ModBox

ModBox-VNA-976nm-40GHz

976 nm, 40 GHz Modulation Unit

The ModBox-VNA-976nm-40GHz is a wide bandwidth Optical Transmitter designed to extend Vectorial Network Analyzers applications into the optical domain.

When associated with a Vectorial Network Analyzer, they make up a high performance and easy to use test equipment for photoreceivers or any high speed optoelectronic device characterization.

The ModBox-VNA-976nm-40GHz incorporates a 976 nm low noise laser source and a modulation stage based on a wide bandwidth $LiNbO_3$ analog modulator with an automatic bias control circuit.



FEATURES

- Analog modulation up to 40 GHz
- Low RIN
- High harmonics suppression

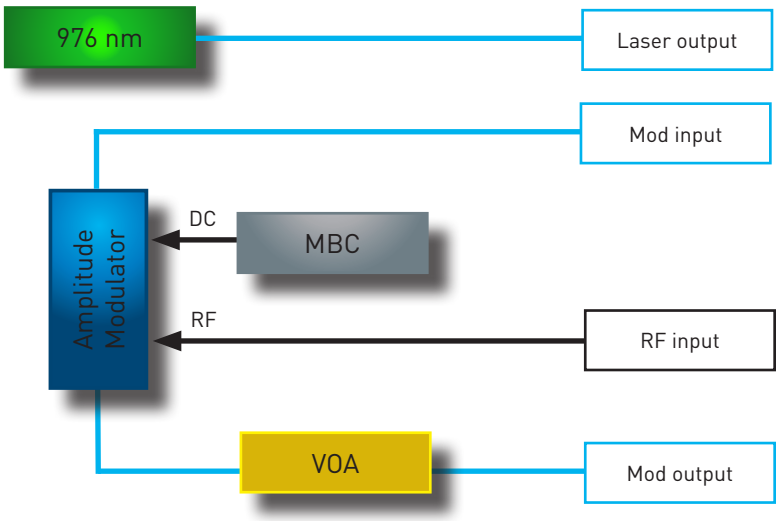
APPLICATIONS

- Transmission system test
- Components characterization
- Receiver frequency test
- R&D laboratories

PERFORMANCE HIGHLIGHTS

Parameter	
Operating wavelengh	976 nm
Modulation formats	VNA, NRZ, PAM-4
Frequency	Up to 40 GHz
Modulated output power	Superior to 5 dBm

FUNCTIONAL BLOCK DIAGRAM



The ModBox-VNA-976nm-40GHz features:

• A chirp-free X-cut $LiNbO_3$ (Lithium Niobate) Mach-Zehnder modulator for very high linearity and very wide electro-optical bandwidth.

• A modulator bias controller. The internal $LiNbO_3$ modulator is a X-cut device with very low drift. However an automatic bias control circuit is provided to lock the operating point of the modulator at the quadrature point whatever the environmental conditions. It is pre-set for operation in quadrature, in the linear portion of the modulator transfer curve.

• A 976 nm low RIN laser. Wavelength and power are tunable through the front panel controls or the ModBox software interface. An optical patch-cord is delivered to connect the laser output port to the modulator input optical port.

• A Variable Optical Attenuator (VOA) to precisely control the modulated optical outpul signal.

The ModBox-VNA-976nm-40GHz is controlled from the front panel thanks to the Graphical Interface (Windos OS).
It comes also with a set of TCP commands for remote control through the Ethernet port.

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INPUT OPTICAL SPECIFICATIONS

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Operating wavelength	λ	Continuous wave signal	-	976	-	nm
Optical input power	OP_{in}	Continuous wave signal	7	-	16	dBm
Polarization	Pol	-	Maintain and linear			-

INPUT ELECTRICAL SPECIFICATIONS

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input electrical termination	-	AC coupled		Single ended		
Signal type	-	-		Analog		
Input voltage [1]	V_{IN}	Amplitude modulation	0.4	0.6	1	Vpp
Bandwidth	BW	-	-	-	40	GHz
Impedance matching	Z_{IN-RF}	-	-	50	-	Ω

(1): The ModBox-VNA-976nm-40GHz does not feature an internal RF amplifier. The VNA characterization is usually performed in a "small signal mode", therefore a RF amplifier is not necessary. Omitting the amplifier allows to obtain a smoother and flatter transfer function.

OUTPUT OPTICAL SPECIFICATIONS

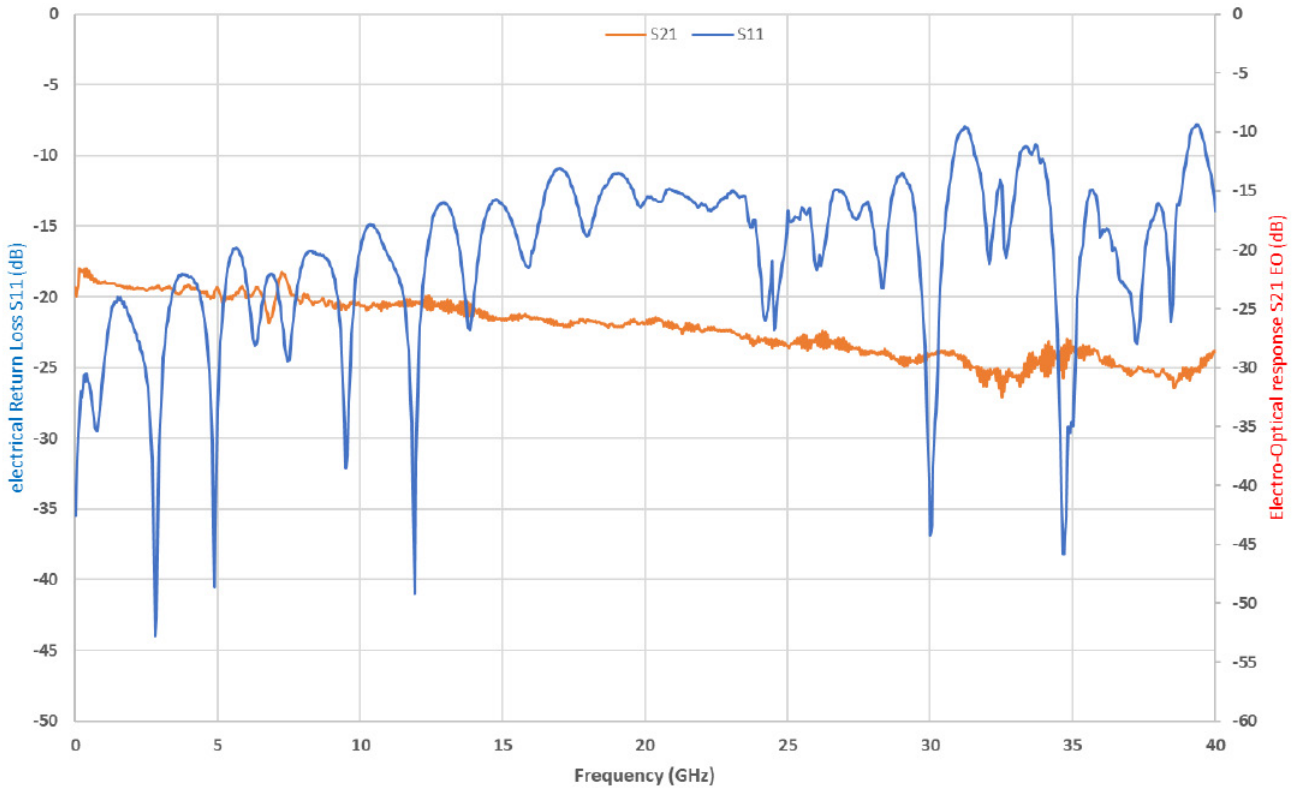
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Modulation frequency	-	-	-	-	40	GHz
Wavelength	λ	Embedded by default	-	976	-	nm
Wavelength laser tuning range	$\Delta\lambda$	Diode chip temperature control	-	0.8	1	nm
Modulated output power	OP_{OUT}	-	5	6	-	dBm
Optical output power adjustment	ΔOP_{OUT}	By the use of VOA	-40	-	0	dB
Optical output power stability	δOP_{OUT}	Over 8 hours	-	-	0.25	dB
Side Mode Suppression ratio	SMSR	-	40	45	-	dB
Spectrum linewidth	$\delta\lambda$	FWHM	-	3	15	MHz
Relative Intensity Noise	RIN	@16 dBm output power from seeder	-	-	-163	dB/Hz
Polarization Extinction Ratio	PER	-	17	20	-	dB
Optical return loss	ORL	-	-40	-	-	dB
Electrical return loss	ERL	-	-	-12	-10	dB

ABSOLUTE MAXIMUM RATINGS

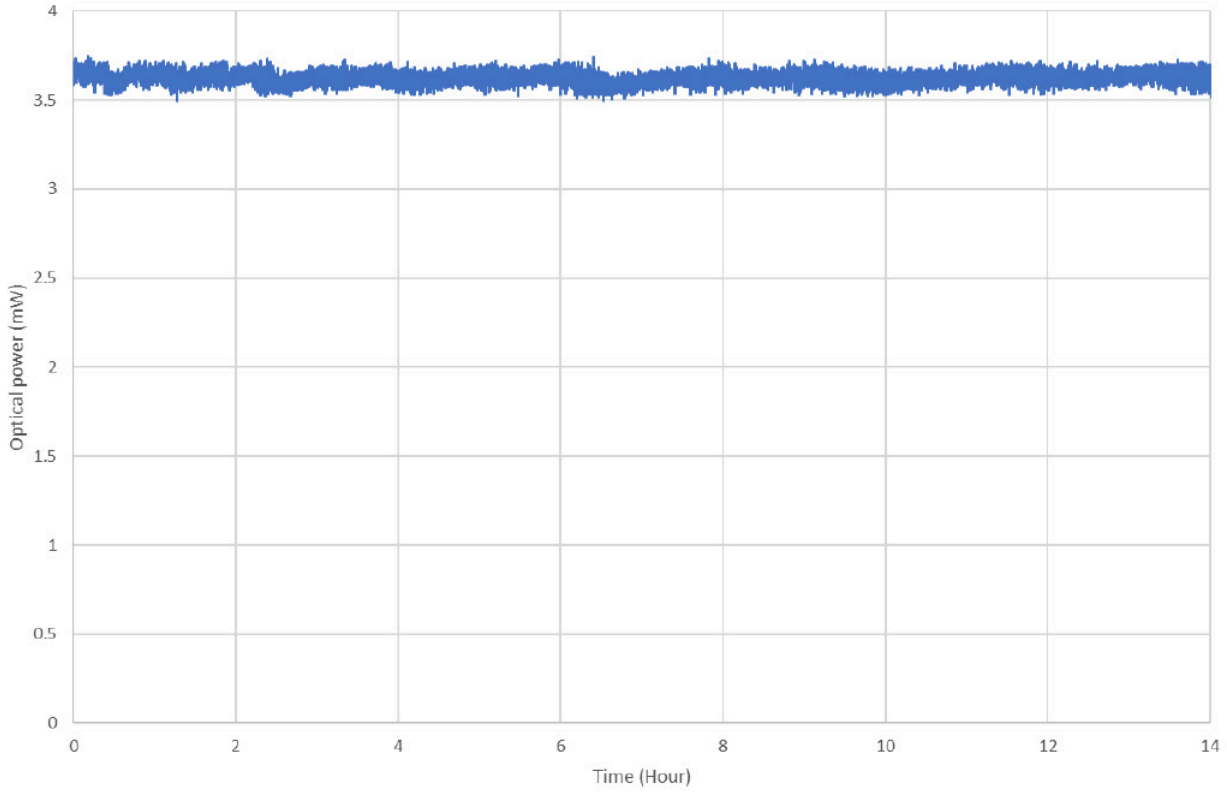
Parameter	Symbol	Min	Max	Unit
RF input power	EP_{in}	-	28	dBm
Optical input power	OP_{in}	-	20	dBm

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Typical ModBox [S] parameters



Typical ModBox output optical power stability at Quad



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INTERFACES, DIMENSIONS AND COMPLIANCE

Interfaces

Optical connectors and fibers	FC/APC - Polarization maintaining fiber, Corning PM85-U25D
Electrical connector	V female (1.85 mm)
Control	Embedded interface (front panel touchscreen) + remote control (Ethernet)
Power supply	100 V - 120 V / 220 V - 240 V automatic switch 50 Hz - 60 Hz (rear panel)
Dimensions / Weight	Rack 19'' x 2U, depth = 495 mm / 5 kg
EMC and optical norms	EN61326-1 Ed. 2006 / NF EN 60625-1
Laser safety	Class 3R 



ORDERING INFORMATION

Modbox-VNA-976nm-40GHz

VNA = Optical Vectorial Network Analyser extension

976nm = operation at 976 nm with embedded laser

40GHz = Analog Modulation up to 40 GHz