



WR15 WR12 WR10 WR08 WR06 WR05 WR03 WR02.2

**V12VNA2 Low Power Series  
WR12 Frequency Extension Modules  
60 to 90 GHz**

**DESCRIPTION**

The V12VNA2 Low Power Series provides a low power solution which expands your existing Vector Network Analyzer (VNA) capabilities so you can conduct industry-leading millimeter wave S-parameters in WR12 (60-90 GHz). These frequency extension modules connect to your existing test port(s) and leverage the inherent microwave network analyzer's performance and features to display two-port S-parameters:  $S_{11}$ ,  $S_{21}$ ,  $S_{12}$ , and  $S_{22}$ . Four architectures are available: 1-port, scalar 2-port, 1-path/2-port, and fully-reversing 2-port. Waveguide calibration kits are available as separate accessories.



**HIGHLIGHTS**

- Dynamic Range of 105 dB
- Output Power of 0 dBm
- Optional Manual Attenuation of 0 to 25 dB
- Raw Directivity of 37 dB
- Raw Test Port Match of 17 dB
- Stability of  $\pm 0.2$  dB &  $\pm 2$  deg

**APPLICATIONS**

- S-parameters for millimeter wave devices
- Truly broadband on-wafer device characterization
- Pulse setups to mitigate power handling considerations
- Filter passband and rejection verification
- Antenna characterization for lobes and polarization
- True differential measurements

**ELECTRICAL AND PERFORMANCE SPECIFICATIONS (+25°C)**

After a one hour warm-up period, the V12.VNA2 module will satisfy the following specifications.

Electrical Characteristics <sup>1</sup>	MIN	TYP	MAX
System Operating Frequency	60 GHz	--	90 GHz
Test Port Output Power <sup>2</sup>	--	-2.5 dBm	0 dBm
System Dynamic Range <sup>3</sup>	92 dB	105 dB	--
Reflection & Transmission Tracking, Magnitude <sup>4</sup>	--	$\pm 0.2$ dB	--
Reflection & Transmission Tracking, Phase <sup>4</sup>	--	$\pm 2$ deg	--
Raw Coupler Directivity (T/R module only) <sup>5</sup>	35 dB	> 37 dB	--
Residual Directivity (with system error correction)	--	>40 dB	--
Raw Test Port Match <sup>5</sup>	--	> 17 dB	--
Residual Source & Load Match (with system error correction)	--	>35 dB	--
Test Port Input Power @ 0.1 dB compress (T/R & T modules) <sup>5</sup>	--	+8 dBm	--
Test Port Input Damage Level	+20 dBm	--	--
Optional Manually Adjustable Attenuator (T/R & S modules) <sup>6</sup>	0 dB	25 dB	--
Operating Temperature Range	+20 °C	+25 °C	+30 °C

<sup>1</sup>Specifications are typical and subject to change without notice

<sup>2</sup>As there are no internationally recognized power standards above 110 GHz, any power data supplied above 110 GHz is traceable only to OML's Calorimeter

<sup>3</sup>Measured with Keysight PNA-X (N524xA) at 10 Hz IF bandwidth

<sup>4</sup>At +25°C, measured for 1 hr after 1 hr warm-up. Based on "perfect" RF & LO test cables not moved after warm-up and calibration. Not tested.

<sup>5</sup>Not tested

<sup>6</sup>Available as an option (Option A)

Module Characteristics <sup>1</sup>	Description
Test Port, System Output Interface <sup>7</sup>	WR-12
RF System Input Interface, SMA(f), T/R & S modules	
RF Input Frequency	10.0 to 15.0 GHz
RF Input Power	+10 dBm $\pm$ 1.5 dB
RF Input Damage Level	+20 dBm
RF Multiply Factor	x6
LO System Input Interface, SMA(f), All modules	
LO Input Frequency	12.0 to 18.0 GHz
LO Input Power	+10 dBm $\pm$ 1.5 dB
LO Input Damage Level	+20 dBm
LO Multiply Factor	x5
IF Output Frequency, SMA(f), All modules	5 to 300 MHz
DC (+12 VDC) Power Requirements: T/R & S versus T	1.5A / 0.5A, typ
Size (L x W x H, excludes rubber feet & output WG length)	13.0" x 4.3" x 2.7" (T module: L = 4.7")
Weight: T/R & S versus T	$\leq$ 6.0 lbs. / $\leq$ 3.0 lbs.

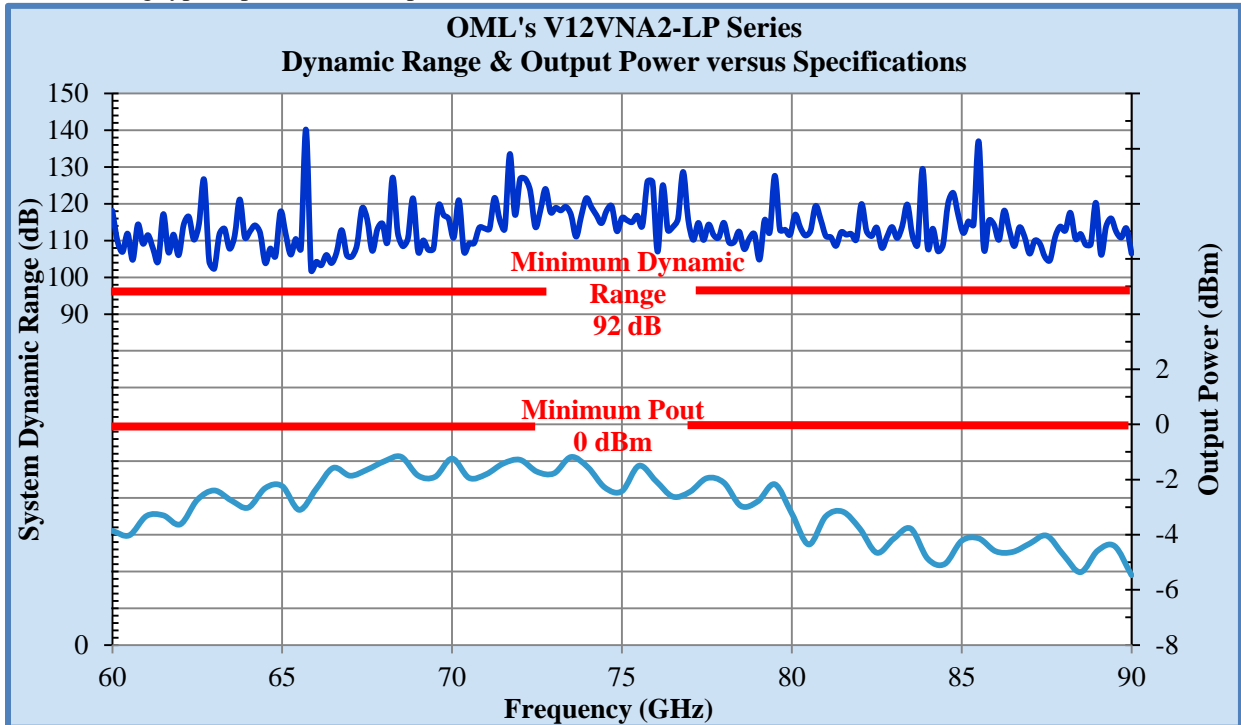
<sup>7</sup>Test Port Flange Configuration is compatible with MIL-DTL-3922/67D (UG387/U-M)





**TYPICAL PERFORMANCE**

The following typical performance is possible with the V12VNA2 Series modules.



**ORDER INFORMATION**

S-parameters {Architecture}	$S_{11}, S_{21}, S_{12}, S_{22}$ {Full 2-port}	$(S_{11}, S_{21})$ or $(S_{12}, S_{22})$ {1-path / 2-port}	$S_{21}$ or $S_{12}$ only {Scalar 2-port}	$S_{11}$ or $S_{22}$ only {Vector 1-port}
Test Port Module(s)	V12VNA2-T/R-LP V12VNA2-T/R-LP	V12VNA2-T/R-LP V12VNA2-T	V12VNA2-S-LP V12VNA2-T	V12VNA2-T/R-LP
Option A	In T/R or S module, adds Manually Adjustable Attenuator (0-25 dB) to RF path			
Option RLA	In T/R or S module, adds amplifier (15 dB gain) in RF&LO paths for drive input of -5 dBm			
Option LOA	In T module, adds amplifier (15 dB gain) in LO path for drive input of -5 dBm			
Option IMD	In T/R module, add second tone for Intermodulation Distortion Measurement			

Standard accessories for each module includes: DC Power Cable (V00DCBC1), Waveguide Section (V12WG2), and 20 dB Attenuator (V12AT20).

**MECHANICAL DIMENSIONS** (If necessary, contact OML for more detailed drawings)

