



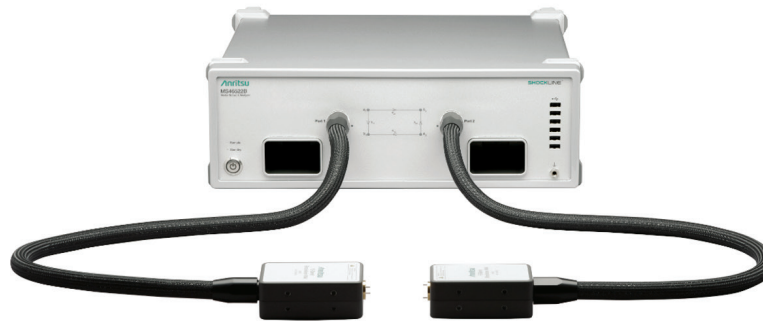
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# ShockLine™ Vector Network Analyzer Family

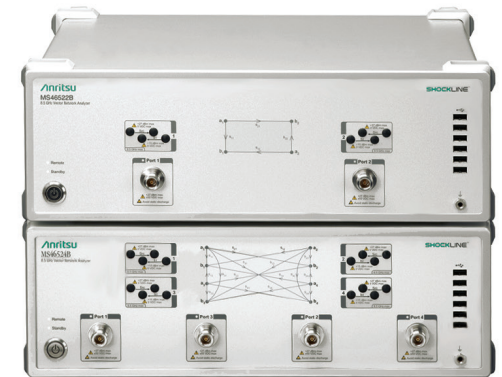
Frequency Ranges from 50 kHz to 92 GHz



**MS46121A 1-port USB VNA**  
**MS46122A 2-port USB VNA**  
**MS46322A 2-port Economy VNA**



**Performance E-Band VNA**  
**MS46522B Option 82**  
**(Not Pictured: MS46524B Option 82)**



**Performance VNA**  
**MS46522B 2-port**  
**MS46524B 4-port**

# MS46121A 1-Port ShockLine™ Vector Network Analyzers

## ShockLine™ 1-Port USB VNAs up to 6 GHz

The MS46121A is a series of two PC-controlled 1-Port USB ShockLine Vector Network Analyzers with frequency ranges from 40 MHz to 4 GHz and 150 kHz to 6 GHz. The VNAs are packaged in a compact housing and are externally controlled via USB from a user supplied PC running the same Graphical User Interface (GUI) software as the rest of the ShockLine family of VNAs.

The MS46121A is ideal for testing 1-port devices in university laboratories and production lines. The combination of small size and good performance make the MS46121A 1-Port VNAs ideal for passive device test applications where low cost, performance and small form factor are desired.

The MS46121A with Option 2 provides a Time Domain Reflectometry (TDR) like display that enables real impedance measurements over frequency. With Option 21, scalar transmission between two to four MS46121A instruments can be performed in various configurations.

## ShockLine™ 1-Port VNA Highlights

- Enables multisite testing of 16 DUTs in one single sweep.
- Direct connection to DUT avoids the need for RF cables resulting in improved measurement stability.
- PC control takes advantage of external computer processing power and functionality.
- Compact package allows measurements at hard to reach places.
- No onboard data storage eliminates the need for data purging in secure applications.
- Standard bandpass time domain grants easier and faster fault identification.
- A common GUI interface within the ShockLine family reduces switching costs between models.
- Low cost, small and lightweight.



MS46121A 1-PORT VECTOR ANALYZER



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## Key Specifications

Analyzer Performance	
Frequency Options	MS46121A-004, 40 MHz to 4 GHz, type N(m) ports MS46121A-006, 150 kHz to 6 GHz, type N(m) ports
Corrected Directivity	42 dB, typical
Sweep Speed	100 $\mu$ s / data point, typical
Trace Noise	Magnitude: 0.01 dB, typical Phase Noise: 0.05 degree, typical
General	
Measurement Parameters	$S_{11}$ , and any user-defined combination of $a_1$ , $b_1$ , 1. Option 21: $S_{ XY }$ where Y is the source and X is the receiver
Display Graphs	Log Magnitude, Phase, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart, Polar
Measurements Data Points	2 to 20,000 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 30, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 100 kHz <b>Option 21</b> External Reference Enabled 1, 2, 3, 5, 7, 10, 20, 30, 50, 100 kHz Internal Reference Enabled 10, 20, 30, 50, 100 kHz
Display Channels	ShockLine software can control up to 16 MS46121A VNAs at a time, each on an independent channel. Great for making parallel measurements and reducing test time.
Traces	A maximum of 16 traces each. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker per trace
Display	Powerful GUI displayed on user-provided computer.
Temperature	Operating Temperature 0 °C to 50 °C
Dimensions	52 mm x 36 mm x 144 mm (HxWxD)
Weight:	0.4 kg (0.9 lb)

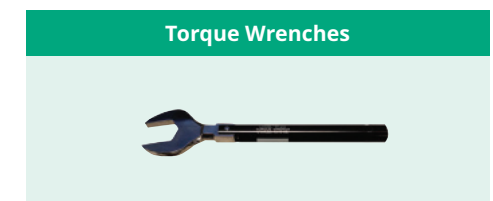
## Product Options

Option Number	Description
MS46121A-002	Low Pass Time Domain
MS46121A-021	Scalar Transmission Measurement

## Calibration Accessories

Part Number	Description
MN25208A	2-Port SmartCal 8.5 GHz USB Auto Calibration Unit
TOSLN50A-18	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLNF50A-18	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee
36585K	2-Port AutoCal 40 GHz Auto Calibration Unit
3653A	Type N Calibration Kit
3652A	Type K Calibration Kit
3650A	SMA / 3.5 mm Calibration Kit

## Accessories



# MS46122A Compact ShockLine™ Vector Network Analyzers

## World's first series of compact VNAs to 43.5 GHz

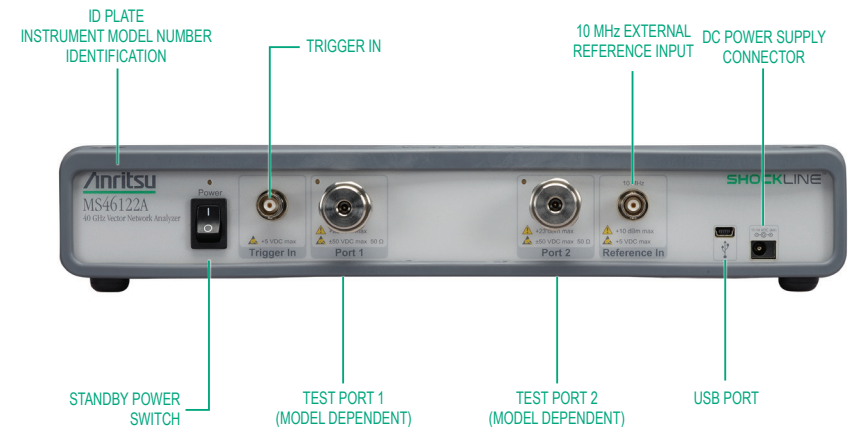
The MS46122A is a series of three Compact ShockLine USB Vector Network Analyzers. The VNAs are packaged in a compact 1U chassis and are externally controlled via USB from a user supplied PC running the same Graphical User Interface (GUI) software as the rest of the ShockLine family of VNAs. The unit also comes standard with 19" rack mount hardware for convenient rack mount installation.

The MS46122A benefits from patented Shockline VNA-on-chip technology which simplifies the internal VNA architecture at high frequencies, reduces instrument cost, and enhances accuracy and measurement repeatability. The combination of lower cost, small size and good performance make the MS46122A series VNAs ideal for passive device test applications where performance and small form factor are desired.



## ShockLine™ Compact VNA Highlights

- World's first series of compact VNAs to 43.5 GHz for cost-effective measurements.
- Small, and lightweight, easily shared between test locations.
- PC control takes advantage of external computer processing power and functionality.
- Compact 1U high package for efficient use of bench and rack space.
- No onboard data storage eliminates the need for data purging in secure applications.
- Time domain with time gating option grants easier and faster fault identification.
- A common GUI interface within the ShockLine family reduces switching costs between models.
- Compatibility with the 36585K AutoCal enables fast calibrations up to 40 GHz



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## Key Specifications

Analyzer Performance	
Frequency Options	MS46122A-010, 1 MHz to 8 GHz, type N(f) ports MS46122A-020, 1 MHz to 20 GHz, type Ruggedized K(m) ports MS46122A-040, 1 MHz to 43.5 GHz, type Ruggedized K(m) ports (Ruggedized K(m) ports are compatible with 3.5 mm and SMA connectors)
Dynamic Range	> 110 dB, 14 GHz to 43.5 GHz, typical
Sweep Speed	220 $\mu$ s / data point, typical
High Level Noise	1 mdB, 20 MHz to 43.5 GHz, typical
General	
Measurement Parameters	$S_{11}$ , $S_{21}$ , $S_{22}$ , $S_{12}$ , and any user-defined combination of $a_1$ , $a_2$ , $b_1$ , $b_2$ , 1.
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart, Polar
Measurements Data Points	2 to 16,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 5, 7, 10, 20, 30, 50, 70, 100, 300 kHz
Display Channels and Traces	Up to 16 channels with a maximum of 16 traces each. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker per trace
Display	Powerful GUI displayed on user-provided computer.
Temperature	Operating Temperature 0 °C to 50 °C
Dimensions	61 mm x 328 mm x 198 mm (H x W x D)
Weight:	< 2.2 kg (< 5 lbs), typical

## Product Options

Option Number	Description
MS46122A-002	Time Domain with time gating

## Calibration Accessories

Part Number	Description
MN25208A	2-Port SmartCal 8.5 GHz USB Auto Calibration Unit
TOSLN50A-18	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLNF50A-18	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee
36585K	2-Port AutoCal 40 GHz Auto Calibration Unit
3653A	Type N Calibration Kit
3652A	Type K Calibration Kit
3650A	SMA / 3.5 mm Calibration Kit

## Accessories



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# MS46322A Economy ShockLine™ Vector Network Analyzers

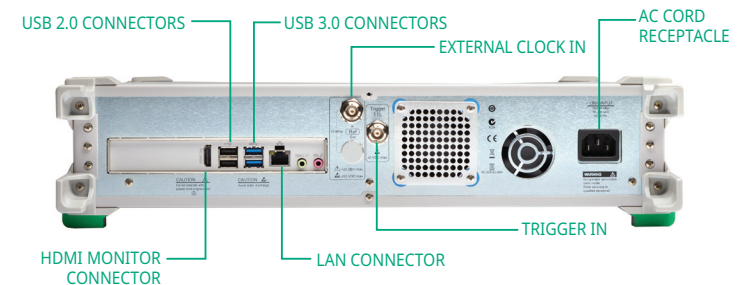
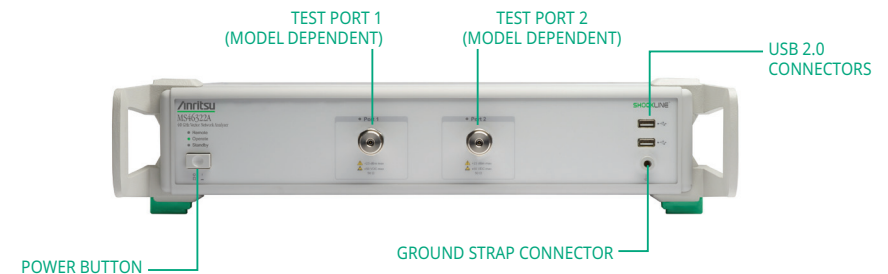
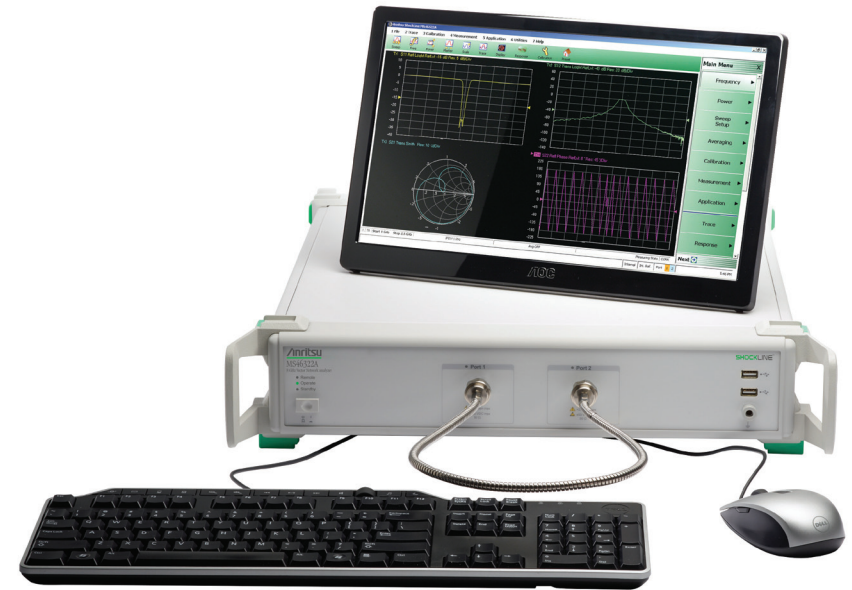
## The Ideal Choice for Cost-Sensitive Applications

The MS46322A is a series of Economy ShockLine™ Vector Network Analyzers with frequency range from 1 MHz to 4/8/14/20/30/43.5 GHz. It is based on patented Shockline VNA-on-chip technology, which simplifies the internal VNA architecture at high frequencies, reduces instrument cost, enhances accuracy and minimizes measurement uncertainty.

The MS46322A are all 2-port VNAs packaged in a compact and rugged 2U chassis. The entire series has 220 microseconds per point sweep speed, and better than 100 dB dynamic range to 43.5 GHz, making it suitable for testing passive devices in engineering, manufacturing and cost-sensitive education applications.

## ShockLine™ Economy VNA Highlights

- Ideal for testing RF and microwave devices
- Fast sweep speed and wide dynamic range minimizes production test time
- Excellent corrected directivity allows for less measurement uncertainty
- Time domain with time gating option grants easier and faster fault identification
- The LAN interface for remote control is faster than GPIB
- A common GUI and SCPI interface within the ShockLine family for ease of use
- USB ports allow for easy connection to peripherals like keyboard and mouse
- The small 2U packages allows for the efficient use of rack space
- Compatibility with the 36585K AutoCal enables fast calibrations up to 40 GHz



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## Key Specifications

Analyzer Performance	
Frequency Options	MS46322A-004, 1 MHz to 4 GHz, type N(f) ports MS46322A-010, 1 MHz to 8 GHz, type N(f) ports MS46322A-014, 1 MHz to 14 GHz, type Ruggedized K(m) ports MS46322A-020, 1 MHz to 20 GHz, type Ruggedized K(m) ports MS46322A-030, 1 MHz to 30 GHz, type Ruggedized K(m) ports MS46322A-040, 1 MHz to 43.5 GHz, type Ruggedized K(m) ports (Ruggedized K(m) ports are compatible with 3.5 mm and SMA connectors)
Dynamic Range	> 100 dB
Sweep Speed	220 us / data point, typical
Corrected Directivity	≥ 30 dB at 30 - 43.5 GHz
General	
Measurement Parameters	$S_{11}$ , $S_{21}$ , $S_{22}$ , $S_{12}$ , and any user-defined combination of $a_1$ , $a_2$ , $b_1$ , $b_2$ , 1.
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart
Measurements Data Points	2 to 16,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 5, 7, 10, 20, 30, 50, 70, 100, 300 kHz
Display and Traces	Up to 16 traces. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker per trace
Remote Control Interface	SCPI/Software drivers over LAN
Display	Powerful GUI displayed on user-provided monitor, touchscreen compatible
Temperature	Operating Temperature 0 °C to 50 °C, humidity 95% or less at 40 °C
Dimensions	108 mm x 484 mm x 590 mm
Weight:	< 11 kg (< 25 lb), typical

## Product Options

Option Number	Description
MS46322A-001	Rack mount
MS46322A-002	Time Domain with time gating

## Calibration Accessories

Part Number	Description
MN25208A	2-Port SmartCal 8.5 GHz USB Auto Calibration Unit
TOSLN50A-8	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLNF50A-8	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee
36585K	2-Port AutoCal 40 GHz Auto Calibration Unit
3653A	Type N Calibration Kit
3650A	SMA / 3.5 mm Calibration Kit

## Accessories



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# MS46522B 2-Port ShockLine™ Performance Vector Network Analyzer

## RF and Microwave VNAs to 43.5 GHz

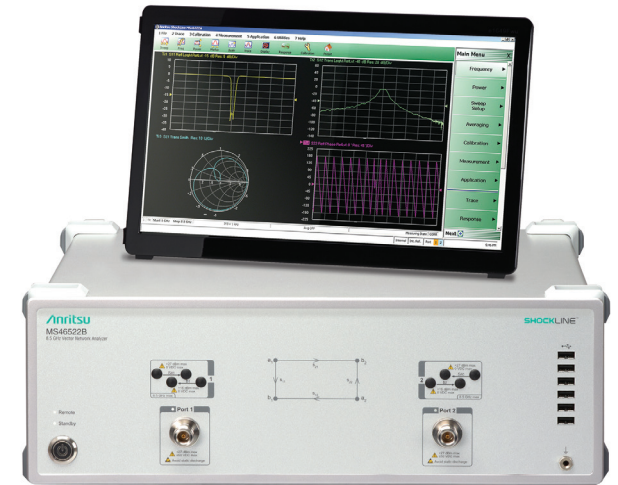
The MS46522B is a series of 2-port Performance ShockLine Vector Network Analyzers. Delivering an unprecedented level of value and performance, including best-in-class dynamic range, the MS46522B series lowers cost-of-test and speeds time to market in numerous test applications up to 43.5 GHz. These applications include characterizing and manufacturing mobile network equipment, mobile devices, automotive cables, high-speed data interconnects and system integration components.

The MS46522B configured with option 10, 20, or 40 brings RF to microwave frequency capabilities to the Performance ShockLine family. These frequency options, combined with powerful ShockLine software, provide a cost effective solution for the most challenging, passive device testing.

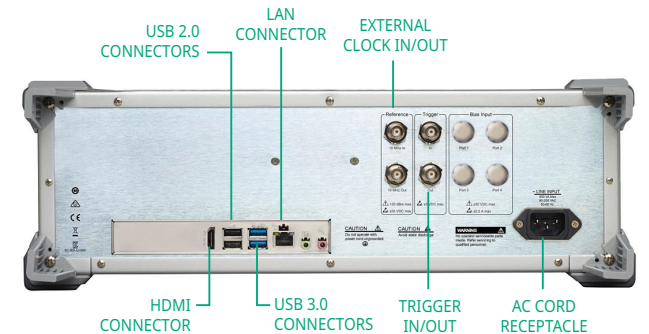
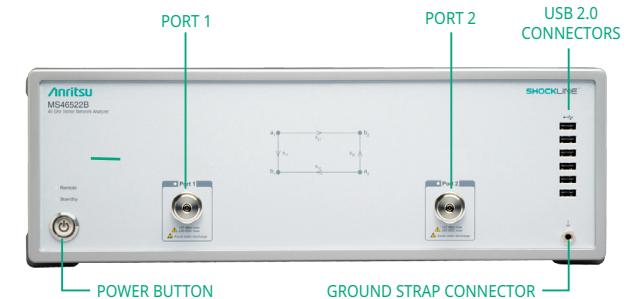
The MS46522B series comes in a 3U high chassis and uses the same GUI, software, command syntax, drivers, and programming environments as the rest of the ShockLine family.

## ShockLine™ Performance VNA Highlights

- High output power allows measurement of high attenuation devices.
- Industry leading dynamic range enables measurement of very low reflection artifacts.
- Excellent corrected directivity minimizes measurement uncertainty.
- SmartCal auto calibration unit reduces calibration and setup time.
- Time domain with time gating option grants easier and faster fault identification.
- Modern LAN interface for remote control is faster than GPIB.
- A common GUI and SCPI interface within the Shockline Family for ease of use.
- USB ports allow for easy connection to peripherals like keyboard and mouse.
- The small 3U packages allows for the efficient use of rack space.



MS46522B-010 (8.5 GHz VNA SHOWN ABOVE)



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## Key Specifications

Analyzer Performance	
Frequency Options	MS46522B-010, 50 kHz to 8.5 GHz, type N(f) ports MS46522B-020, 50 kHz to 20 GHz, type k(m) ports MS46522B-040, 50 kHz to 43.5 GHz, type k(m) ports
Dynamic Range	> 140 dB, (50 MHz to 2 GHz)
Output Power	-30 dBm to +15 dBm, (300 kHz to 6 GHz)
Corrected Directivity	> 42 dB
General	
Measurement Parameters	$S_{11}$ , $S_{21}$ , $S_{22}$ , $S_{12}$ , and any user-defined combination of $a_1$ , $a_2$ , $b_1$ , $b_2$ , 1.
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart (Impedance)
Measurements Data Points	2 to 20,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 30, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 70, 100, 200, 300, 500 kHz
Display and Traces	Up to 16 traces. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker
Remote Control Interface	SCPI/Software drivers over LAN
Display	Powerful GUI displayed on user-provided monitor, touchscreen compatible
Dimensions (H x W x D)	152 mm x 445 mm x 442 mm
Weight:	< 11 kg (< 25 lb), typical

## Product Options

Option Number	Description
MS46522B-001	Rack mount
MS46522B-002	Time Domain with time gating

## Calibration Accessories

Part Number	Description
MN25208A	2-Port SmartCal 8.5 GHz USB Auto Calibration Unit
36585k	2-Port Precision AutoCal 40 GHz Auto Calibration Unit
TOSLN50A-8	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLNF50A-8	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee
3653A	Type N Calibration Kit
3650A	SMA / 3.5 mm Calibration Kit
15NN50-1.0B	Test port Cable, DC to 18 GHz, N(m)-N(m)

## Accessories

Cables	Automatic Calibration Unit
	
Calibration Accessories	Torque Wrenches
	

# MS46524B 4-Port ShockLine™ Performance Vector Network Analyzer

## RF and Microwave VNAs to 43.5 GHz

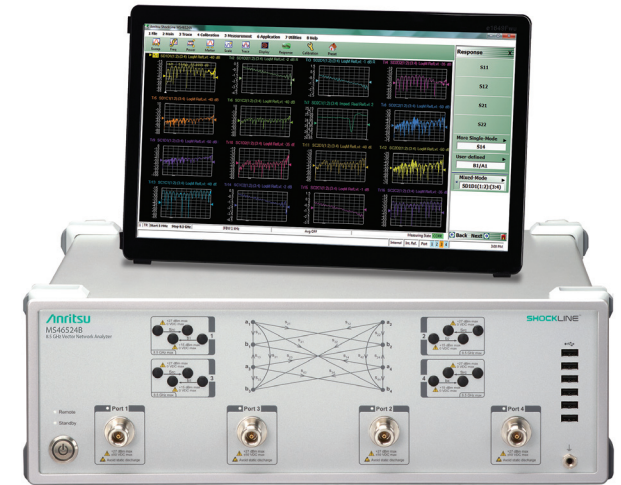
The MS46524B is a series of 4-port Performance ShockLine Vector Network Analyzers. Delivering an unprecedented level of value and performance, including best-in-class dynamic range, the Performance series lowers cost-of-test and speeds time to market in numerous test applications up to 43.5 GHz. These applications include characterizing and manufacturing, multi-port mobile network equipment, mobile devices, automotive cables, high-speed data interconnects and system integration components.

The MS46524B configured with option 10, 20, or 40 brings RF to microwave frequency capabilities to the Performance ShockLine family. These frequency options, combined with powerful ShockLine software, provide a cost effective solution for the most challenging, passive device testing.

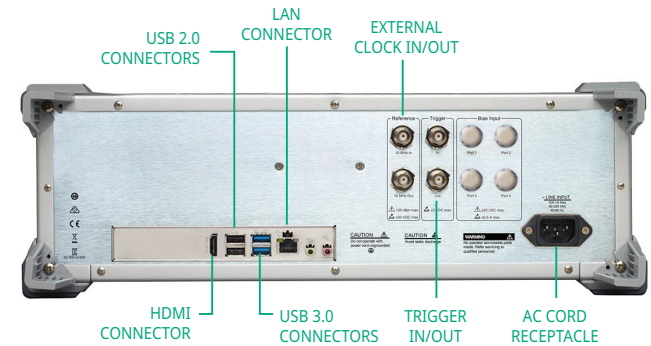
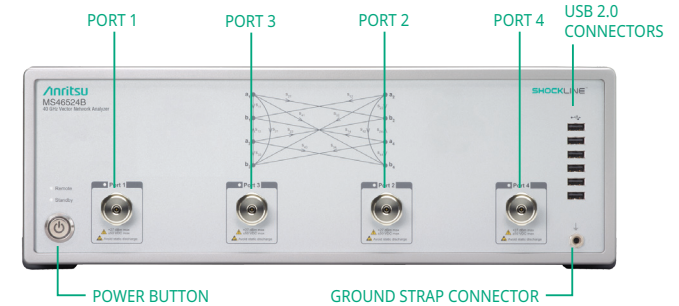
The MS46524B series comes in a 3U high chassis and uses the same GUI, software, command syntax, drivers, and programming environments as the rest of the ShockLine family.

## ShockLine™ 4-Port VNA Highlights

- Ideal for testing single-ended and multi-port RF devices.
- Industry leading dynamic range enables measurement of very low reflection artifacts.
- Excellent corrected directivity minimizes measurement uncertainty.
- Time domain with gating option grants easier and faster fault identification.
- Modern LAN interface for remote control is faster than GPIB.
- A common GUI and SCPI interface within the ShockLine family.
- USB ports allow for easy connection to peripherals like keyboard and mouse.
- The compact 3U high packages allows for the efficient use of rack space.



MS46524B-010 (8.5 GHz VNA SHOWN ABOVE)



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## Key Specifications

Analyzer Performance	
Frequency Option	MS46524B-010, 50 kHz to 8.5 GHz, type N(f) ports MS46524B-020, 50 kHz to 20 GHz, type k(m) ports MS46524B-040, 50 kHz to 43.5 GHz, type k(m) ports
Dynamic Range	> 140 dB (50 MHz to 2 GHz)
Output Power	-30 dBm to +15 dBm (300 kHz to 6 GHz)
Corrected Directivity	> 42 dB
General	
Measurement Parameters	Single ended S-Parameters: $S_{11}, S_{12}, S_{13}, S_{14}, S_{21}, S_{22}, S_{23}, S_{24}, S_{31}, S_{32}, S_{33}, S_{34}, S_{41}, S_{42}, S_{43}, S_{44}$ Mixed-Mode S-Parameters: SD1D1, SD1D2, SD1C1, SD1C2, SD2D1, SD2D2, SD2C1, SD2C2, SC1D1, SC1D2, SC1C1, SC1C2, SC1D2, SC2D2, SC2C1, SC2C2 User-defined combination: $a_1, a_2, a_3, a_4, b_1, b_2, b_3, b_4, 1$ .
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart (Impedance)
Measurements Data Points	2 to 20,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 30, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 70, 100, 200, 300, 500 kHz
Display and Traces	Up to 16 traces. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker per trace
Remote Control Interface	SCPI/Software drivers over LAN
Display	Powerful GUI displayed on user-provided monitor, touchscreen compatible
Dimensions (H x W x D)	152 mm x 445 mm x 442 mm
Weight:	< 13.6 kg (< 30 lbs), typical

## Product Options

Option Number	Description
MS46524B-001	Rack mount
MS46524B-002	Time Domain with time gating

## Calibration Accessories

Part Number	Description
MN25208A	2-Port SmartCal 8.5 GHz USB Auto Calibration Unit
36585k	2-Port Precision AutoCal 40 GHz Auto Calibration Unit
TOSLN50A-8	Precision N Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLNF50A-8	Precision N Female Through/Open/Short/Load Mechanical Calibration Tee
TOSLK50A-40	Precision K Male Through/Open/Short/Load Mechanical Calibration Tee
TOSLKF50A-40	Precision K Female Through/Open/Short/Load Mechanical Calibration Tee
3653A	Type N Calibration Kit
3650A	SMA / 3.5 mm Calibration Kit
15NN50-1.0B	Test port Cable, DC to 18 GHz, N(m)-N(m)

## Accessories



# MS46522B Option 82

## ShockLine™ Performance Vector Network Analyzer

### Dedicated E-Band VNA for 55-92 GHz Applications

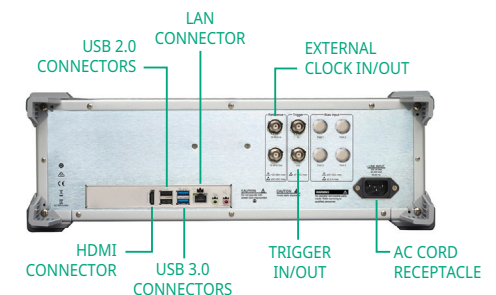
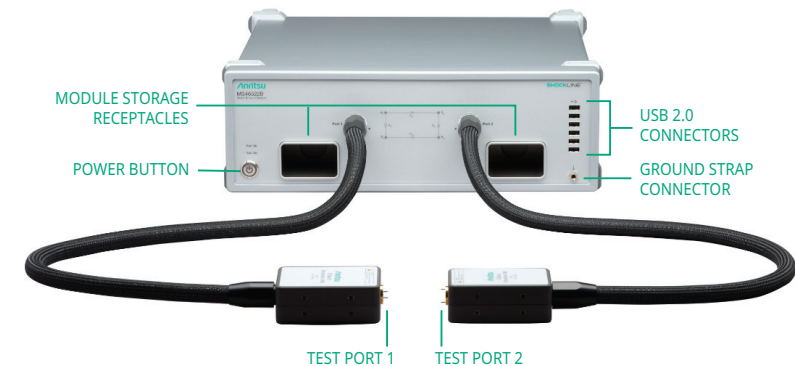
Option 82 is the E-band frequency option for the 2-port MS46522B. It brings banded mm-wave measurement capabilities to an economic cost level unprecedented in the marketplace. For applications requiring only E-band frequency coverage, the new 500B series 55-92 GHz mm-wave option is the best value on the market and enables mass market production of E-band components.

The E-band VNA consists of small tethered source/receiver modules and a base chassis. The modules are attached to the chassis through one-meter cables that are permanently attached to the unit making this a compact, ready-to-use E-band VNA. The remote modules have native WR12 waveguide interface for convenient interfacing to typical waveguide devices.

The MS46522B series comes in a 3U high chassis and uses the same GUI, software, command syntax, drivers, and programming environments as the rest of the ShockLine family.

### ShockLine™ Performance VNA Highlights

- Extended frequency range covering E-band and major parts of V band.
- 120 dB dynamic range enables measurement of very low reflection artifacts.
- Full-assembled test system eliminates setup errors and increases reliability.
- Tethered modules connect directly to the DUT increasing measurement stability.
- Modern LAN interface for remote control is faster than GPIB.
- A common GUI and SCPI interface within the Shockline Family for ease of use.
- USB ports allow for easy connection to peripherals like keyboard and mouse.
- The small 3U packages allows for the efficient use of rack space.



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## Key Specifications

Analyzer Performance	
Frequency Options	MS46522B-082, 55 to 92 GHz, WR-12 Waveguide Flange
Dynamic Range	120 dB
Output Power	-50 dBm to 0 dBm, (69 GHz to 85 GHz)

General	
Measurement Parameters	$S_{11}$ , $S_{21}$ , $S_{22}$ , $S_{12}$ , and any user-defined combination of $a_1$ , $a_2$ , $b_1$ , $b_2$ , $\Gamma$ .
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart (Impedance)
Measurements Data Points	2 to 20,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 30, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 70, 100, 200, 300, 500 kHz
Display and Traces	Up to 16 traces. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker
Remote Control Interface	SCPI/Software drivers over LAN
Display	Powerful GUI displayed on user-provided monitor, touchscreen compatible

General (continued)	
Dimensions (H x W x D)	152 mm x 445 mm x 442 mm (Dimensions apply to chassis only)
Weight:	< 13 kg (< 28 lb), typical

## Product Options

Option Number	Description
MS46522B-001	Rack mount
MS46522B-002	Time Domain with time gating

## Calibration Accessories

Part Number	Description
3655E	Waveguide Calibration kit (WR12)

## Accessories



# MS46524B Option 82

## ShockLine™ Performance Vector Network Analyzer

### Dedicated E-Band VNA for 55-92 GHz Applications

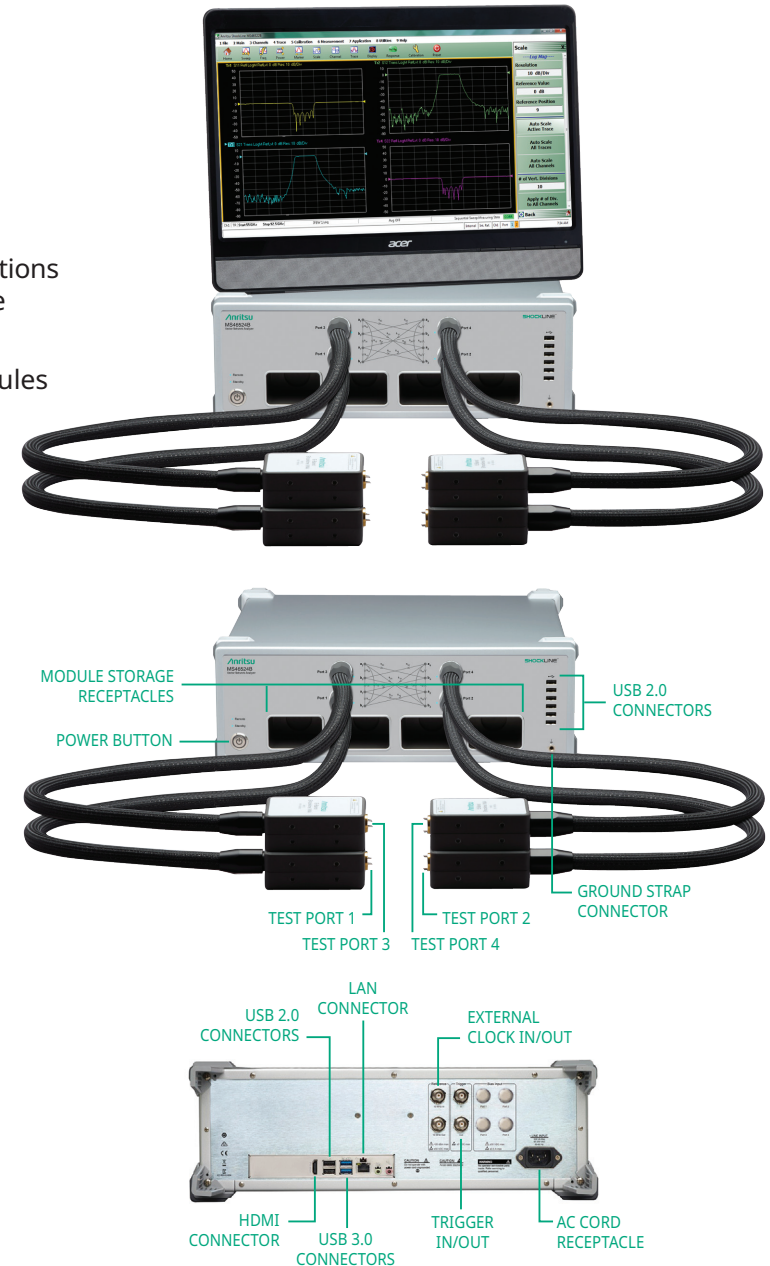
Option 82 is the E-Band frequency option for the 4-port MS46524B. It brings banded mm-wave measurement capabilities to an economic cost level unprecedented in the marketplace. For applications requiring only E-band frequency coverage, the new 500B series 55-92 GHz mm-wave option is the best value on the market and enables mass market production of E-band components.

The E-band VNA consists of small tethered source/receiver modules and a base chassis. The modules are attached to the chassis through one-meter cables that are permanently attached to the unit making this a compact, ready-to-use E-band VNA. The remote modules have native WR12 waveguide interface for convenient interfacing to typical waveguide devices.

The MS46524B series comes in a 3U high chassis and uses the same GUI, software, command syntax, drivers, and programming environments as the rest of the ShockLine family.

### Key Features and Benefits

- Extended frequency range covering E-band and major parts of V band.
- 120 dB dynamic range enables measurement of very low reflection artifacts.
- Full-assembled test system eliminates setup errors and increases reliability.
- Tethered modules connect directly to the DUT increasing measurement stability.
- Modern LAN interface for remote control is faster than GPIB.
- A common GUI and SCPI interface within the Shockline Family for ease of use.
- USB ports allow for easy connection to peripherals like keyboard and mouse.
- The small 3U packages allows for the efficient use of rack space.



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## Key Specifications

### Analyzer Performance

Frequency Option	MS46524B-082, 55 to 92 GHz, WR-12 Waveguide Flange
Dynamic Range	120 dB
Output Power	-50 dBm to 0 dBm (69 GHz to 85 GHz)

### General

Measurement Parameters	<p>Single ended S-Parameters:  <math>S_{11}, S_{12}, S_{13}, S_{14}, S_{21}, S_{22}, S_{23}, S_{24}, S_{31}, S_{32}, S_{33}, S_{34}, S_{41}, S_{42}, S_{43}, S_{44}</math></p> <p>Mixed-Mode S-Parameters:            SD1D1, SD1D2, SD1C1, SD1C2, SD2D1, SD2D2, SD2C1, SD2C2, SC1D1, SC1D2, SC1C1, SC1C2, SC1D2, SC2D2, SC2C1, SC2C2</p> <p>User-defined combination:  <math>a_1, a_2, a_3, a_4, b_1, b_2, b_3, b_4, 1</math>.</p>
Display Graphs	Log Magnitude, Phase, Group Delay, Linear Magnitude, Real, Imaginary, SWR, Impedance, Smith Chart (Impedance)
Measurements Data Points	2 to 20,001 points
Limit Lines	Single or segmented. 2 limit lines per trace. 50 segments per trace.
IF Bandwidth	10, 20, 30, 50, 70, 100, 200, 300, 500, 700 Hz 1, 2, 3, 5, 7, 10, 20, 30, 50, 70, 100, 200, 300, 500 kHz
Display and Traces	Up to 16 traces. A separate memory for each trace can be used to store measurement data for later display or subtraction, addition, multiplication or division with current measurement data. The trace data can be saved and recalled.
Markers	12 markers + 1 reference marker per trace
Remote Control Interface	SCPI/Software drivers over LAN

### General (continued)

Display	Powerful GUI displayed on user-provided monitor, touchscreen compatible
Dimensions (H x W x D)	152 mm x 445 mm x 442 mm (Dimensions apply to chassis only)
Weight:	< 15.9 kg (< 35 lbs), typical

## Product Options

Option Number	Description
MS46524B-001	Rack mount
MS46524B-002	Time Domain with time gating

## Calibration Accessories

Part Number	Description
3655E	Waveguide Calibration kit (WR12)

## Accessories

### Calibration Kit



# MN25208A SmartCal™

## Automatic Calibration Unit

### Low Cost USB Automatic Calibration Units

The SmartCal MN25208A is a series of 2-port automatic calibration units covering a frequency range from 300 kHz to 8.5 GHz. The MN25208A has 4 different connector options which include a set of N(f), K(f), 3.5mm(f) or SMA(f) type connectors.

The MN25208A delivers automatic, fast and error-free calibrations for any ShockLine VNA. The SmartCal automatically powers on via a USB connection and loads calibration kit coefficients from on-board memory into the ShockLine software. The SmartCal is ready to use immediately after detection by the VNA because it doesn't require warm-up.

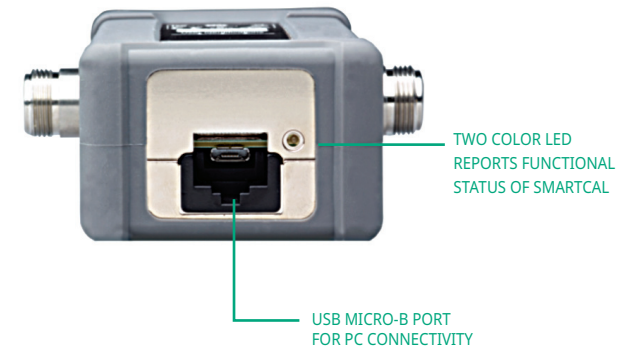
SmartCal improves productivity by providing easier and faster single connection calibrations. Port auto sense and port mapping feature reduce errors and make multiport calibrations easier. The MN25208A, along with easyTest, can also be used in guided graphical test procedures to further simplify complex calibrations.

### MN25208A SmartCal™ Highlights

- Auto load of calibration kit coefficients speeds up setups and reduces calibration error.
- Auto sense determines the number of VNA ports connected preventing poor connections and calibration.
- VNA to SmartCal Port mapping increases flexibility and simplifies multiport calibrations.
- ShockLine software auto detects SmartCal providing simple and easy to use calibration software.
- No internal heater eliminates warm up time and provides a stable calibration.
- USB powered and controlled provides the convenience of a one plug interface without an external power supply.
- Single connection calibrations reduce wear and tear on connectors and cables over manual calibrations.
- Supports all ShockLine VNAs with 1-, 2-, 4-port calibration available.
- SCPI command set allows for easy integration into automated test environments.
- Automatic and fast calibrations at a low price.
- Small size provides easier use when moving between VNAs.



N(F) CONNECTOR  
(OTHER CONNECTOR  
OPTIONS AVAILABLE)



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## Key Specifications

Analyzer Performance		
SmartCal Corrected Performance		
Typical Performance	MS46524B/522B	MS46322A/122A
Corrected Source Match	> 35 dB (300 kHz - 8.5 GHz)	≥ 33 dB (1 MHz - 8 GHz)
Corrected Load Match	> 38 dB (300 kHz - 5 GHz) > 33 dB (5 GHz - 8 GHz)	≥ 42 dB (1 MHz - 6 GHz) ≥ 37 dB (6 GHz - 8 GHz)
Corrected Directivity	> 42 dB (300 kHz - 5 GHz) > 36 dB (5 GHz - 8 GHz)	≥ 42 dB (1 MHz - 6 GHz) ≥ 37 dB (6 GHz - 8 GHz)
Transmission Tracking	± 0.08 dB (30 MHz - 8 GHz)	± 0.06 dB (1 MHz - 3 GHz) ± 0.08 dB (3 GHz - 8 GHz)
Reflection Tracking	± 0.08 dB (30 MHz - 8 GHz)	± 0.15 dB (1 MHz - 8 GHz)

## Product Options


Option Number	Description
MN25208A-001	Option1, N(f) - N(f) Connectors
MN25208A-002	Option 2, K(f) - K(f) Connectors
MN25208A-003	Option 3, 3.5 mm(f) - 3.5 mm(f) Connectors
MN25208A-004	Option 4, SMA(f) - SMA(f) Connectors

## Included Accessories

Option Number	Description
2000-1606-R	1.8 m USB A/ Micro-B latch cable

## Recommended Accessories


Option Number	Description
01-200	Torque Wrench, 3/4 in. 0.9 N*m (8 lbf*in), Type N
01-201	Torque Wrench, 5/16 in, 0.9 N*m (8 lbf*in)
34NN50A	Precision Adapter, DC to 18 GHz, N(m) - N(m), 50 Ω
33NNF50B	Calibration Grade Adapter, DC to 18 GHz, N(m) - N(f), 50 Ω
33SS50	Calibration Grade Adapter, DC to 26.5 GHz, 3.5 mm (m) - 3.5 mm (m), 50 Ω
K220B	Precision Adapter, DC to 40 GHz, K(m)-K(m), 50 Ω




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### ShockLine™ Vector Network Analyzer Family


Frequency Ranges from 50 kHz to 92 GHz



MS46121A 1-port USB VNA  
MS46122A 2-port USB VNA  
MS46322A 2-port Economy VNA



Performance E-Band VNA  
MS46522B Option 82  
(Not Pictured: MS46524B Option 82)



Performance VNA  
MS46522B 2-port  
MS46524B 4-port

For more information visit: [www.anritsu-shockline.com](http://www.anritsu-shockline.com)

# ShockLine™ VNA Comparison

	MS46522B/524B	MS46322A	MS46122A	MS46121A
Frequency range	50 kHz to 8.5, 20, 43.5 GHz E-Band Option 82: 55 GHz to 92 GHz	1 MHz to 4, 8, 14, 20, 30, 43.5 GHz	1 MHz to 8, 20, 43.5 GHz	40 MHz to 4 GHz 150 kHz to 6 GHz
Number of ports	2 and 4-port	2 port	2 port	1 port
Dynamic Range (@10 Hz IFBW)	≥90 dB 300 kHz to 1 MHz ≥100 dB (>1 MHz to 50 MHz) ≥140 dB (>50 MHz to 2 GHz) ≥137 dB (>2 GHz to 4 GHz) ≥130 dB (>4 GHz to 6 GHz) ≥128 dB (>6 GHz to 8 GHz) ≥120 dB (>8 GHz to 8.5 GHz) ≥117 dB (8.5 GHz to 25 GHz) ≥120 dB (>25 GHz to 40 GHz) 120 dB, typ (>40 GHz to 43.5 GHz) E-Band Option 82: 120 dB typ, 60 GHz to 90 GHz	≥100 dB 20 MHz to 43.5 GHz	≥100 dB 20 MHz to 43.5 GHz	Corrected Directivity: 42 dB (150 kHz to 6 GHz)
Trace noise (rms) (100 Hz IFBW)	4 mdB (3 mdB typ, >300 kHz to 1 GHz) 3 mdB (2 mdB typ, >1 GHz to 25 GHz) 4 mdB (2 mdB typ, >25 GHz to 40 GHz) 2 mdB typ, >40 GHz to 43.5 GHz E-Band Option 82: 4 mdB, 60 GHz to 90 GHz	6 mdB	6 mdB	10 mdB (typical)
Port Power	-30 to +15 dBm E-Band Option 82: -50 to 0 dBm	High State: -3 dBm Low State: -20 dBm	High State: -3 dBm Low State: -20 dBm	Nominal State: -3 dBm
Corrected directivity	>42 dB, 300 kHz to 10 GHz ≥36 dB >10 GHz to 20 GHz ≥32 dB >20 GHz to 30 GHz ≥30 dB >30 GHz to 43.5 GHz E-Band Option 82: 27 dB typ, 60 GHz to 90 GHz	≥42 dB, 1 MHz to 10 GHz ≥36 dB, 10 GHz to 30 GHz ≥30 dB, 30 GHz to 43.5 GHz	≥42 dB, 1 MHz to 10 GHz ≥36 dB, 10 GHz to 30 GHz ≥30 dB, 30 GHz to 43.5 GHz	42 dB, typical



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	MS46522B/524B	MS46322A	MS46122A	MS46121A
Measurement speed, typical (@widest IFBW)	30 us/point typ	220 µs/point	220 µs/point	100 µs/point
Sweep type	Freq: Linear, Log, CW, Segment Power: Linear	Freq: Linear, Log, CW, Segment	Freq: Linear, Log, CW, Segment	Freq: Linear, CW
Max number of points	20,000	16,000	16,000	20,000
Calibration	SOLT, SOLR, SSLT, SSST, LRL/LRM, WG, Microstrip, Autocal / SmartCal, Thru update	SOLT, SSLT, SSST, WG, Microstrip, Autocal / SmartCal, Thru update	SOLT, SSLT, SSST, WG, Microstrip, Autocal / SmartCal, Thru update	SOL, SmartCal
Embedding, de-embedding	Yes, including multiple networks and extraction utility	Yes, including multiple networks and extraction utility	Yes, including multiple networks and extraction utility	Yes
Marker statistics function	Mean, maximum, minimum, standard deviation Per trace or over a marker region	Mean, maximum, minimum, standard deviation Per trace or over a marker region	Mean, maximum, minimum, standard deviation Per trace or over a marker region	Mean, maximum, minimum, standard deviation Per trace or over a marker region
Pass/fail testing	Yes	Yes	Yes	Yes
Remote Control	LAN	LAN	USB	USB
Programming	IVI-C, LabView, LabWindows, , C#, .NET, MATLAB, and Python34	IVI-C, LabView, LabWindows, , C#, .NET, MATLAB, and Python34	IVI-C, LabView, LabWindows, , C#, .NET, MATLAB, and Python34	IVI-C, LabView, LabWindows, , C#, .NET, MATLAB, and Python34
Major Options	Time Domain and Rack-mount E-Band Frequency (55 GHz to 92 GHz)	Time Domain and Rack-mount	Time Domain and Rack-mount (standard)	Low Pass Time Domain Scalar Transmission Measurement

• **United States**

**Anritsu Company**

1155 East Collins Boulevard, Suite 100,  
Richardson, TX, 75081 U.S.A.  
Toll Free: 1-800-267-4878  
Phone: +1-972-644-1777  
Fax: +1-972-671-1877

• **Canada**

**Anritsu Electronics Ltd.**

700 Silver Seven Road, Suite 120,  
Kanata, Ontario K2V 1C3, Canada  
Phone: +1-613-591-2003  
Fax: +1-613-591-1006

• **Brazil**

**Anritsu Eletrônica Ltda.**

Praça Amadeu Amaral, 27 - 1 Andar  
01327-010 - Bela Vista - São Paulo - SP - Brazil  
Phone: +55-11-3283-2511  
Fax: +55-11-3288-6940

• **Mexico**

**Anritsu Company, S.A. de C.V.**

Av. Ejército Nacional No. 579 Piso 9, Col. Granada  
11520 México, D.F., México  
Phone: +52-55-1101-2370  
Fax: +52-55-5254-3147

• **United Kingdom**

**Anritsu EMEA Ltd.**

200 Capability Green, Luton, Bedfordshire LU1  
3LU, U.K.  
Phone: +44-1582-433280  
Fax: +44-1582-731303

• **France**

**Anritsu S.A.**

12 avenue du Québec, Batiment Iris 1-Silic 612,  
91140 Villebon-sur-Yvette, France  
Phone: +33-1-60-92-15-50  
Fax: +33-1-64-46-10-65

• **Germany**

**Anritsu GmbH**

Nemetschek Haus, Konrad-Zuse-Platz 1  
81829 München, Germany  
Phone: +49-89-442308-0  
Fax: +49-89-442308-55

• **Italy**

**Anritsu S.r.l.**

Via Elio Vittorini 129, 00144 Roma Italy  
Phone: +39-06-509-9711  
Fax: +39-06-502-2425

• **Sweden**

**Anritsu AB**

Kistagången 20B, 164 40 KISTA, Sweden  
Phone: +46-8-534-707-00  
Fax: +46-8-534-707-30

• **Finland**

**Anritsu AB**

Teknobulevardi 3-5, FI-01530 VANTAA, Finland  
Phone: +358-20-741-8100  
Fax: +358-20-741-8111

• **Denmark**

**Anritsu A/S**

Kay Fiskers Plads 9, 2300 Copenhagen S, Denmark  
Phone: +45-7211-2200  
Fax: +45-7211-2210

• **Russia**

**Anritsu EMEA Ltd.**

**Representation Office in Russia**

Tverskaya str. 16/2, bld. 1, 7th floor.  
Moscow, 125009, Russia  
Phone: +7-495-363-1694  
Fax: +7-495-935-8962

• **Spain**

**Anritsu EMEA Ltd.**

**Representation Office in Spain**

Edificio Cuzco IV, Po. de la Castellana, 141, Pta. 8  
28046, Madrid, Spain  
Phone: +34-915-726-761  
Fax: +34-915-726-621

• **United Arab Emirates**

**Anritsu EMEA Ltd.**

**Dubai Liaison Office**

P O Box 500413 - Dubai Internet City  
Al Thuraya Building, Tower 1, Suite 701, 7th floor  
Dubai, United Arab Emirates  
Phone: +971-4-3670352  
Fax: +971-4-3688460

• **India**

**Anritsu India Pvt Ltd.**

2nd & 3rd Floor, #837/1, Binnamangla 1st Stage,  
Indiranagar, 100ft Road, Bangalore - 560038, India  
Phone: +91-80-4058-1300  
Fax: +91-80-4058-1301

• **Singapore**

**Anritsu Pte. Ltd.**

11 Chang Charn Road, #04-01, Shriro House  
Singapore 159640  
Phone: +65-6282-2400  
Fax: +65-6282-2533

• **P. R. China (Shanghai)**

**Anritsu (China) Co., Ltd.**

27th Floor, Tower A,  
New Caohejing International Business Center  
No. 391 Gui Ping Road Shanghai, Xu Hui Di  
District,  
Shanghai 200233, P.R. China  
Phone: +86-21-6237-0898  
Fax: +86-21-6237-0899

• **P. R. China (Hong Kong)**

**Anritsu Company Ltd.**

Unit 1006-7, 10/F., Greenfield Tower, Concordia  
Plaza,  
No. 1 Science Museum Road, Tsim Sha Tsui East,  
Kowloon, Hong Kong, P. R. China  
Phone: +852-2301-4980  
Fax: +852-2301-3545

• **Japan**

**Anritsu Corporation**

8-5, Tamura-cho, Atsugi-shi,  
Kanagawa, 243-0016 Japan  
Phone: +81-46-296-6509  
Fax: +81-46-225-8359

• **Korea**

**Anritsu Corporation, Ltd.**

5FL, 235 Pangyoyeok-ro, Bundang-gu, Seongnam-  
si, Gyeonggi-do, 463-400 Korea  
Phone: +82-31-696-7750  
Fax: +82-31-696-7751

• **Australia**

**Anritsu Pty Ltd.**

Unit 21/270 Ferntree Gully Road,  
Notting Hill, Victoria 3168, Australia  
Phone: +61-3-9558-8177  
Fax: +61-3-9558-8255

• **Taiwan**

**Anritsu Company Inc.**

7F, No. 316, Sec. 1, Neihu Rd., Taipei 114, Taiwan  
Phone: +886-2-8751-1816  
Fax: +886-2-8751-1817