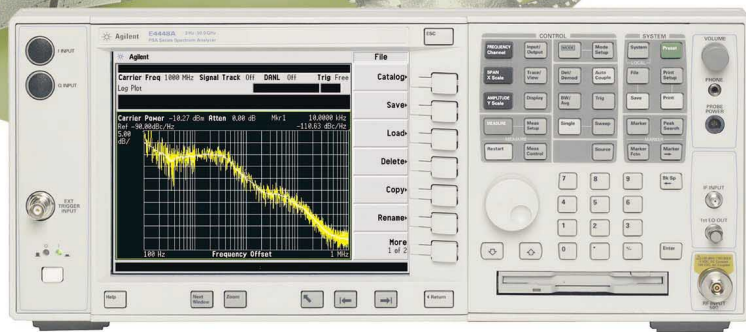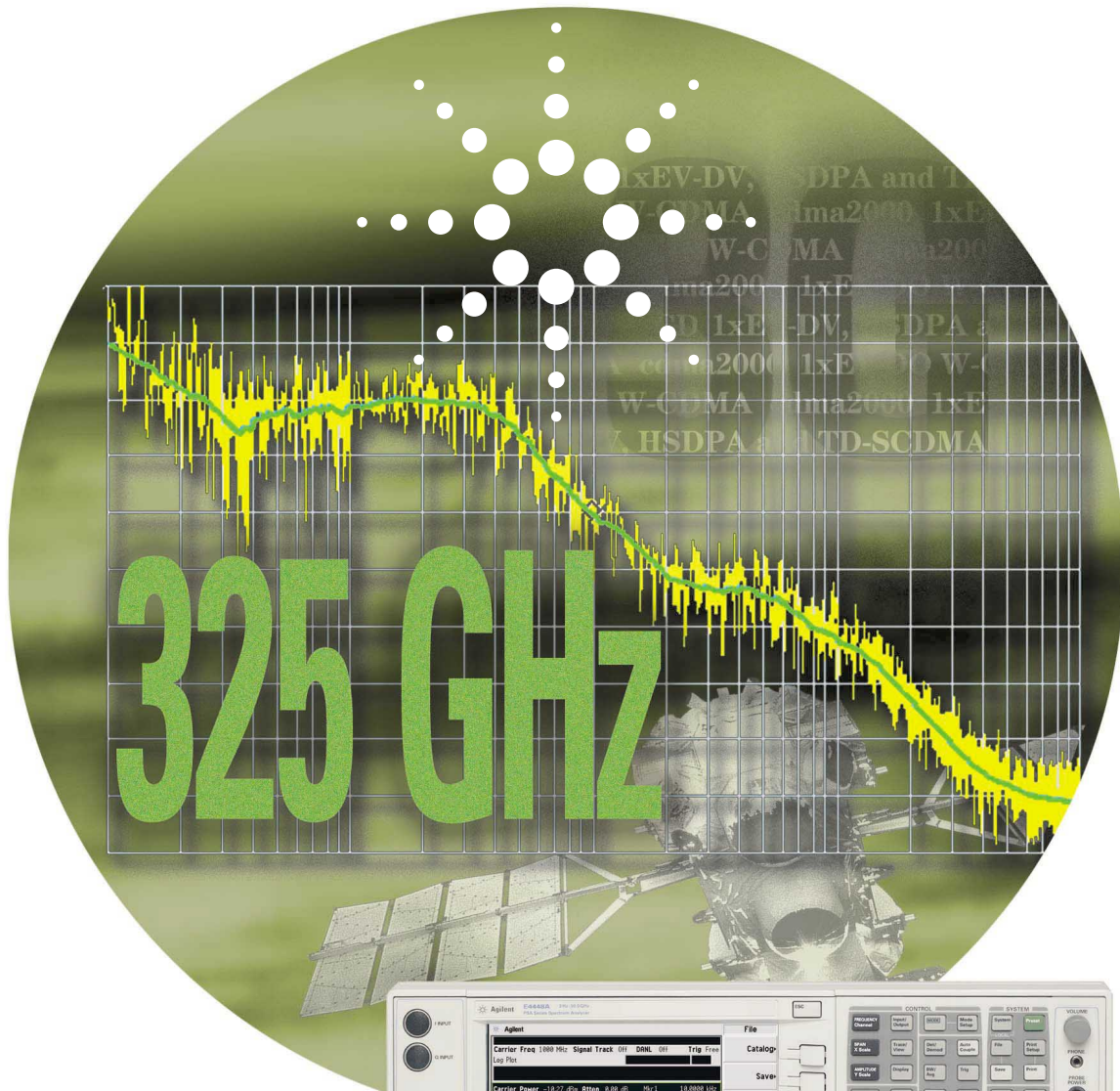# Agilent PSA Series
Spectrum Analyzers

325 GHz

New!
- 325 GHz with external mixing
- TD-SCDMA
- HSDPA
- 1xEV-DV

Agilent Technologies

Performance Exceeding Expectations

The brainpower and the will are already yours; the next step is selecting precisely the right tools to reach the market first.

In 1964, Hewlett-Packard Company introduced its first spectrum analyzer at the birth of the technology revolution. Since that time, HP and now Agilent Technologies have continued to be industry leaders in spectrum analysis tools. Today, Agilent offers an entirely new platform for high-performance spectrum analysis.

The Agilent PSA Series offers high-performance spectrum analysis up to 50 GHz and beyond with powerful one-button measurements, a versatile feature set, and a leading-edge combination of flexibility, speed, accuracy, and dynamic range. From millimeter wave and phase noise measurements to spur searches and modulation analysis, the PSA Series offers unique and comprehensive high-performance solutions to R&D and manufacturing engineers in cellular and emerging wireless communications, aerospace, and defense.

Dynamic range
Fine-tune measurements with the industry's most usable dynamic range.

Accuracy
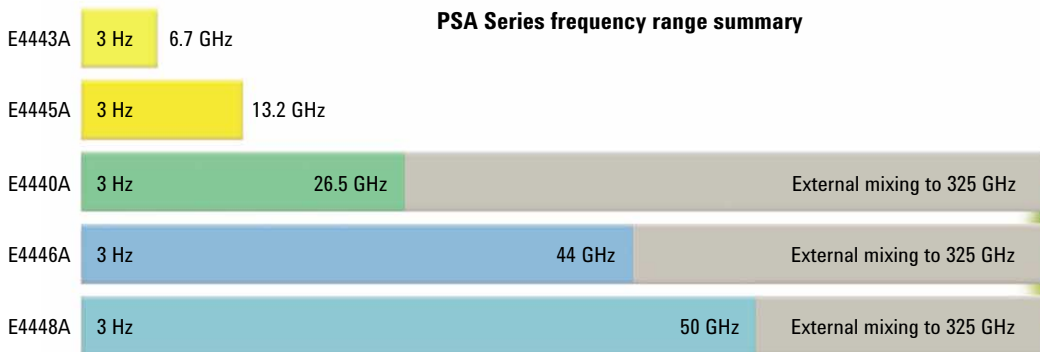Design with confidence using industry's highest accuracy.

Flexibility
Take control of measurement setups through advanced flexibility.

Speed
Increase throughput and design efficiently with fast measurements.

PSA Series frequency range summary

E4443A	3 Hz	6.7 GHz
E4445A	3 Hz	13.2 GHz
E4440A	3 Hz — 26.5 GHz	External mixing to 325 GHz
E4446A	3 Hz — 44 GHz	External mixing to 325 GHz
E4448A	3 Hz — 50 GHz	External mixing to 325 GHz

New to 325 GHz

Capability Beyond Limitation

Design efficiently and with confidence

To promote productivity in research and development, test and measurement tools must be flexible, thorough, and easy to use. Troubleshooting and design verification can be expedited and simplified with the PSA Series spectrum analyzers. With this one tool, it is easy to optimize setups for unique spectrum measurements, to customize advanced power measurements for modulated signals, and to dive down to the bit level using the digital demodulation personalities.

Having confidence in measurement results is essential to design verification. Understanding the importance of this, Agilent makes measurement integrity its highest priority. We provide guaranteed technical specifications to a set performance level on which you can depend.

Increase and maintain manufacturing throughput

From high-volume automated testing of cellular base stations to manually tuning oscillators, the PSA Series optimizes manufacturing throughput on many levels.

Increased throughput – Fast 1 ms sweeps and 45/s update rates reduce automated test times. Manual tests are accelerated by one-button setups and fewer required button presses per measurement. The PSA Series shifts easily between measurement personalities, minimizing changeover time and accelerating troubleshooting.

Improved yields – Excellent specifications reduce measurement uncertainty to allow for narrower test margins and improved yields. Sophisticated algorithms constantly monitor analyzer conditions and determine when internal background alignment is required.

One analyzer, many solutions – Using only 177 mm (7 in) of rack space, the PSA Series is packed with features. Superior accuracy (±0.17 dB typical) and linearity may eliminate the need for a power meter. Cellular communications measurement personalities give it digital demodulation capability. The phase noise personality transforms it to a phase noise tester. The feature list is long and will continue to grow.

The PSA Series offers a wide variety of features for making more than just traditional spectrum analyzer measurements.

- **Power Suite**
- **Measurement personalities**
- **Modulation analysis**
- **Modern connectivity**

High-Performance Spectrum Analysis

Great specifications are the starting point for great measurements. The PSA Series has the technology to offer unprecedented control over dynamic range, resolution, and speed.

2 dB step attenuator

160 RBW settings (10% steps)

Optional built-in preamplifier

Noise correction for ACP measurements

- −154 dBm typical DANL
- −167 dBm typical DANL with built-in preamplifier
- +19 dBm typical TOI
- +7 dBm typical 1-dB gain compression
- −117 dBc/Hz typical phase noise at 10 kHz offset
- 81 dB typical W-CDMA ACPR with noise correction

✓ Dynamic range
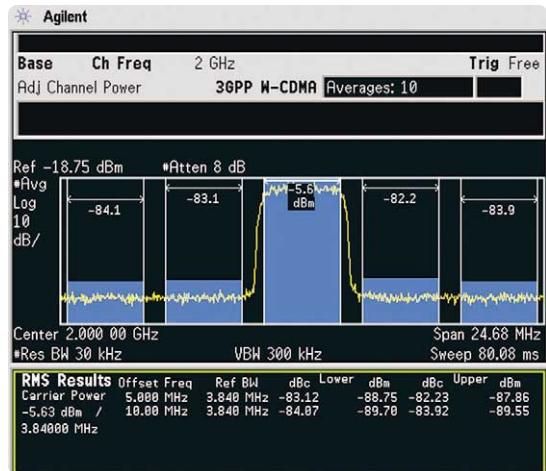
The PSA Series has excellent dynamic range for a W-CDMA adjacent channel power (ACP) measurement

To learn more, read...

Optimizing Dynamic Range for Distortion Measurements, product note, literature number 5980-3079EN


The PSA Series achieves superior linearity and unsurpassed accuracy due to its advanced design and modern technology.

All-digital auto-ranging IF reduces or eliminates amplitude uncertainty

Auto alignment guarantees accuracy with temperature changes

Amplitude correction to compensate for gains and losses in your test setup

- ±0.21 dB typical amplitude accuracy
- 0 dB reference level uncertainty
- 0 dB display switching uncertainty
- ±0.05 dB RBW switching uncertainty
- ±0.07 dB display linearity

✓ Accuracy
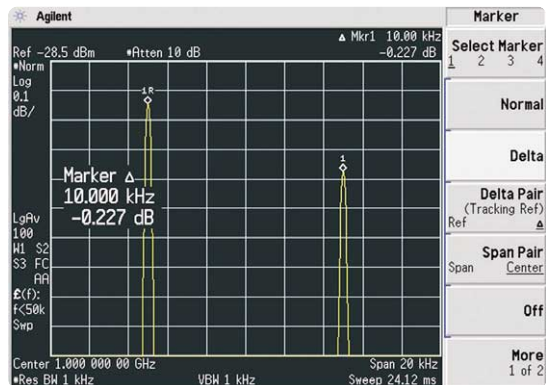
This figure illustrates 0.1 dB/division display resolution, 0.01 dB reference level resolution, and 0.001 marker resolution with averaging.

To learn more, read...

PSA Series Amplitude Accuracy, product note, literature number 5980-3080EN

From the novice to the most knowledgeable expert, the PSA makes it easy for anyone to obtain accurate, reliable results from their measurements.

Swept versus FFT

Perform swept-tuned measurements with digital RBW filters or fast Fourier transform (FFT) measurements with digital FFT filters. Use this flexibility to optimize for speed and sensitivity.

Phase noise optimization

The PSA Series' local oscillator (LO) phase lock loop configuration can be set to optimize phase noise close to a carrier within a 50 kHz offset, close to a carrier outside of a 50 kHz offset, or for tuning speed.

Digital detectors

Detector modes become important for accurately measuring different types of continuous wave, noise, and noise-like signals. The PSA Series offers this complete suite of detectors to assure correct measurement results.

- normal
- average (log, rms, voltage)
- peak
- sample
- negative peak

Flexibility

Choose between swept or FFT measurements and optimize input attenuation and resolution bandwidths to make fast measurements.

- 1 µs sweep times in zero-span
- 1 ms frequency sweep times
- >50 measurements/second locally
- >45 measurements/second remotely
- Fast low-level spur search

Speed
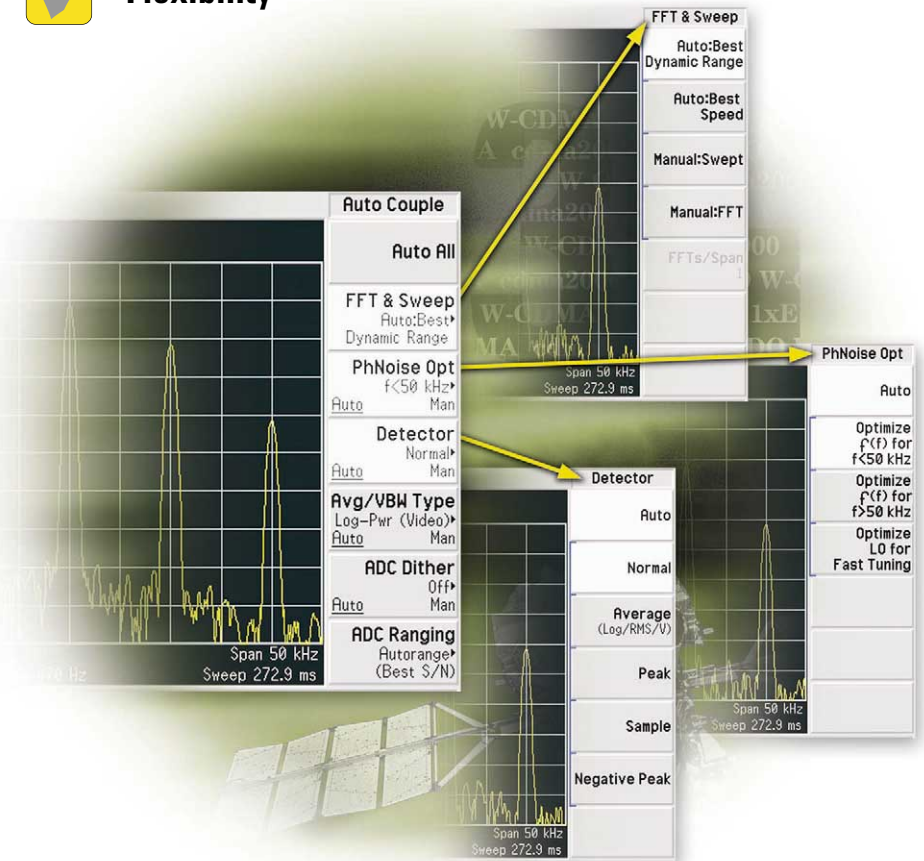
To learn more, read...

PSA Series Swept and FFT Analysis, product note, literature number 5980-3081EN

Power Suite:
The Power to Realize

Making broadband signal measurements simple and intuitive requires unique spectrum analyzer measurement capability. The PSA Series offers a comprehensive suite of flexible, one-button RF and microwave power measurements, with wireless format-based setups for 2G/3G, W-LAN, *Bluetooth*™, and DVB-T standards. Power Suite is a standard tool set included in every PSA Series spectrum analyzer.

Power Suite measurements

- channel power
- occupied bandwidth
- adjacent channel power (with multiple offsets)
- multicarrier power/12-carrier ACP
- power statistics (CCDF)
- harmonic distortion
- burst power
- third order intercept (TOI)
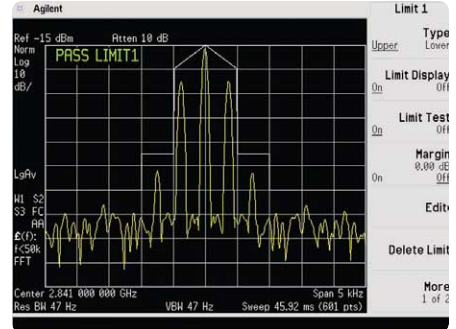- spurious emissions
- spectrum emission mask

TOI measurement
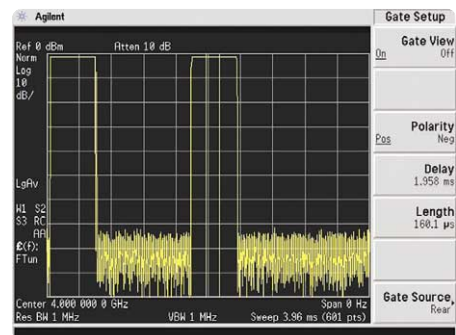

SEM measurement

Limit Lines

Customizable limit lines for pass/fail testing are standard with every PSA Series spectrum analyzer.

Customize limit lines for pass/fail testing

Gated Sweep

Analyze time varying signals such as pulsed RF, time division multiple access (TDMA), interleaved and burst-modulated with gated sweep capability. This type of time gating, standard in every PSA, makes fast spectrum measurements on burst signals without interference from switching the carrier on and off.

Gated sweep measurement
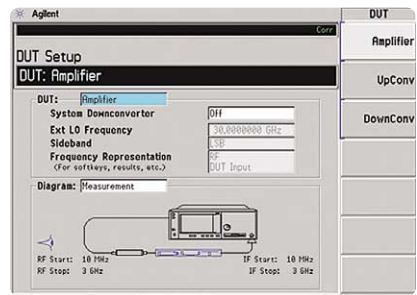
Measurement Personalities

Conveniently built in to the analyzer, these optional application-specific measurement personalities provide advanced capability with one-button measurement simplicity.
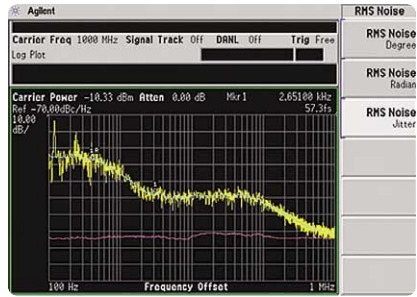
Log plot measurement

Phase noise (Option 226)

This flexible tool quickly and easily generates plots of phase noise in dBc/Hz versus log offset frequency, measures jitter, or makes continuous spot frequency phase noise measurements.
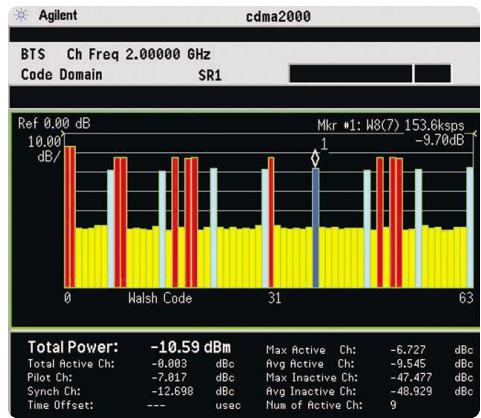

DUT setup menu

Noise figure (Option 219)

Make noise figure and gain measurements from 100 kHz to 26.5 GHz with this personality that offers guides for measurement setups and a built-in uncertainty calculator to qualify the measurement system.

Digital demodulation hardware (Option B7J)

This option, required for modulation analysis, includes a 1-dB electronic step attenuator and provides spectrum and waveform analysis and I/Q pairs over GPIB or LAN.

Cellular communications

The PSA Series offers powerful, format-based power measurements and modulation analysis for several popular cellular formats.

cdma2000 code domain analysis

- **W-CDMA** (Option BAF) power measurements and modulation analysis for uplink and downlink
- *NEW* **HSDPA** (Option 210) enhancement to the W-CDMA option
- **GSM with EDGE** (Option 202) power measurements and modulation analysis including PvT and ORFS
- **cdma2000** (Option B78) power measurements and modulation analysis for forward and reverse links

- *NEW* **1xEV-DV** (Option 214) enhancement to the cdma2000 option
- **1xEV-DO** (Option 204) power measurements and modulation analysis for forward and reverse links
- **cdmaOne** (Option BAC) power measurements and modulation analysis
- *NEW* **TD-SCDMA** (Option 211) power measurements
- **NADC/PDC** (Option BAE) power measurements and modulation analysis

To learn more, read...
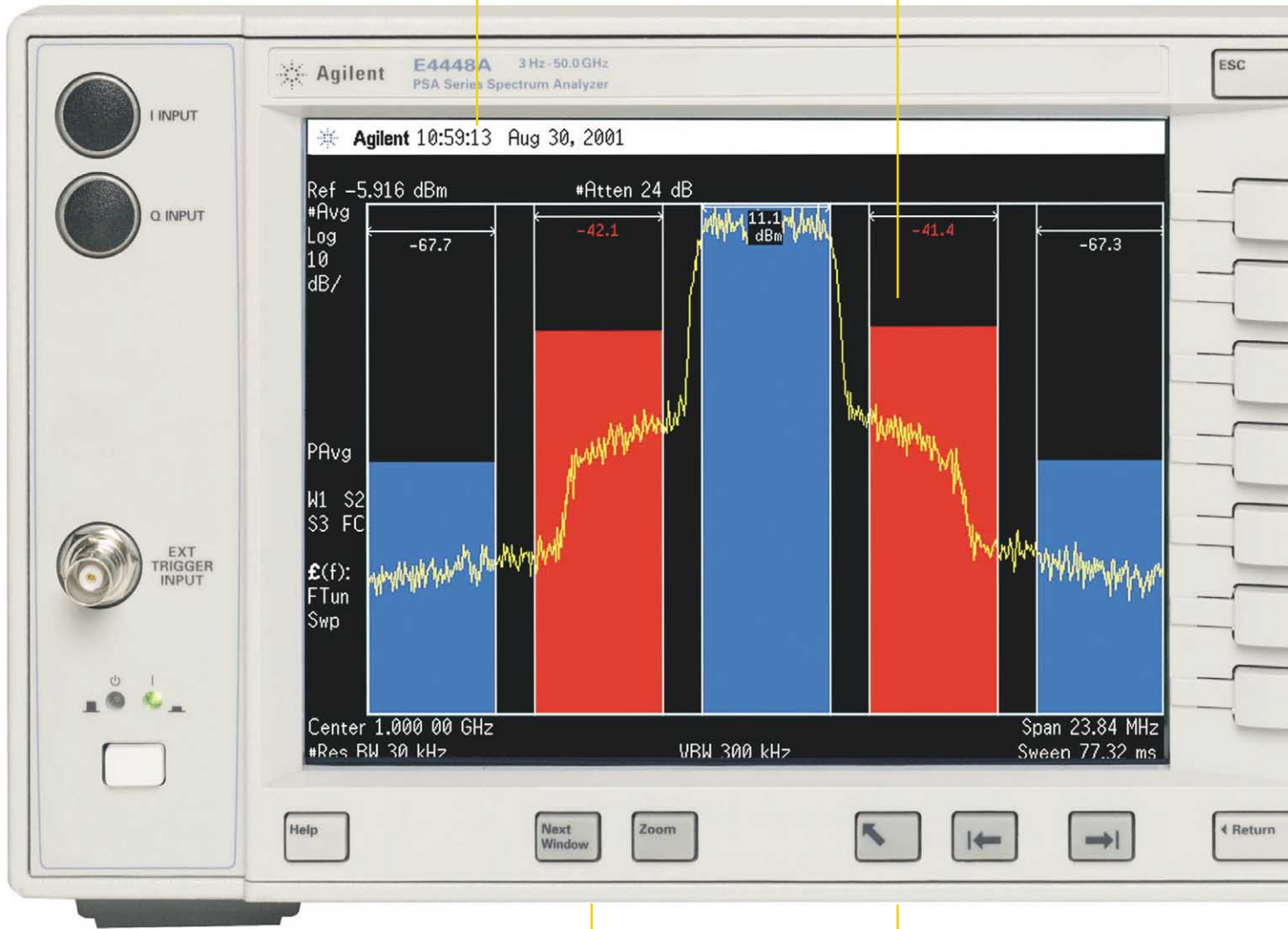Measurement Personality technical overviews, a complete list is available on page 16

Truly User Friendly

The PSA Series has a simple and intuitive user interface. The display is large and bright with effective use of colors. Front panel hard keys perform frequently used functions and provide access to menus. Soft keys on the display are organized for quick and easy navigation. One-button set-ups are provided for many measurements.

Noise source control output for noise figure measurements (Option 219)

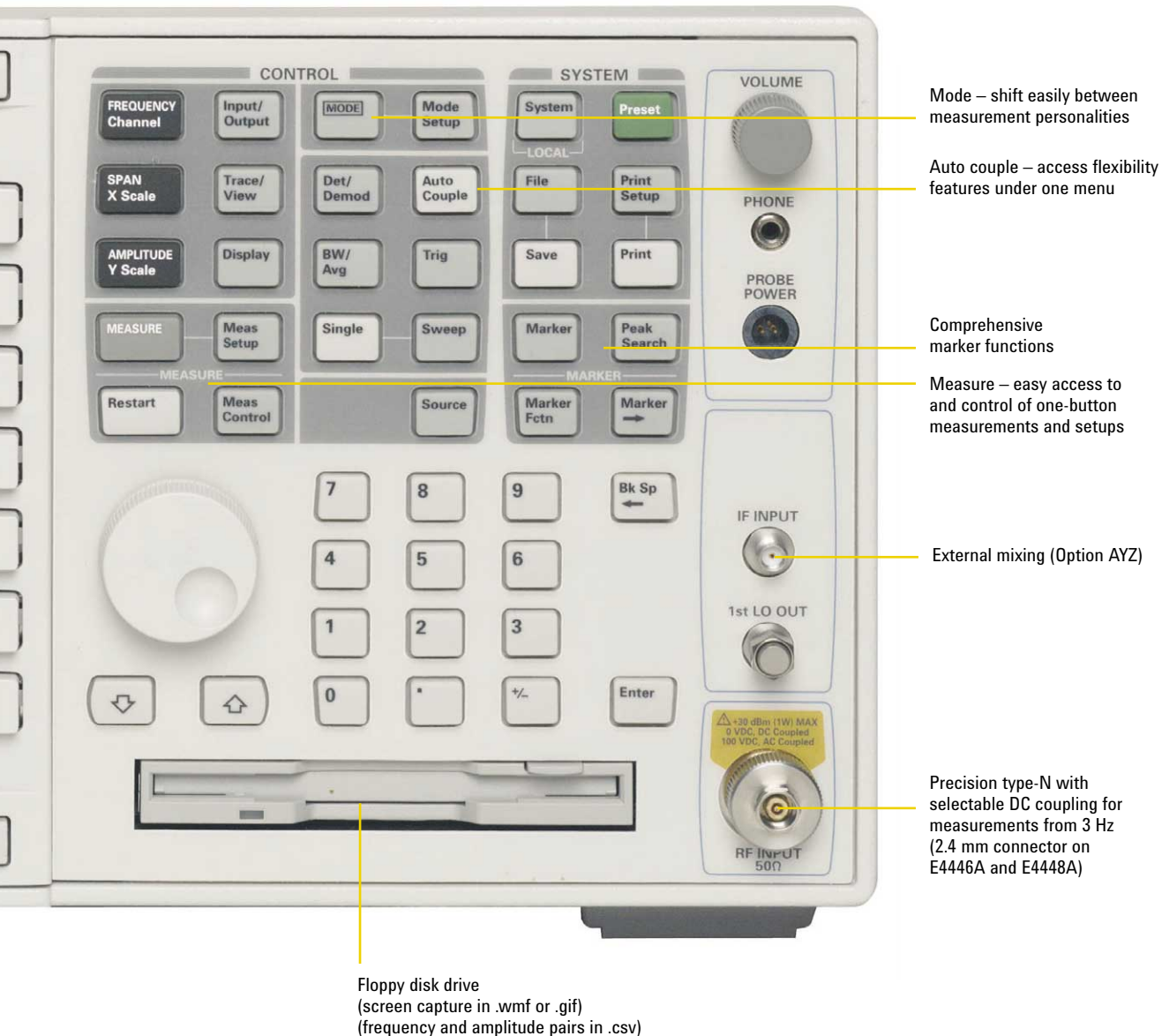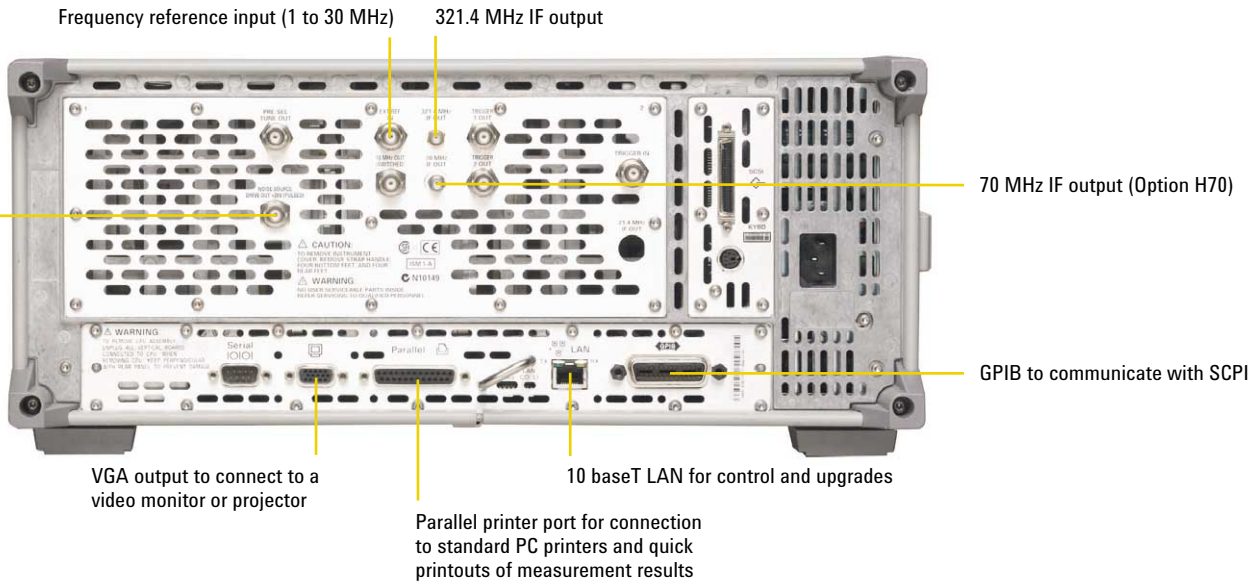Real-time clock for time-stamping of data files and printouts

Display — expand measured results to full screen on the bright, high resolution, wide viewing angle, 17-cm color display
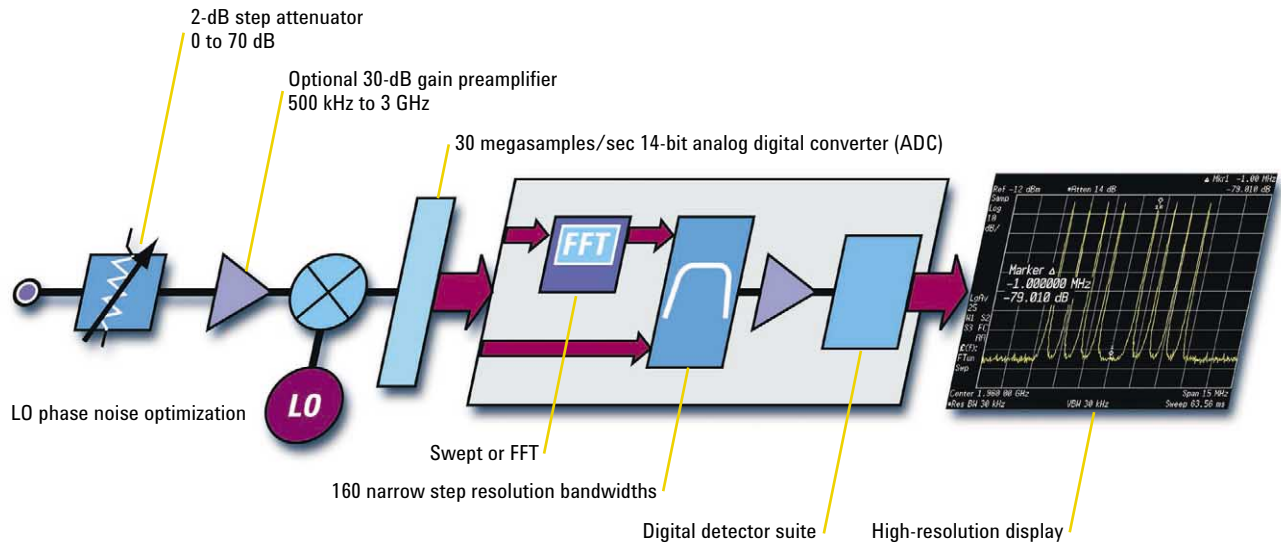

Workstation processor

Automatic background alignment for exceptional accuracy

Frequency reference input (1 to 30 MHz)

321.4 MHz IF output

70 MHz IF output (Option H70)

GPIB to communicate with SCPI

VGA output to connect to a
video monitor or projector

Parallel printer port for connection
to standard PC printers and quick
printouts of measurement results

10 baseT LAN for control and upgrades

Mode – shift easily between
measurement personalities

Auto couple – access flexibility
features under one menu

Comprehensive
marker functions

Measure – easy access to
and control of one-button
measurements and setups

External mixing (Option AYZ)

Precision type-N with
selectable DC coupling for
measurements from 3 Hz
(2.4 mm connector on
E4446A and E4448A)

Floppy disk drive
(screen capture in .wmf or .gif)
(frequency and amplitude pairs in .csv)

A Spectrum Analyzer with a Digital Brain

Agilent PSA Series block diagram

2-dB step attenuator
0 to 70 dB

Optional 30-dB gain preamplifier
500 kHz to 3 GHz

30 megasamples/sec 14-bit analog digital converter (ADC)

FFT

LO

LO phase noise optimization

Swept or FFT

160 narrow step resolution bandwidths

Digital detector suite

High-resolution display

All-digital auto-ranging IF

The PSA Series has an all-digital IF section with auto-ranging capability. After the input signal is downconverted, it is immediately digitized, and all processing is performed digitally. This architecture offers:

- Variable RBW filters in 10% steps
- Exact and predictable resolution bandwidths
- Zero uncertainty in reference level and display scale switching
- Improved filter shape factor
- Faster sweep speeds
- Increased display resolution
- FFT capability
- Multiple detector modes

With auto-ranging, the analyzer adjusts the input signal in real time during the sweep so that the full range of the digitizer is utilized. Thus, at every point in the sweep the signal is being measured with the full resolution and dynamic range of the ADC.

- Signals are measured accurately everywhere on the display.
- Accuracy and linearity do not degrade when measuring small signals in the presence of large signals.
- The dynamic range of the instrument is not limited by the dynamic range of the digitizer.

To learn more, read...

Measurement Innovations and Benefits, product note, literature number 5980-3082EN

Modern Connectivity

Connect

The PSA Series has built-in capability to network with PCs, printers, and software programs. Standard connectivity features include

- **IVI-COM** and **VXI***plug&play* drivers for Agilent VEE, National Instrument's LabView, and LabWindows

- **IntuiLink** software for easy transfer of measurement results into Microsoft® Excel and Word

- **Floppy drive**

- **GPIB** and **10 baseT LAN** for automated control and remote operation

- **SCPI** programmability

- **Code compatibility** with the HP 8566B/8568B spectrum analyzers (Option 266)

- **Parallel port** for printing

- **BenchLink Web Remote** (Option 230) used to control analyzer functions, record and evaluate data, and view signals in real time, remotely anywhere in the world over the Web

- **Agilent's Connectivity Suites** and products will enable you to make fast, easy instrument connections and create test programs based on the power of Microsoft Visual Studio/.NET

For more information, please visit

www.agilent.com/find/connectivity
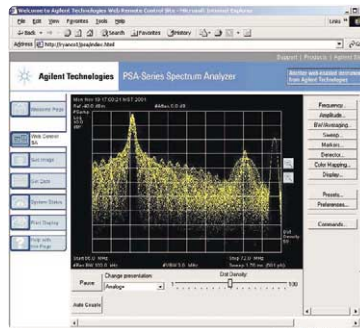
Benchlink Web Remote

Flexible modulation analysis with Agilent 89601A vector signal analysis software

Embrace the power of flexible modulation analysis by linking the PSA to the 89601A vector signal analysis software. For frequencies up to 50 GHz, the PSA can serve as a front-end receiver for use with the 89601A, a flexible tool for demodulating and analyzing even the most advanced digital formats. Features include variable block size signal acquisition with user-selectable pulse search and synch words and a user-controllable adaptive equalizer. Additionally, the 89601A can be used with Agilent's Advanced Design System (ADS) software to integrate design and test.
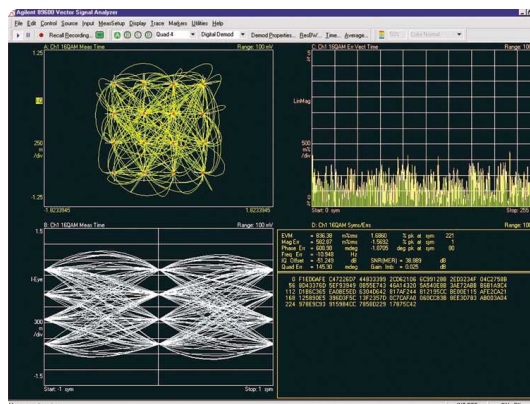
Agilent 89601A vector signal analysis software

Confidence Brings Reward

PSA series specifications

Every PSA Series spectrum analyzer is thoroughly tested and guaranteed to meet the specifications given in the PSA Spectrum Analyzers Specifications Guide and all product literature. With reliable performance, error budgets for measurement uncertainty can be reduced resulting in increased yields, improved device specification settings, and reduction in test setup costs.

Typical performance

Because 80% of PSA Series analyzers typically perform significantly better than the guaranteed specifications, we supply a "typical" value for the more commonly used specifications. Use this typical data when comparing products, or when the application pushes the limit on a given specification.

Performance verification and adjustment software for instrument calibration (Option UK6)

This software allows fast and accurate testing of PSA spectrum analyzers and provides ANSI Z540 and ISO 17025 compliant test reports. It runs on a PC platform running Windows® 95/98/NT/ 2000/XP and uses a standard calibration platform to help minimize calibration run time and operator involvement.

To learn more, read...

*ISO 17025 Calibration –
essential information
that will help you win,*
brochure,
literature number
5988-7953EN

Key Specifications[1]

E4443A/E4445A/E4440A/E4446A/E4448A

Frequency range	3 Hz to 6.7/13.2/26.5/44/50 GHz (to 325 GHz with external mixing)

Speed

Sweep time, span ≥ 10 Hz	1 ms to 2000 s
Sweep time span = 0 Hz	1 µs to 6000 s
Local measurement update rate	≥ 50 measurements/sec
Remote measurement update rate	≥ 45 measurements/sec

Resolution

Resolution bandwidth range, swept and FFT	1 Hz to 3 MHz (10% steps), 4, 5, 8 MHz
Variable sweep (trace) point range	101 to 8192
Phase noise at 1 GHz	
10 kHz offset	−114 dBc/Hz (−117 dBc/Hz, typical)
1 MHz offset	−144 dBc/Hz (−148 dBc/Hz, nominal)
10 MHz offset	−151 dBc/Hz (−-157 dBc/Hz, nominal)

Dynamic range

Displayed average noise level (DANL)	
10 MHz to 3 GHz	−153 dBm (−154 dBm typical)
3 GHz to 20 GHz	−147 dBm (−149 dBm typical)
20 GHz to 26.5 GHz	−143 dBm (−145 dBm typical)
26.5 GHz to 44 GHz	−129 dBm (−132 dBm typical)
44 GHz to 50 GHz	−127 dBm (−130 dBm typical)
Preamplifier (DANL), 10 MHz to 3 GHz	−166 dBm (−167 dBm typical)
1 dB gain compression, 200 MHz to 3 GHz	+3 dBm (+7 dBm nominal)
Input attenuator range	0 to 70 dB in 2 dB steps
TOI, 1.7 GHz to 3.0 GHz	+17 dBm (+19 dBm typical)
ACPR, W-CDMA (5 MHz offset)	
Dynamic range	74.5 dB typical
with noise correction	81 dB typical

Accuracy

Absolute amplitude accuracy	±(0.24 dB + frequency response) [±(0.06 dB + frequency response) typical]
Frequency response, 3 Hz to 3 GHz	±0.38 dB (±0.15 dB typical)
Frequency accuracy (1 GHz)	±100 Hz
ACPR, W-CDMA accuracy (5 MHz offset)	
Mobile station	±0.12 dB
Base station	±0.22 dB
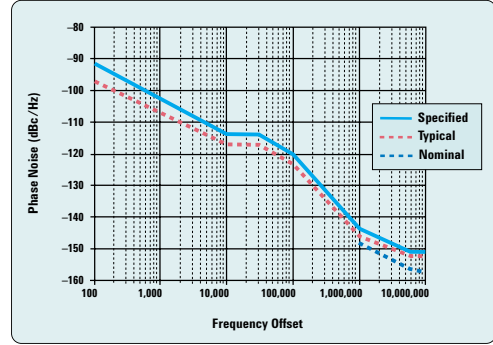
PSA Series phase noise performance plot (1 GHz center frequency)

To learn more, read...

PSA Series, data sheet, literature number 5980-1284E

1. See PSA Series spectrum analyzers data sheet for more specification details (literature number 5980-1284E).

Service and Support

The performance and flexibility of the PSA Series spectrum analyzer is only a small part of what is available from Agilent. In a constantly changing environment, Agilent's ability to understand your business needs and quickly provide the latest end-to-end service and support solutions gives the certainty and confidence necessary to accelerate the development and deployment of winning technologies.

Support solutions

Use Agilent's support solutions to get more from the PSA, as well as other test equipment, by increasing productivity and maximizing uptime. Our programs are designed with flexibility and can be tailored to meet your needs, including costs and response times.

Repair services ensure that the instrument is up and running as quickly as possible. The PSA comes with a threee-year return-to-Agilent warranty. Additional repair options are available at the time of purchase.

Calibration services guarantee measurement confidence in PSA. Choose return-to-Agilent or on-site service and order the service as needed or on a regularly scheduled basis.

Volume On-site Calibration (VOSCAL) service minimizes instrument downtime and associated costs by delivering quality calibration on-site without interfering with output schedules. VOSCAL is a fully operational, high-quality mobile calibration laboratory complete with high-specification systems and automation.

System uptime services provide Agilent's global resources and expertise to help prevent system failures and develop solutions to problems fast. Our system up-time teams are comprised of our best service specialists to keep systems up and running.

Equipment management services assist in managing test and measurement assets. Agilent's global equipment management solution helps maximize the utilization and reduce the ownership cost of test equipment.

For more information on Agilent support solutions visit:

www.agilent.com/find/tm_services

Knowledge services

Our goal at Agilent is to provide the key resources that will help you build the comprehensive solutions to stay competitive. Agilent's knowledge services are the best in the business and encompass a wide range of solutions designed with your goals in mind.

Technical consulting provides the required technical expertise to complete and implement specific test strategies.

Process consulting helps to integrate new R&D or manufacturing test processes and technology into your current environment.

Enterprise business consulting provides business-planning services focused on enterprise-wide test issues.

Training and education gives access to our depth of product expertise and helps keep you abreast of emerging technologies. Encompassing technology training, product training, measurement fundamentals and applications training, our classes can be delivered on-site or at an Agilent Training Center.

For more information on Agilent education and training visit:

www.agilent.com/find/education

PSA Series Ordering Information

PSA Series spectrum analyzer

E4443A 3 Hz to 6.7 GHz

E4445A 3 Hz to 13.2 GHz

E4440A 3 Hz to 26.5 GHz

E4446A 3 Hz to 44 GHz

E4448A 3 Hz to 50 GHz

Options

To add options to a product, use the following ordering scheme:

Model E444xA (x = 0, 3, 5, 6 or 8)

Example options   E4440A-B7J

E4448A-1DS

Measurement personalities

E444xA-226	Phase noise	
E444xA-219	Noise figure	Requires Option 1DS
E444xA-BAF	W-CDMA	Requires Option B7J
E444xA-210	HSDPA	Requires Options B7J and BAF
E444xA-202	GSM w/ EDGE	Requires Option B7J
E444xA-B78	cdma2000	Requires Option B7J
E444xA-214	1xEV-DV	Requires Option B7J and B78
E444xA-204	1xEV-DO	Requires Option B7J
E444xA-211	TD-SCDMA	
E444xA-BAC	cdmaOne	Requires Option B7J
E444xA-BAE	NADC, PCD	Requires Option B7J
E444xA-266	HP 8566/8568B code compatibility	

Hardware

E444xA-1DS	100 kHz to 3 GHz built-in preamplifier	
E444xA-B7J	Digital demodulation hardware	
E444xA-AYZ	External mixing	Available on E4440A/46A/48A only
E4440A-BAB	Replaces type-N input connector	
	with APC 3.5 connector	Available on E4440A only
E444xA-H70	70 MHz IF output	

Connectivity software

E444xA-230   BenchLink Web Remote Control Software

Accessories

E444xA-1CM	Rack mount kit
E444xA-1CN	Front handle kit
E444xA-1CP	Rack mount with handles
E444xA-1CR	Rack slide kit
E444xA-045	Millimeter wave accessory kit
E444xA-0B1	Extra manual set including CD ROM
E2696A	General purpose 6 GHz probe

Warranty & service

For warranty and service of 5 years, please order 60 months of R-51B (quantity = 60). Standard warranty is 36 months.

R-51B   Return-to-Agilent warranty and service plan

Calibration[1]

For 3 years, order 36 months of the appropriate calibration plan shown below. For 5 years, specify 60 months.

R-50C-001	Standard calibration
R-50C-002	Standards compliant calibration
E444xA-0BW	Service manual and calibration software
E444xA-UK6	Commercial calibration certificate with test data

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1. Options not available in all countries

Product Literature

- *PSA Series*, data sheet, literature number 5980-1284E
- *Self-Guided Demonstration for Spectrum Analysis*, product note, literature number 5988-0735EN
- *Phase Noise Measurement Personality*, technical overview, literature number 5988-3698EN
- *Noise Figure Measurement Personality*, technical overview, literature number 5988-7884EN
- *W-CDMA and HSDPA Measurement Personalitie*s, technical overview, literature number 5988-2388EN
- *GSM with EDGE Measurement Personality*, technical overview, literature number 5988-2389EN
- *cdma2000 and 1xEV-DV Measurement Personalities*, technical overview, literature number 5988-3694EN
- *1xEV-DO Measurement Personality*, technical overview, literature number 5988-4828EN
- *TD-SDCMA Measurement Personality*, technical overview, literature number 5989-0056EN
- *cdmaOne Measurement Personality*, technical overview, literature number 5988-3695EN
- *NADC/PDC Measurement Personality*, technical overview, literature number 5988-3697EN
- *Optimizing Dynamic Range for Distortion Measurements*, product note, literature number 5980-3079EN
- *PSA Series Amplitude Accuracy*, product note, literature number 5980-3080EN
- *PSA Series Swept and FFT Analysis*, product note, literature number 5980-3081EN
- *PSA Series Measurement Innovations and Benefits*, product note, literature number 5980-3082EN
- *8 Hints for Millimeter Wave Spectrum Measurements*, application note, literature number 5988–5680EN
- *Spectrum Analyzer Measurements to 325 GHz with the Use of External Mixers*, application note 1453, literature number 5988-9414EN
- *PSA Series Spectrum Analyzers, Option H70, 70 MHz IF Output*, product overview, literature number 5988-5261EN
- *PSA Series Spectrum Analyzer Performance Guide Using 89601A Vector Signal Analysis Software*, product note, literature number 5988-5015EN
- *89600 Series + PSA, 802.11a and HiperLAN2 ODFM Measurements*, product note, literature number 5988-4094EN
- *Selecting the Right Signal Analyzer for Your Needs*, selection guide, literature number 5968-3413E
- *BenchLink Web Remote Control Software*, product overview, literature number 5988-2610EN
- *IntuiLink Software*, data sheet, literature number 5980-3115EN

For more information on the PSA Series or to view the above-listed literature, please visit:

www.agilent.com/find/psa

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Get the latest on the products and information you select.

❋ Agilent Technologies