ModBox

ModBox-1064 nm-CS-SSB

The ModBox-1064nm-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 at 1064 nm and up to 18 GHz.



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The ModBox-1064nm-CS-SSB is a versatile SSB transmitter allowing the control of the carrier level by an original mean, and achieving coherent modulation schemes such as CS-SSB.
This modulation scheme is set for a 10 GHz ± 7 GHz frequency range operation.
The laser, RF amplifiers' parameters and RF delay lines are controllable.

The ModBox-1064nm-CS-SSB is a fully optimized SSB optical transmitter based on new NIR $LiNbO_3$ IQ modulator and its automatized bias controller.

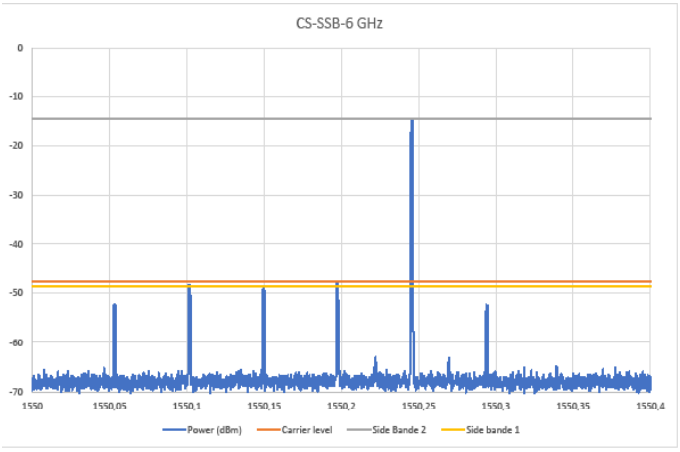
FEATURES

- Versatile Optical Transmitter
- High side band & carrier suppressions
- Optimized for CS-SSB operation
- Proven Modbox design

PERFORMANCE HIGHLIGHTS

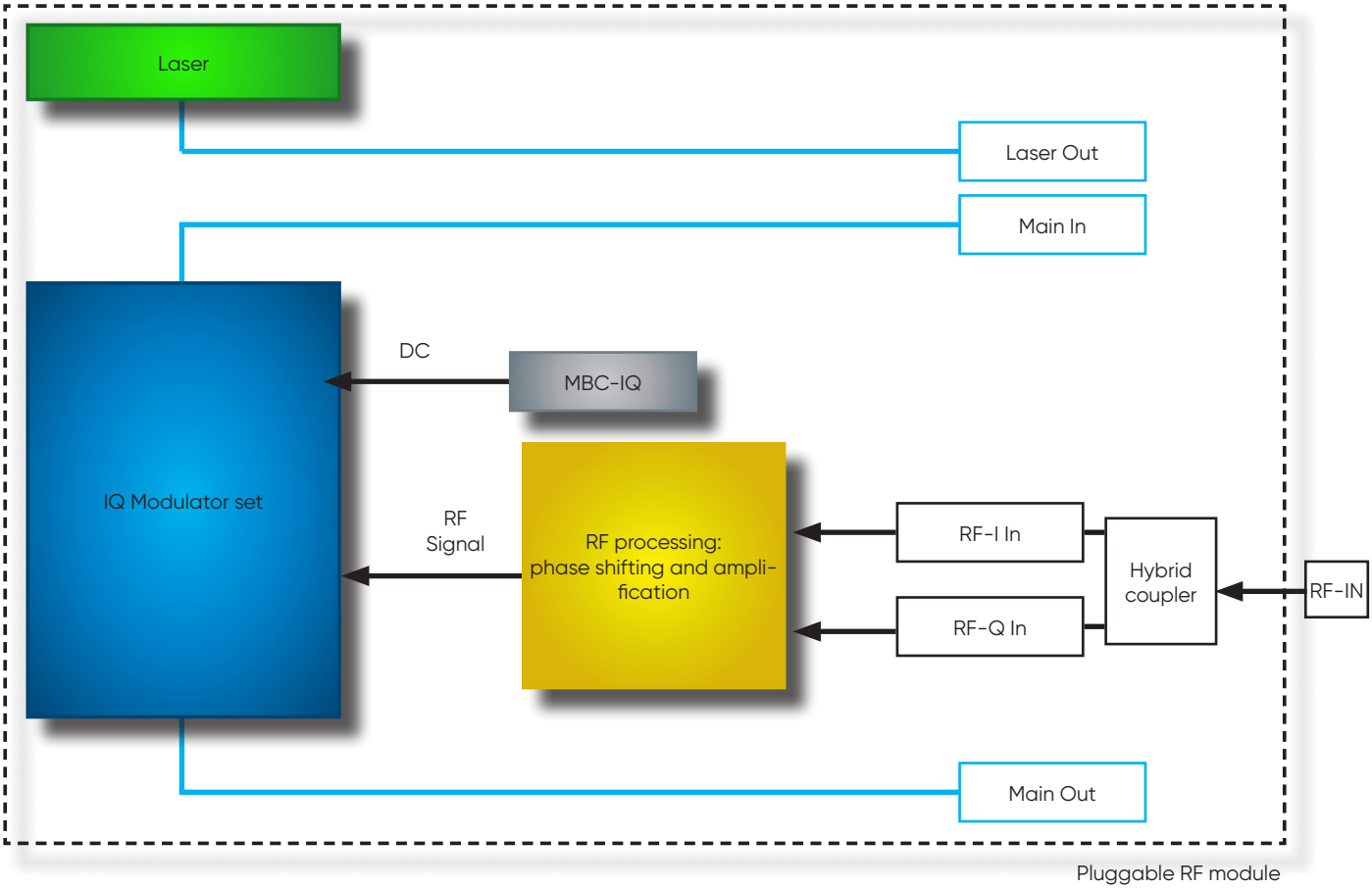
Parameter	Nominal
Operating wavelengh	1064 nm
Modulation formats	CS-SSB
Offset SSB modulation frequency	Up to 18 GHz
Optical carrier attenuation	> 20 dB
Side band attenuation	> 20 dB

Optical CS-SSB ModBox Response



Example of Carrier Suppressed Single Side Band signal
(measure from ModBox-CBand-CS-SSB)

FUNCTIONAL BLOCK DIAGRAM



The ModBox-1064m-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 1064 nm laser source.

The equipment is delivered with an RF 90° hybrid coupler (internal to the ModBox) that splits the RF signal toward the I and Q sub-Mach-Zehnders RF input, tunable delay lines and RF driver. The hybrid coupler can be proposed as an external device to install on the front pannel (options). The ModBox will be fully preset with fine adjustments of the RF driver gain, delay line and DC_3 bias voltage in order to obtain the maximum extinction of the carrier and the side band at 1064 nm.

ModBox-1064 nm-CS-SSB

ELECTRICAL INPUT SPECIFICATIONS

User supplied, not a Modbox specification. External laser specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Signal type	RF-I/Q_{in}, RF_{in}	-			sine	
Level	RF_{in}	With 90° coupler-50 Ω–SE	-10	-	+4	dBm
Impedance matching	Z_{RFIN}	-	-	50	-	Ω
Frequency	F_{RFIN}	-	1	-	18	GHz

OPTICAL INPUT SPECIFICATIONS

User supplied, not a Modbox specification. External laser specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Signal type	Main In	-			CW	
Level	OP_{IN}	-	-	-	200	mW
Operating wavelength	λ	-	950	1064	1150	nm
Linewidth	OP_{IN}	-	-	1	10	MHz
Side mode suppression ratio	SMSR	-	30	-	-	dB

OPTICAL OUPUT SPECIFICATIONS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Test
Internal laser mode	-	-			CW		
Internal laser wavelength	λ	-	-	1064	-	nm	OK
Internal laser optical power	LOP_{OUT}	-	1	-	50	mW	OK
Internal laser linewidth	Δλ	-	-	1	10	MHz	-
Side mode suppression ratio	SMSR	-	30	35	-	dB	-
SSB mode control	-	-		Automatic bias control			
Modulation formats	MF	-			CS-SSB		OK
SSB output power	SSB	Optical input: 50 mW RF freq range: 10 GHz +/-7 GHz with optimised RF phase shift and power	-	-4	-	dBm	OK
Output power	OP_{IN}	Max mode, optical input: 50 mW	-	10	-	mW	OK
Offset SSB frequency	SSB	-	1	5	18	GHz	-
Optical carrier attenutation (operation 10 GHz & 1064 nm)	CS	-	20	25	-	dB	OK
CS stability	ΔCS	Over 12 hours	-	1	-	dBrms	OK
Side band attenuation (operation 10 GHz & 1064 nm)	SSB	-	20	25	-	dB	OK
Polarisation extenction ratio	PER	-	20	23	-	dB	-
Optical return loss	ORL	-	40	-	-	dB	-
Warm-up time	-	-	-	30	120	min	OK

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INTERFACES, DIMENSIONS AND COMPLIANCE

Interfaces	
Optical (Laser Out, Main In, Main Out)	Front panel: SC/APC with metal cap - Polarization maintaining fiber, Corning PM 98-U25D
RF (RF-I In, RF-Q In, RF In)	Front panel - SMA - Female
Control	Touch screen Smart Interface (front panel), GUI (Ethernet) - Windows 10
	Manual control through knobs: RF delay line
	GUI: MBC, RF driver gain, seed laser
	Low level commands for external control sofware
Power supply	100 V - 120 V / 220 V - 240 V automatic switch 50-60 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		%



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