Agilent

PNA Series RF and Microwave Network Analyzers

300 kHz to 67 GHz

exceptional performance

advanced automation

expanding capabilities

Agilent Technologies

The PNA Series

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 Series
Across the platform

- < 26 µsec/point measurement speed
- 16,001 points per channel
- 32 independent measurement channels
- Windows® 2000 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 Series
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 Series
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)

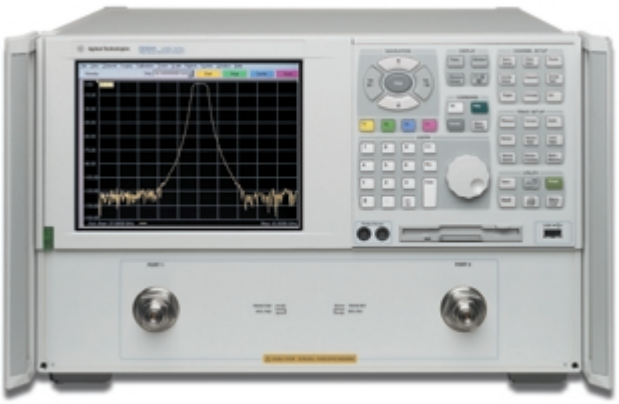
Performance

RF PNA Series

300 kHz 3 GHz
300 kHz 6 GHz
300 kHz 9 GHz

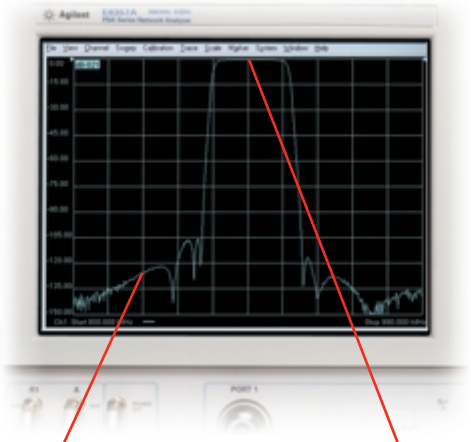
Performance
- Up to 143 dB dynamic range
- < 0.002 dB trace noise
- < 26 µsec/point measurement speed

Microwave PNA Series



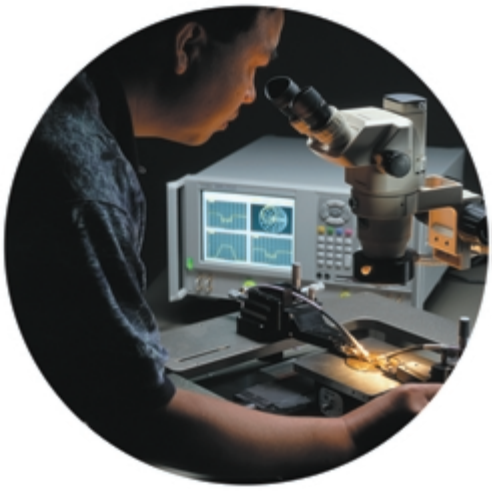
10 MHz 20 GHz
10 MHz 40 GHz
10 MHz 50 GHz
10 MHz NEW! 67 GHz[1]

Performance
- Up to 134 dB dynamic range
- < 0.006 dB trace noise
- < 26 µsec/point measurement speed
- Start frequency lowered to 10 MHz



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

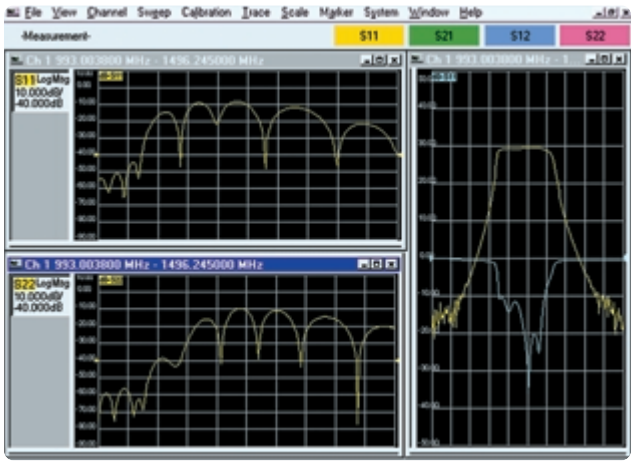
High power measurements

- 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

Agilent's balanced-measurement systems make complex characterization of fully balanced or balanced-to-single-ended RF, and microwave components a lot easier. Devices such as differential filters and amplifiers, baluns, and balanced transmission lines – which were once difficult to measure using a conventional two-port measuring system – can now be completely and accurately tested with Agilent's solutions. For more information visit: **www.agilent.com/find/balanced**

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

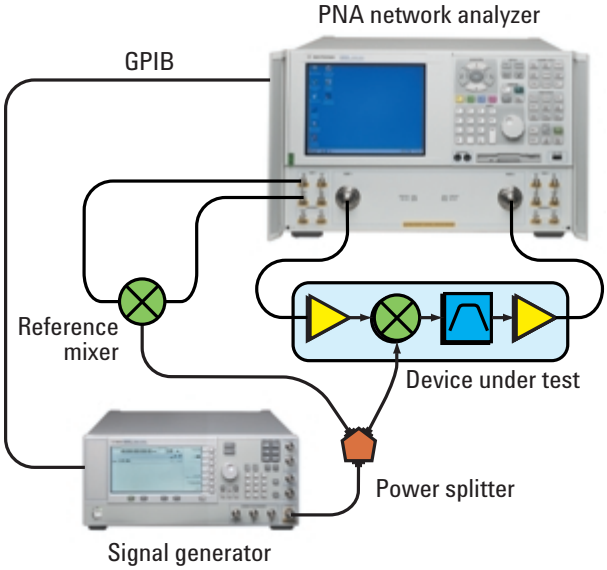
- Configure up to 32 independent measurement channels to eliminate the need for multiple instrument state recalls.
- 16,001 points per channel.
- Display up to 16 windows.
- Display up to 4 active traces in each window.
- Select 10 coupled or fully-independent markers per trace.

Capabilities

The frequency-offset capability for the microwave PNA Series offers industry-leading accuracy and ease-of-use for measuring mixers and frequency converters.

The frequency-offset capability is implemented in an integrated hardware and firmware solution. The hardware lets you independently set the PNA's source and receiver frequencies for measuring:

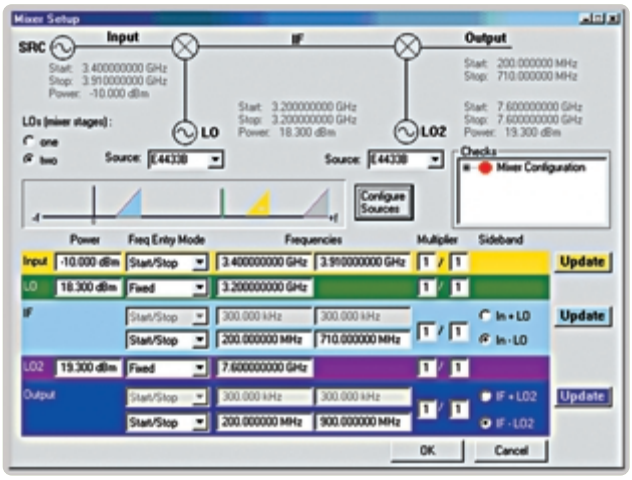
- Mixer conversion loss/gain
- Harmonic and spurious responses
- Intermodulation distortion (IMD)



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[1]

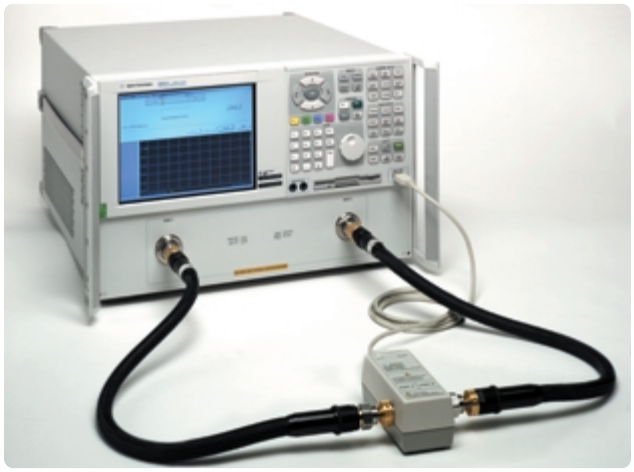
- Provides highest amplitude accuracy for measurements of conversion loss/gain
- Combines SOLT and power-meter calibration
- Simplest setup and calibration procedure

1. Patent pending.

Throughput

Built for speed

Decreasing your test time is critical for your success in the marketplace. The PNA Series 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 GHz[1] 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).

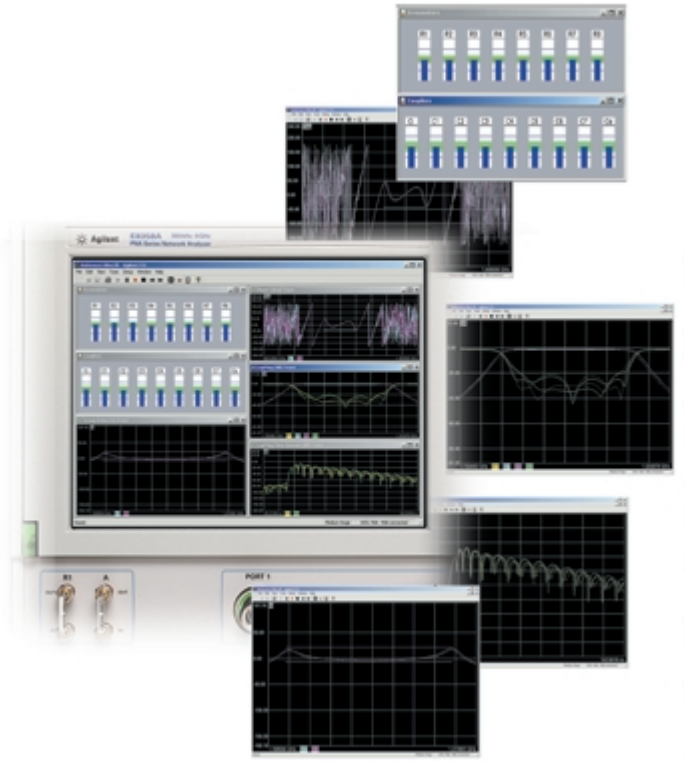
Reduce test time with a network analyzer optimized to increase throughput.

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.

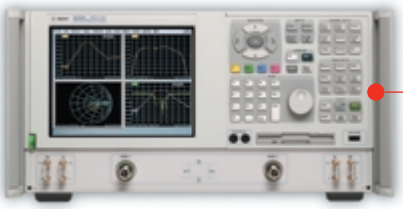
The COM/DCOM advantage

- 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

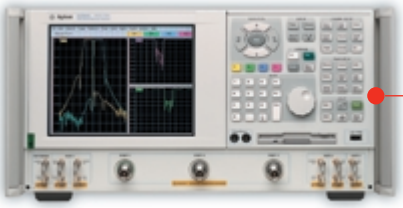
Connectivity

Achieve a new level of integration

Standard features and an integrated Windows 2000 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.

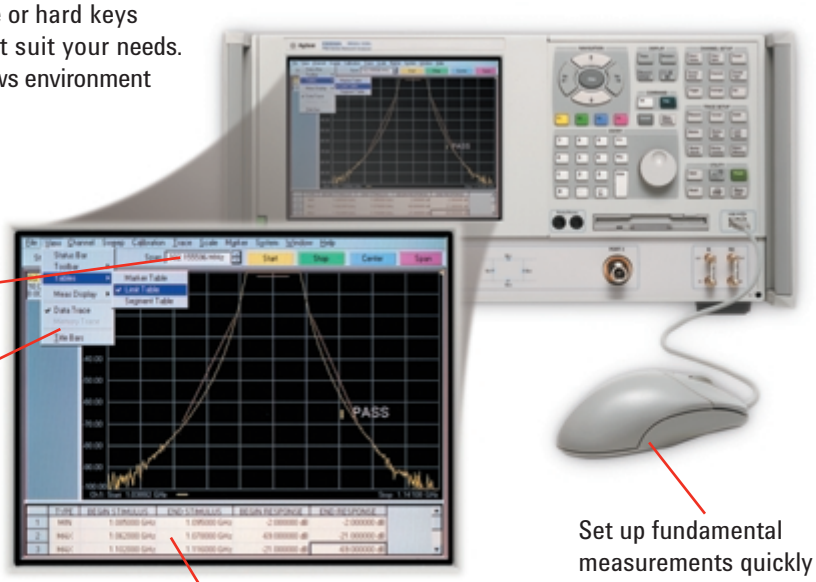
Control additional test equipment directly from the analyzer.

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.

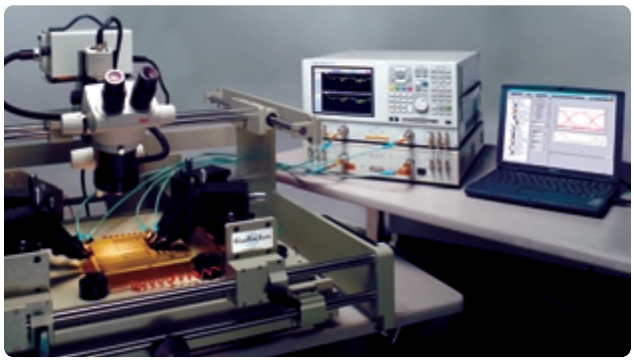
Answers when and where you need them with embedded help

Accelerate learning with context-sensitive help and robust tutorials. Use on-line help to quickly reference programming and user documentation in French, German, Japanese, 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



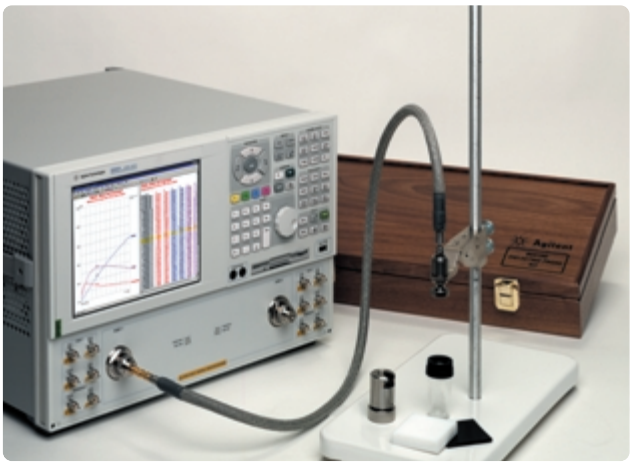
The Agilent physical-layer test systems provide the highest accuracy and most comprehensive tool set for characterizing single-ended or differential physical-layer components. For example: high-speed backplanes, cables, connectors, packages, and controlled impedance traces on circuit boards.

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**

Material measurements



Measuring the dielectric properties of materials is easy with Agilent's 85070D, High Temperature Dielectric Probe Kit, and 85071D 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**

Device modeling system

The Agilent PNA Series network analyzers is integrated into a fully automated device modeling system (Agilent 85225F), which offers complete DC to RF device characterization and modeling.

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

Key Specifications

	RF		
Model	**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 ◆ Available soon

	Microwave	
Model	**E8362/3/4/B**	**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	▲	◆
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 ◆ Available soon

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

Visit our electronic calibration (ECal) area:
www.agilent.com/find/ecal

Visit our wireless component manufacturer industry area:
www.agilent.com/find/wireless

Visit our service and support products, area:
www.agilent.com/find/tm_services

Visit our aerospace defense industry area:
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:
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Telephone: (909) 987-4715
Fax: (909) 987-1112
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E-mail: maury@maurymw.com

Agilent Email Updates

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

Probe station (page 10) courtesy of GigaTest Labs.

Agilent Technologies' Test and Measurement Support, Services, and Assistance
Agilent Technologies aims to maximize the value you receive, while minimizing your risk and problems. We strive to ensure that you get the test and measurement capabilities you paid for and obtain the support you need. Our extensive support resources and services can help you choose the right Agilent products for your applications and apply them successfully. Every instrument and system we sell has a global warranty. Support is available for at least five years beyond the production life of the product. Two concepts underlie Agilent's overall support policy: "Our Promise" and "Your Advantage."

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 use Agilent equipment, we can verify that it works properly, help with product operation, and provide basic measurement assistance for the use of specified capabilities, at no extra cost upon request. Many self-help tools are available.

Your Advantage
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.

Agilent T&M Software and Connectivity
Agilent's Test and Measurement software and connectivity products, solutions and developer network allows you to take time out of connecting your instruments to your computer with tools based on PC standards, so you can focus on your tasks, not on your connections. Visit
www.agilent.com/find/connectivity
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(fax) (305) 269 7599
Taiwan:
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(fax) 0800 286 331
Other Asia Pacific Countries:
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(fax) (65) 6836 0252
Email:
tm_asia@agilent.com

Online Assistance:
www.agilent.com/find/assist

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