ModBox

# ModBox-VNA- CBand-40GHz

## C-Band, 40 GHz Modulation Unit

The ModBox-VNA-CBand-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 us test equipment for photoreceivers or any high speed optoelectronic device characterization.

The ModBox-VNA-CBand-40GHz incorporates a tunable laser source covering the C-Band and a modulation stage based on a wide bandwidth $LiNbO_3$ analog modulator with an automatic bias control circuit.
An optical input for external laser can be added to provide maximum flexibility for test & measurement.

### FEATURES

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

### APPLICATIONS

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

### OPTIONS

- Optical input for external laser

### PERFORMANCE HIGHLIGHTS

| Parameter | |
|---|---|
| Operating wavelengh | C-Band |
| Embedded laser | Tunable |
| Modulation formats | VNA, NRZ, PAM-4 |
| Frequency | Up to 40 GHz |
| Modulated output power | Superior to 5 dBm |

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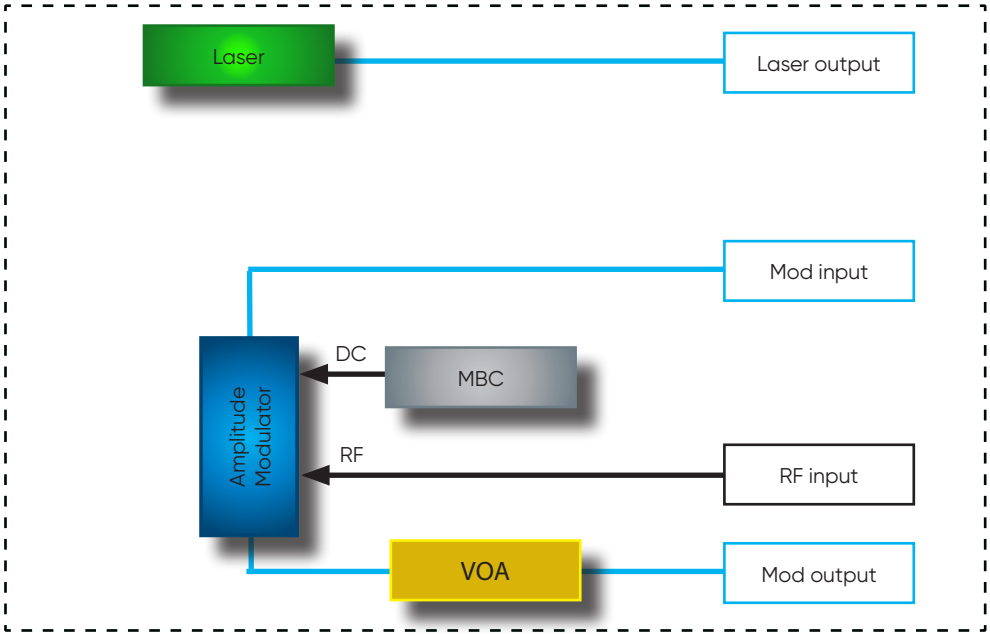
## FUNCTIONAL BLOCK DIAGRAM




The ModBox-VNA-CBand-40GHz features:

• A chirp-free X-cut $LiNbO_3$ (Lithium Niobate) Mach-Zehnder modulator for very high linearity and very wide electro-optical bandwidth, it operates within the full C-Band.

• 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 in the linear portion of the modulator transfer curve. The MBC ensures a stable operation over time and shows a very low noise sensitivity yielding a significant reduction of the required dither voltage amplitude.

• An ITLA (Integrated Tunable Laser Assembly) spanning the whole C-Band. Wavelength and power 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-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 ELECTRICAL SPECIFICATIONS

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

## INPUT OPTICAL SPECIFICATIONS (optional)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Operation | λ | CW | 1527.6 | - | 1608.80 | nm |
| Polarization | - | - | | Linear and controlled | | |
| Power | $OP_{IN}$ | - | - | - | 20 | dBm |

## OUTPUT OPTICAL SPECIFICATIONS

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Modulation frequency | - | - | - | - | 40 | GHz |
| Wavelength | λ | - | 1527.60 | - | 1565.50 | nm |
| Wavelength accuracy | _ | - | - | +/-1.5 | - | GHz |
| Modulated output power | $OP_{OUT}$ | With embedded laser | 5 | 6 | - | dBm |
| Optical output power adjustment | $\Delta OP_{OUT}$ | By the use of VOA | -40 | - | 0 | dB |
| Optical output power stability | $\delta OP_{OUT}$ | Over 8 hours | - | - | 0.25 | dB |
| Spectrum linewidth | δλ | FWHM | - | 100 | - | kHz |
| Relative intensity noise | RIN | - | - | - | -145 | dB/Hz |
| Optical return loss | ORL | - | -40 | -45 | - | 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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## INTERFACES, DIMENSIONS AND COMPLIANCE

**Interfaces**

| | |
|---|---|
| Optical connectors and fibers | FC/APC - Polarization maintaining fiber, Corning PM 13-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 1M  |




## ORDERING INFORMATION

**Modbox-VNA-CBand-40GHz**

VNA = Optical Vectorial Network Analyser extension

CBand = operation in the C-Band band with a Tunable laser embedded laser by default

40GHz = Analog Modulation up to 40 GHz





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