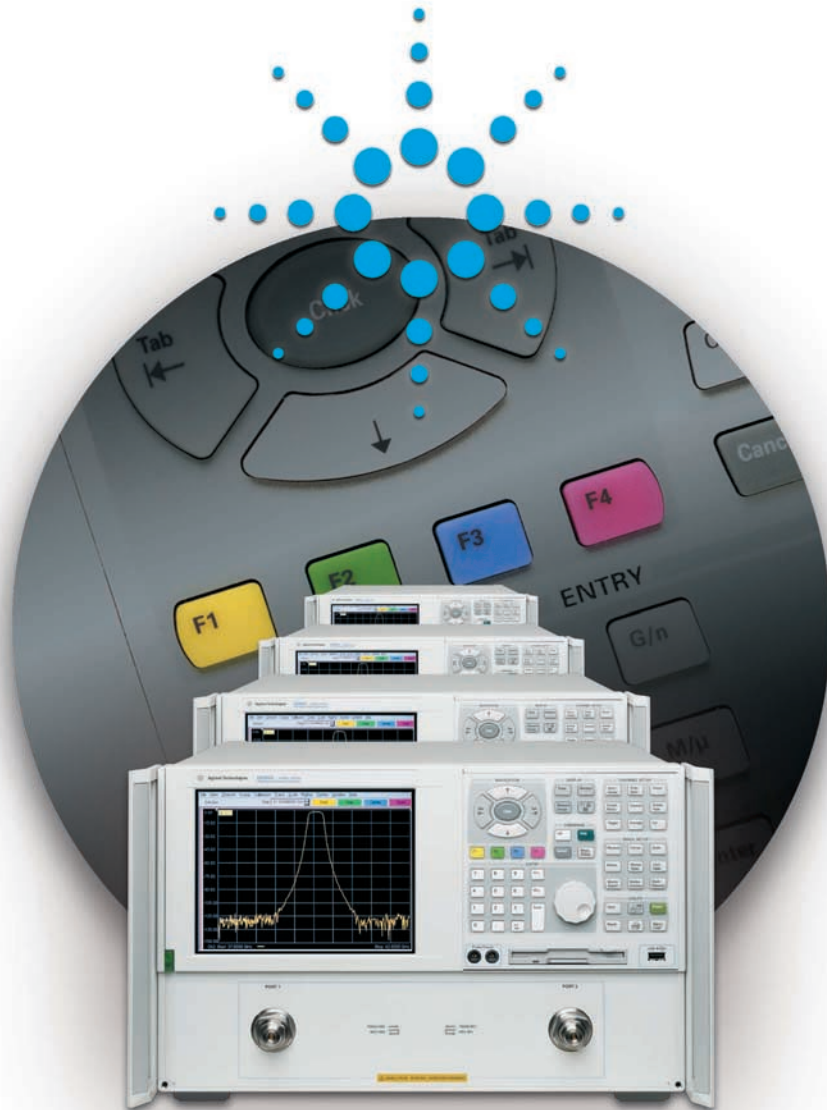


Agilent

RF and Microwave PNA Network Analyzers

300 kHz to 67 GHz



exceptional performance
advanced automation
expanding capabilities



Agilent Technologies

PNA Network Analyzers

Rapid and continuous changes in RF, microwave, and millimeter-wave technology present a growing challenge for designers and manufacturers. The Agilent PNA Series is a measurement platform that meets the challenge, with the right combination of fast sweep speeds, wide dynamic range, low trace noise, and flexible connectivity. Test your high-performance components with a fast, accurate network analyzer that meets your measurement needs now and well into the future.

-  • **Performance**
-  • **Flexibility**
-  • **Throughput**
-  • **Connectivity**

PNA models **Across the platform**

- < 26 μ sec/point measurement speed
- 16,001 points per channel
- 32 independent measurement channels
- Windows® operating system
- User interface supports hardkeys, softkeys and mouse
- Embedded help system includes full manual, extensive measurement tutorials, and complete programming guide
- Advanced calibration includes:
 - Guided calibration
 - Electronic calibration (ECal), provides a precision, single connection, one to four port calibration
 - User defined ECal
 - Adapter removal

RF PNA models **300 kHz to 3/6/9 GHz**

Features

- 2-port – available with 3 or 4 receivers
 - 4 receivers enable TRM/LRM calibration for the most accurate on-wafer and in-fixture measurements
 - 3 receivers provide high performance at a great value
- 3-port with 3-port calibration
- Support for 2- or 4-port ECal

Options

- Configurable test set
- Extended power range
- Receiver attenuators and bias-tees
- High-stability timebase
- Time domain

Microwave PNA models **10 MHz to 20/40/50/67 GHz**

Features

- Integrated 2-port test set with 4 receivers – enables TRM/LRM calibration for the most accurate on-wafer, in-fixture, and waveguide measurements
- Measure mixers and converters using frequency-offset mode
- Advanced mixer calibration includes:
 - Support for 2-port ECal
 - Vector-corrected mixer calibration
 - Match-corrected power-meter calibration
- IMD and harmonic measurement capability

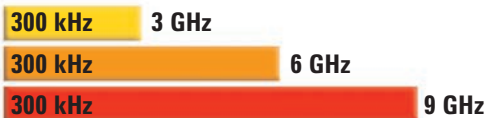
Options

- Configurable test set
- Extended power range and bias-tees
- Frequency-offset mode
- Frequency converter measurement application
- Time domain
- Receiver attenuators
- Reference-channel switch
- Extended memory (512 MB RAM)
- IF access
- Pulsed-RF capabilities

Performance



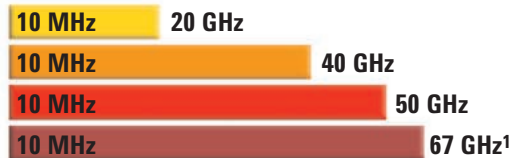
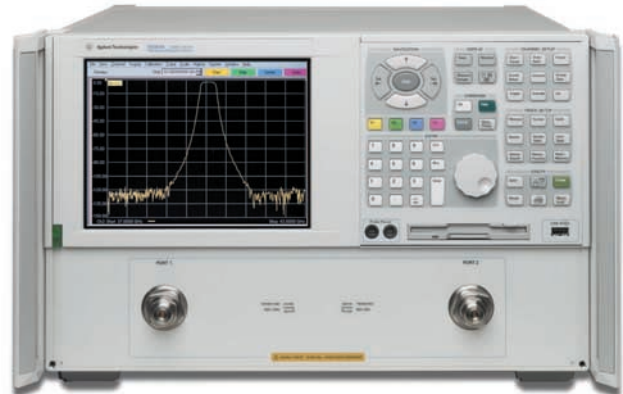
RF PNA



Performance

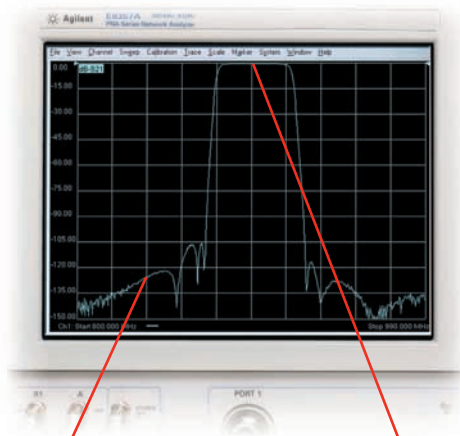
- Up to 143 dB dynamic range
- < 0.002 dB trace noise
- < 26 μ sec/point measurement speed

Microwave PNA



Performance

- Up to 134 dB dynamic range
- < 0.006 dB trace noise
- < 26 μ sec/point measurement speed
- Extend up to 325 GHz with external test heads



Measure base station filters or LNA/receiver filter combinations with up to 143 dB dynamic range.

Accurately measure passband ripple of low insertion loss filters, such as DRF or LC filters, with low trace noise.



Use TRL calibration for accurate in-fixture, on-wafer, or waveguide measurements.

1. Specified to 67 GHz, with operation to 70 GHz.

Flexibility



High power measurements

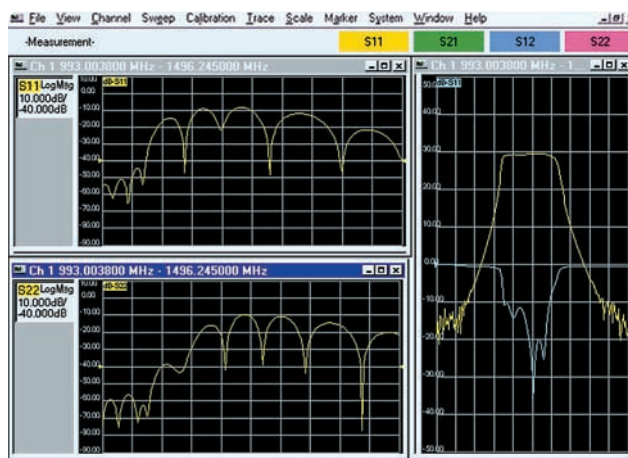
- Use the configurable test set option to add your own external components in the measurement path.
- Internally controlled step attenuators in the source and/or receiver path allow you to make measurements over a wider power range.
- Bias-tees supply DC power to your active components.



Configurable test set:
access signal paths for
flexible configurations.

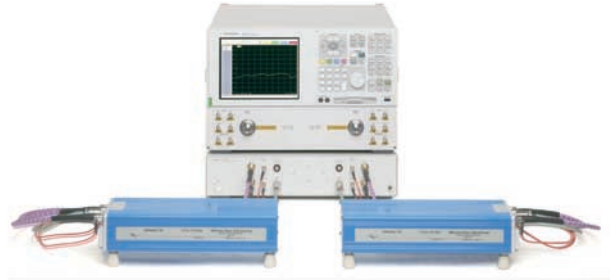
High-rejection measurements

Use the configurable test set option to reverse the directional coupler to obtain maximum dynamic range at the test port with 12-term error correction.



Arrange windows for custom viewing or select standard viewing configurations.

Characterize your balanced devices



The MW PNA IF access option (H11) provides network analyzer IF signal path access for applications including antenna measurements, point-in-pulse, and extended frequency coverage beyond 67 GHz.

The MW PNA is capable of controlling external test heads to increase the frequency range of your network analyzer up to 325 GHz! When a MW PNA network analyzer is equipped with the IF Access option (H11), N5260A millimeter-wave controller and external sources, it can be configured for millimeter-wave measurements.

For more information visit www.agilent.com/find/pna

Option H11 also adds internal receiver gates for use in pulsed-RF and pulsed antenna test applications. Combined with Option H08, these gates augment the PNA's average-pulse measurement capability by enabling point-in-pulse testing, with pulse widths smaller than 100 ns. For more information see page 10.

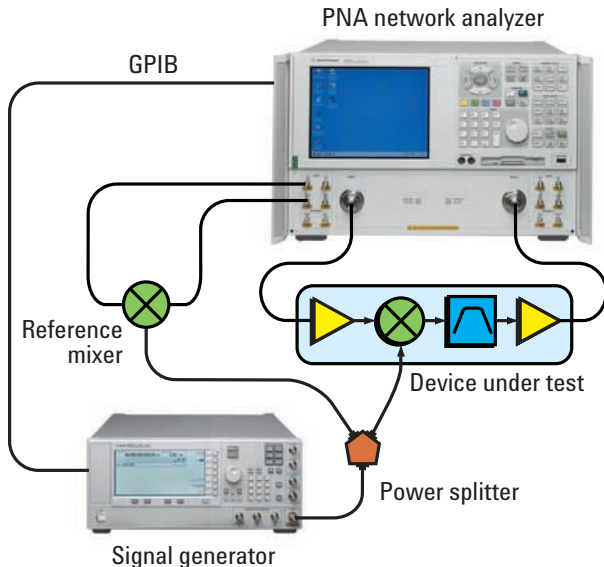
With Option H11 IF Access, antenna-test professionals can use an externally generated 8.33 MHz IF, bypassing the PNA's internal first converter to achieve maximum sensitivity with remote mixing for antenna measurements. Users can attain exceptionally accurate antenna and radar cross section (RCS) measurements faster than previously possible. For more information visit

www.agilent.com/find/antenna

The PNA family combines powerful features with the benefit of Windows to provide maximum measurement flexibility and versatility.

- Configure up to 32 independent measurement channels to eliminate the need for multiple instrument state recalls.
- 16,001 points per channel.
- Display up to 16 windows.
- Display up to 4 active traces in each window.
- Select 10 coupled or fully-independent markers per trace.

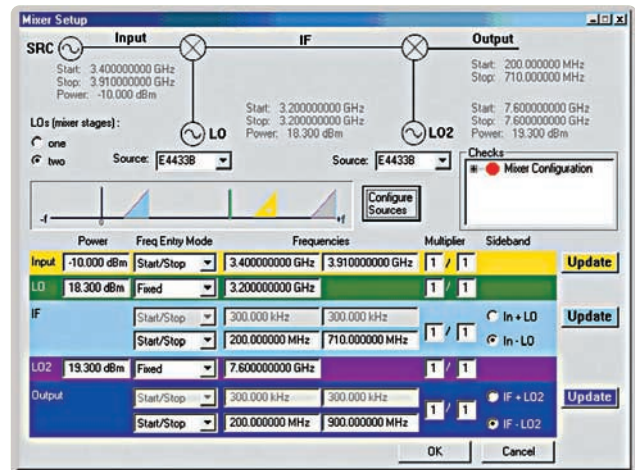
- Mixer conversion loss/gain
- Harmonic and spurious responses
- Intermodulation distortion (IMD)



Measurement setup for vector-mixer calibrated magnitude and phase measurements. An internal reference switch automatically switches between S-parameter and frequency-offset measurements.

Mixer measurement suite

- Conversion loss/gain
 - Magnitude response
 - Phase response
 - Group delay
- Input match
- Output match
- Isolation



Frequency converter application

The firmware automates mixer and frequency converter measurements. Features include:

- Easy-to-use graphical user interface and control of LO source and power-meter simplifies test setup.
- Enhanced error correction improves measurement accuracy.

New mixer calibration choices

Patented vector mixer calibration

- Provides unparalleled accuracy for measurements of relative phase and absolute group delay
- Uses combination of SOLT standards and a reciprocal-mixer/IF-filter pair during calibration
- After calibration, both reciprocal and non-reciprocal mixers and converters can easily be measured

Match-corrected amplitude measurements

- Provides highest amplitude accuracy for measurements of conversion loss/gain
- Combines SOLT and power-meter calibration
- Simplest setup and calibration procedure

Throughput



Built for speed

Decreasing your test time is critical for your success in the marketplace. The PNA network analyzers are designed with maximum throughput in mind. Use a variety of powerful tools to optimize your measurement process.



Less than 9 seconds typical calibration times for 2-port calibration with 1601 points at 35 kHz IFBW.

Decrease calibration time with easy-to-use electronic calibration (ECal)

Perform fast, accurate, and repeatable automatic calibrations with Agilent's ECal modules. Control ECal directly from the analyzer. User-characterized ECal provides the flexibility to use adapters to customize ECal modules to meet your connector needs.

Various two and four-port modules cover the 300 kHz to 67 GHz¹ range in the following connector types:

- 1.85 mm
- 2.4 mm
- 2.95 mm
- 3.5 mm
- 7 mm
- 7-16
- Type-N

Reduce test time with fewer connections

Connect your 3-port device once for full characterization in just three sweeps with the 3-port PNAs (see specific models on page 11).



Reduce test time with a network analyzer optimized to increase throughput.

Dramatically increase throughput with segment sweep mode

Optimize each sweep by collecting data at frequency segments you define. Specify each segment with the optimal number of points, IF bandwidth and power level for increased speed and dynamic range. Optimize display resolution by selecting "X-Axis Point Spacing" to draw evenly spaced measurement data for non-contiguous frequency bands.

1. Specified to 67 GHz, with operation to 70 GHz.

Automation



Gain a competitive advantage with powerful automation tools

Automated test is yet another method to eliminate valuable seconds from your test processes. Use the flexible automation environment to lower your cost of test.

- Control the analyzer using SCPI commands, or gain the speed and connectivity advantage of COM/DCOM.
- Execute code directly from the analyzer, or from an external PC through LAN or GPIB.
- Develop code in programming environments such as Visual Basic®, Visual Basic .NET, Visual C++, Visual C++ .NET, Agilent-VEE, or LabView.

The COM/DCOM advantage

- Quick data transfer rate (< 1 ms COM, 57 ms SCPI over GPIB; 1601 points)
- Swift command execution
- Fewer lines of code
- Re-use rather than re-write objects

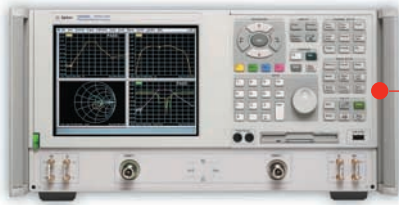


Connectivity

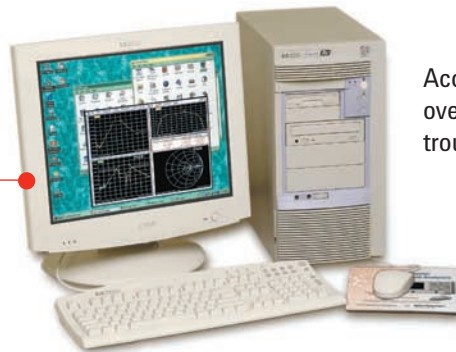
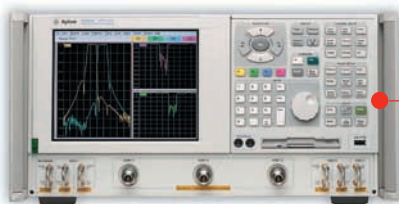


Achieve a new level of integration

Standard features and an integrated Windows operating system give you maximum connectivity choices.



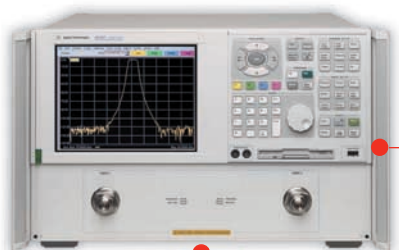
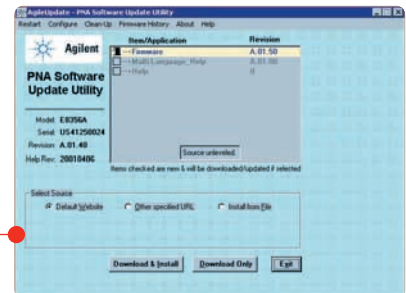
← Use a variety of I/O interfaces including GPIB, USB, LAN, and parallel connections.



Access the analyzer over LAN for remote troubleshooting.



Use the analyzer's AgileUpdate to alert you to new features or new functionality available for free download to any PNA Series analyzer.



Send results to local or networked printers.



Control additional test equipment directly from the analyzer.



Send test data to a central file server.

Ease of Use

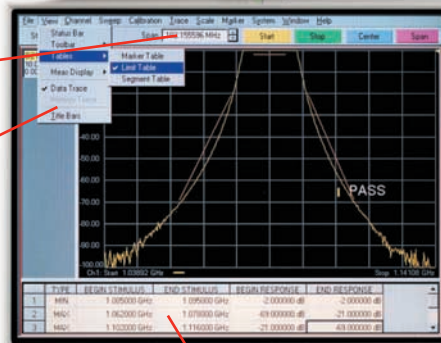


Configure measurements easily with intuitive user interface

Navigate the analyzer efficiently using familiar front panel keys or with a mouse. Use a mouse or hard keys independently, or in combination to best suit your needs. Both methods are optimized in the Windows environment for fast, intuitive operation.

Enter parameters quickly using active entry toolbars.

View choices easily with drop down menus.



Easily enter limit line and segment sweep values.

Set up fundamental measurements quickly using front panel keys, or by using a mouse.

Answers when and where you need them with embedded help

Accelerate learning with context-sensitive help and robust tutorials. Use on-line help to quickly reference programming and user documentation in French, German, Japanese, Chinese, Spanish or English languages.¹ You can bookmark important topics for easy reference.

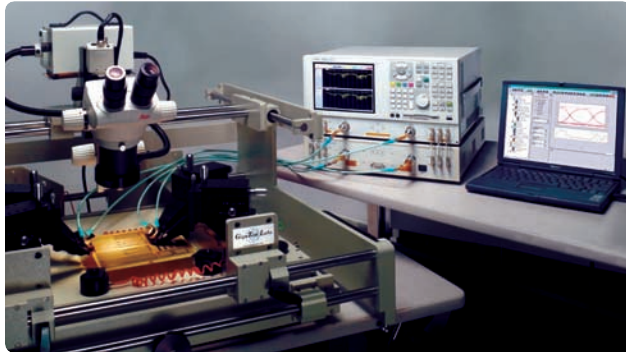


1. Non-English versions may not include latest features.

Total Solutions



Physical-layer test system



Agilent physical-layer test systems provide the highest accuracy and most comprehensive tool set for characterizing single-ended or differential physical-layer components. For example: high-speed backplanes, cables, connectors, packages, and controlled impedance traces on circuit boards.

Key features include:

- S-parameter and TDR/TDT measurements
- Single-ended, differential-, common-, and mixed-modes in frequency and time domains
- Eye diagram analysis with PRBS data patterns
- RLCG transmission-line parameter extraction

For more information visit: www.agilent.com/find/plts

Device modeling system



Agilent PNA network analyzers can be integrated into a fully automated device modeling system, which offers complete DC to RF device characterization and modeling.

For more information visit: www.agilent.com/find/eesof

Material measurements

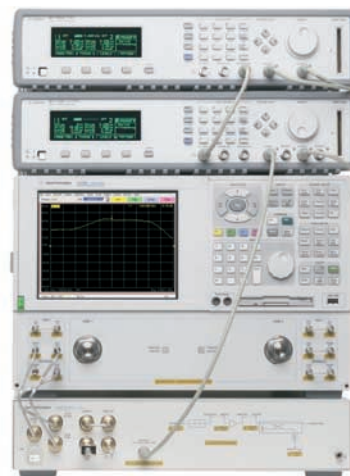


Measuring the dielectric properties of materials is easy with Agilent's 85070E, High Temperature Dielectric Probe Kit, and 85071E Materials Measurement Software.

- Measure complex permittivity and permeability across a broad frequency range.
- View data in real, imaginary, loss tangent, and Cole-Cole formats.
- Develop code in common programming environments such as Visual Basic and Visual C++.

For more information visit: www.agilent.com/find/materials

Pulsed-RF Measurement Capability



Average and point-in-pulse measurements are essential for radar and EW components, subsystems and systems. The PNA's optional pulsed-RF measurement capability, augments the PNA's average-pulse measurement capability by adding internal receiver gates to enable point-in-pulse testing with pulse widths smaller than 100 ns. A test set including an RF modulator, amplifier and directional coupler is also available for creating pulsed-RF signals.

For more information visit: www.agilent.com/find/pna

Key Specifications



Model	RF		
	E8356/7/8A	E8801/2/3A	N3381/2/3A
Frequency range	300 kHz to 3/6/9 GHz	300 kHz to 3/6/9 GHz	300 kHz to 3/6/9 GHz
Number of ports	2	2	3
Measurement receivers ¹	4	3	4
Configurable test set	■	▲	▲
Receiver attenuators	■	▲	▲
Extended power range	■	▲	▲
High stability timebase	■	▲	▲
Bias-tees	■	–	–
Time domain	▲	▲	▲
ECal support	Yes	Yes	Yes
Dynamic range (at test port) Port 1/Port 2, 3			
300 kHz to 1 MHz	125 dB	125 dB	125/123 dB
1 MHz to 3 GHz	128 dB	128 dB	128/126 dB
3 to 6 GHz	118 dB	118 dB	118/116 dB
6 to 9 GHz	113 dB	113 dB	113/113 dB
Dynamic range (receiver access) Port 1/Port 2, 3			
300 kHz to 1 MHz	140 dB	140 dB	140/138 dB
1 MHz to 3 GHz	143 dB	143 dB	143/141 dB
3 to 6 GHz	133 dB	133 dB	133/131 dB
6 to 9 GHz	128 dB	128 dB	128/128 dB
Trace noise (1kHz IF BW)			
300 kHz to 9 GHz	< 0.002 dB < 0.010 deg rms	< 0.002 dB < 0.010 deg rms	< 0.002 dB < 0.010 deg rms
Maximum output power Port 1/Port 2, 3			
300 kHz to 6 GHz	+10 dBm	+10 dBm	+10/+8 dBm
6 to 9 GHz	+5 dBm	+5 dBm	+5/+5 dBm

■ Standard ▲ Optional – Not available

Model	Microwave	
	E8362/3/4B	E8361A
Frequency range	10 MHz to 20/40/50 GHz	10 MHz to 67 GHz
Number of ports	2	2
Measurement receivers	4	4
Configurable test set	▲	▲
Receiver attenuators	▲	▲
Extended power range	▲	▲
High stability timebase	■	■
Bias-tees	▲	▲
Frequency-offset mode	▲	▲
Reference channel switch	▲	▲
Frequency converter measurement application	▲	▲
IF access	▲	▲
Pulsed-RF capability	▲	▲
Time domain	▲	▲
ECal support	Yes	Yes
Dynamic range (at test port) ²		
10 to 45 MHz	78 dB	70 dB
45 MHz to 2 GHz	94 to 119 dB	89 to 114 dB
2 to 20 GHz	122 dB	118 dB
20 to 40 GHz	110 dB	106 dB
40 to 50 GHz	104 dB	98 dB
50 to 60 GHz	–	97 dB
60 to 70 GHz	–	93 dB
Dynamic range (receiver access) ²		
10 to 45 MHz	130 dB	104 dB
45 MHz to 2 GHz	132 dB	101 to 125 dB
2 to 20 GHz	136 dB	127 dB
20 to 40 GHz	119 dB	114 dB
40 to 50 GHz	111 dB	105 dB
50 to 60 GHz	–	102 dB
60 to 70 GHz	–	96 dB
Trace noise (1kHz IF BW) ²		
10 MHz to 50 GHz	< 0.006 dB < 0.1 deg rms	< 0.006 dB < 0.1 deg rms
Maximum output power ²		
10 to 45 MHz	+2 dBm	-10 dB
45 MHz to 10 GHz	+5 dBm	0 dB
10 to 20 GHz	+3 dBm	+1 dB
20 to 40 GHz	-4 dBm	-2 dB
40 to 45 GHz	-5 dBm	-4 dB
45 to 50 GHz	-10 dBm	-5 dB
50 to 60 GHz	–	-6 dB
60 to 70 GHz	–	-10 dB

■ Standard ▲ Optional – Not available

Measurement speed (35 kHz IF bandwidth)

Model	Frequency	Points	Cycle time (ms) ³	µs/point	Updates/second
All	1.8 GHz to 2 GHz	101	9	89	111
All	1.8 GHz to 2 GHz	1601	56	26	18
All	300 kHz to 9 GHz	201	57	284	18
E8361A/2/3/4B	10 MHz to 20/40/50/67 GHz	201	126/185/210/244	627/920/1045/1214	8/6/5/4
E8361A	10 MHz to 67 GHz	16,001	645	40	1.5

Data transfer speed, 32-bit binary (ms)⁴

	201 points	16,001 points
COM ⁵	2	6
SCPI ⁵	3	30
DCOM ⁶	3	121
SCPI over GPIB ⁶	9	435

1. TRL calibration not available on 3-port.
2. Typical performance below 45 MHz and above 67 GHz.
3. Typical performance includes retrace and band-switching times with response calibration. Two-port calibration approximately doubles cycle time.

4. Typical performance.
5. Program executed in PNA.
6. Program executed on an external PC.

Key web resources

Visit our PNA Series home page for additional literature and product information:

www.agilent.com/find/pna

RF and microwave test accessories:

www.agilent.com/find/accessories

Electronic calibration (ECal):

www.agilent.com/find/ecal

Wireless component manufacturer industry:

www.agilent.com/find/wireless

Service and support products:

www.agilent.com/find/tm_services

Aerospace defense industry:

www.agilent.com/find/ad

Expand your measurement capabilities with Agilent-qualified Channel Partners.

Our Channel Partners offer accessories and measurement solutions that extend your network analysis capabilities.

For information about test fixtures and part handlers, contact:

Inter-Continental Microwave

Telephone: (408) 727-1596

Fax: (408) 727-0105

Web site: www.icmicrowave.com

E-mail: icmfixture@aol.com

For information about probing equipment and accessories, contact:

Cascade Microtech, Inc

Telephone: (503) 601-1000

Fax: (503) 601-1002

Web site: www.cascademicrotech.com

E-mail: sales@cmicro.com

For information about load pull and noise parameter systems, cal kits, and tuners, contact:

Maury Microwave Corporation

Telephone: (909) 987-4715

Fax: (909) 987-1112

Web site: www.maurymw.com

E-mail: maury@maurymw.com



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Get the latest information on the products and applications you select.

Probe station (page 3) courtesy of Cascade Microtech, Inc.

Probe station (page 10) courtesy of GigaTest Labs.

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Our Promise

Our Promise means your Agilent test and measurement equipment will meet its advertised performance and functionality. When you are choosing new equipment, we will help you with product information, including realistic performance specifications and practical recommendations from experienced test engineers. When you receive your new Agilent equipment, we can help verify that it works properly and help with initial product operation.

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Your Advantage means that Agilent offers a wide range of additional expert test and measurement services, which you can purchase according to your unique technical and business needs. Solve problems efficiently and gain a competitive edge by contracting with us for calibration, extra-cost upgrades, out-of-warranty repairs, and onsite education and training, as well as design, system integration, project management, and other professional engineering services. Experienced Agilent engineers and technicians worldwide can help you maximize your productivity, optimize the return on investment of your Agilent instruments and systems, and obtain dependable measurement accuracy for the life of those products.

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