CBand-CS-SSB

## INTERFACES, DIMENSIONS AND COMPLIANCE

| **Interfaces** | |
|---|---|
| Optical | Front panel: CBand range - FC/APC- Polarization maintaining fiber, Corning PM 15-U25D |
| RF | Front panel - SMA - Female |
| Control | Touch screen Smart Interface (front panel), GUI (Ethernet) - Windows 10 |
| | Other control: MBC, RF driver gain, seed laser |
| Power supply | 100 V - 120 V / 220 V - 240 V automatic switch 50 Hz - 60 Hz (Rear panel) |
| EMC and optional norms | EN61326-1 Ed. 2006 / NF EN 60825-1 & EN 60825-2 Ed.2014 |
| Dimensions / Weight | Rack 19'' x 3U, Depth = 495 mm / 8 kg |

## ENVIRONMENT

| **Parameter** | **Min** | **Typ** | **Max** | **Unit** |
|---|---|---|---|---|
| Operating temperature | | 22 ± 5 | | °C |
| Non-operating temperature | | -10 to +30 | | °C |
| Operating humidity | | 30 to 60 | | % |
| Non-operating humidity | | 30 to 80 | | % |


Non contractual picture





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