



The ModBox-VNA-CBand is a C-Band and 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 the characterization of photoreceivers or any high speed optoelectronic device.

The ModBox-VNA-CBand incorporates a 1550 nm low RIN laser source and a modulation stage based on a wide bandwidth LiNbO₃ modulator with an automatic bias control circuit.

FEATURES

- Analog modulation up to 40GHz, 70GHz
- Dither-free bias controller
- Low RIN
- High harmonics suppression

APPLICATIONS

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

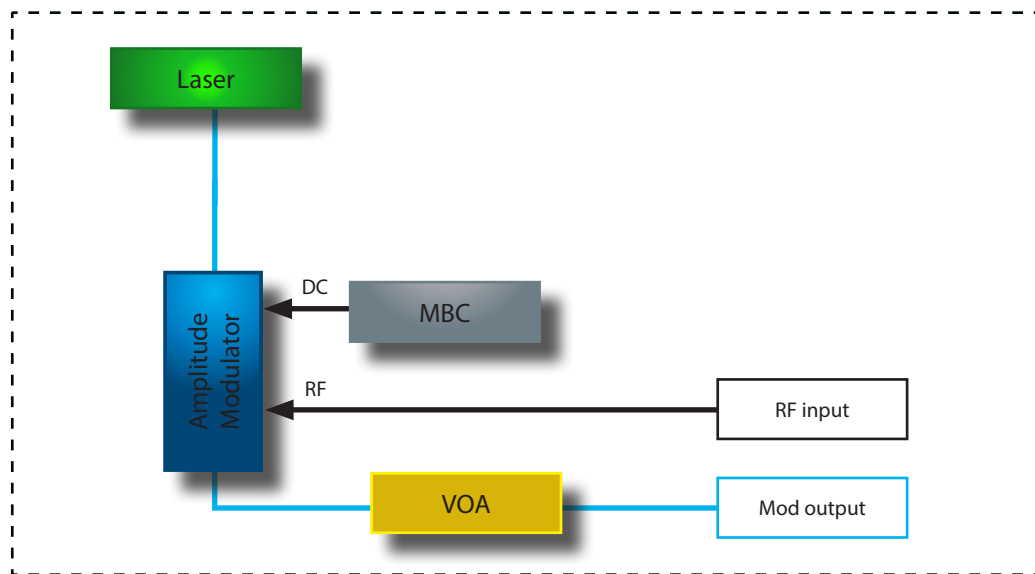
OPTIONS

- 850 nm, 1310 nm & 1550 nm, O-band
- Multi-Channel

Performance Highlights

| Parameter | Min | Typ | Max |
|--------------------------------|--------------------|---------|----------------|
| Operating wavelength | - | 1550 nm | - |
| Modulation format | Analog Modulations | | |
| Modulation bandwidth | - | - | 40 GHz, 70 GHz |
| Modulated optical output power | 6 dBm | - | - |

Functional Block Diagram



The ModBox-VNA-CBand features:

- A chirp-free X-cut LiNbO₃ (Lithium Niobate) Mach-Zehnder Analog Intensity modulator. It is selected for its high electro-optic bandwidth and flat, low ripple, electrooptic response curve.
- A modulator bias controller. The internal LiNbO₃ 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. The bias control circuit is dither free and therefore does not add any spurious content to the small signal modulation generated by the VNA. It is pre-set for operation in quadrature, in the linear portion of the modulator transfer curve.
- A 1550 nm low RIN laser directly spliced to the modulator. Wavelength and power of such embedded laser are tunable through the front panel controls or the ModBox software interface.
- A Variable Optical Attenuator (VOA) to precisely control the modulated optical output signal.

The ModBox-VNA-CBand is controlled from the front panel thanks to the Smart interface touch screen. The Smart manual interface allows for bias control circuit and laser settings. It comes also with a simple GUI solution, Windows based and implemented through the Ethernet interface.

Input Electrical Specifications User supplied, not a ModBox specification

| 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 | ModBox-VNA-CBand-40GHz | - | - | 40 | GHz |
| | | ModBox-VNA-CBand-70GHz | - | - | 70 | GHz |
| Impedance matching | Z_{IN-RF} | - | - | 50 | - | Ω |

(1): The ModBox-VNA-CBand 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 Specifications

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---------------------------------------|-------------------|---------------------------|---------|-----|------|-------|
| Modulation bandwidth | - | ModBox-VNA-CBand-40GHz | - | - | 40 | GHz |
| | | ModBox-VNA-CBand-70GHz | - | - | 70 | GHz |
| Wavelength | λ | From embedded laser diode | 1550 nm | | | - |
| Wavelength laser tuning range | - | From embedded laser diode | - | 0.8 | 1 | nm |
| Maximum modulated output power | OP_{OUT} | 1550 nm | 2 | - | - | dBm |
| Maximum modulated output power | HOP | ModBox-VNA-CBand-40GHz | 5 | 6 | - | dBm |
| Optical output power range adjustment | ΔOP_{OUT} | By the use of the VOA | -40 | - | 0 | dB |
| Optical output power stability | δOP_{OUT} | Over 12 hours | - | - | 1 | %rms |
| Spectrum linewidth | $\Delta\lambda$ | 1550 nm | - | 3 | 15 | MHz |
| Relative Intensity Noise | RIN | - | - | - | -155 | dB/Hz |
| Optical return loss | ORL | - | -45 | -50 | - | dB |
| Electrical return loss | ERL | - | - | -12 | -10 | dB |

Tunable C-Band Laser Specifications Option

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---------------------------------|-----------------|---------------------------------|---------|-----|---------|-------|
| Wavelengths laser tuning range | λ | - | 1527.60 | - | 1565.50 | nm |
| Modulated output power | OP | - | 1 | - | - | dBm |
| Optical output power adjustment | - | Diode Injection current control | 25 | - | 100 | % |
| Spectrum linewidth | $\Delta\lambda$ | FWHM, instantaneous | - | 100 | - | kHz |
| Relative Intensity Noise | RIN | - | - | - | -145 | dB/Hz |

Absolute Maximum Ratings

| Parameter | Symbol | Min | Max | Unit |
|----------------|------------------|-----|-----|------|
| RF input power | EP _{in} | - | 28 | dBm |

Interfaces, Dimensions and Compliance

| Interfaces | |
|-------------------------------|--|
| Optical connectors and fibers | (FC-SC)/(APC-UPC) - Polarization maintaining fiber Corning PM15-U25D |
| Electrical connector | ModBox-VNA-CBand-40GHz V female (1.85 mm) |
| | ModBox-VNA-CBand-70GHz V female (1.85 mm) |
| Control | Embedded Interface (front panel touchscreen) + Remote control (Ethernet) |
| Power supply | 100-120V/220-240 automatic switch 50-60Hz (Rear panel) |
| EMC / Optical norms | EN61326-1 Ed. 2006 / EN 60625-1 |
| Dimensions / Weight | Rack 19" x 2U, Depth=495mm / 5 kg |



Ordering information

ModBox-VNA-CBand-XXGHz-YY

VNA = Optical Vectorial Network Analyser extension
 CBand = Embeds laser, 1550 nm by default
 XX = Analog Modulation bandwidth: 40GHz up to 40 GHz - 70 GHz up to 70 GHz
 YY = Output connectors, FA : FC/APC - FC : FC/UPC - SC : SC/UPC - SA : SC/APC

Opt-CTun

C-Band Tunable Laser option

About us

ixblue Photonics produces specialty optical fibers and Bragg gratings based fiber optics components and provides optical modulation solutions based on the company lithium niobate (LiNbO₃) modulators and RF electronic modules.

ixblue Photonics serves a wide range of industries: sensing and instruments, defense, telecommunications, space and fiber lasers as well as research laboratories all over the world.