

Agilent PSA Series Spectrum Analyzers GSM with EDGE Measurement Personality

Product Overview

The PSA series of high-performance spectrum analyzers offers one-button GSM and EDGE measurements to help you measure radio systems quickly, easily, and accurately in the lab or on the manufacturing line.

PWR

Phase Err

RF Envelope

I/Q Measured Polar Vector

Mean Transmit Power
-1.26 dBm

GSM with EDGE

SEND

Evaluate your designs quickly and thoroughly in R & D and manufacturing.

The Agilent PSA series of high-performance spectrum analyzers provides a unique solution for your GSM and EDGE measurement needs. It couples an unmatched spectrum analyzer with GSM and EDGE standards-based digital modulation analysis, providing a powerful tool.

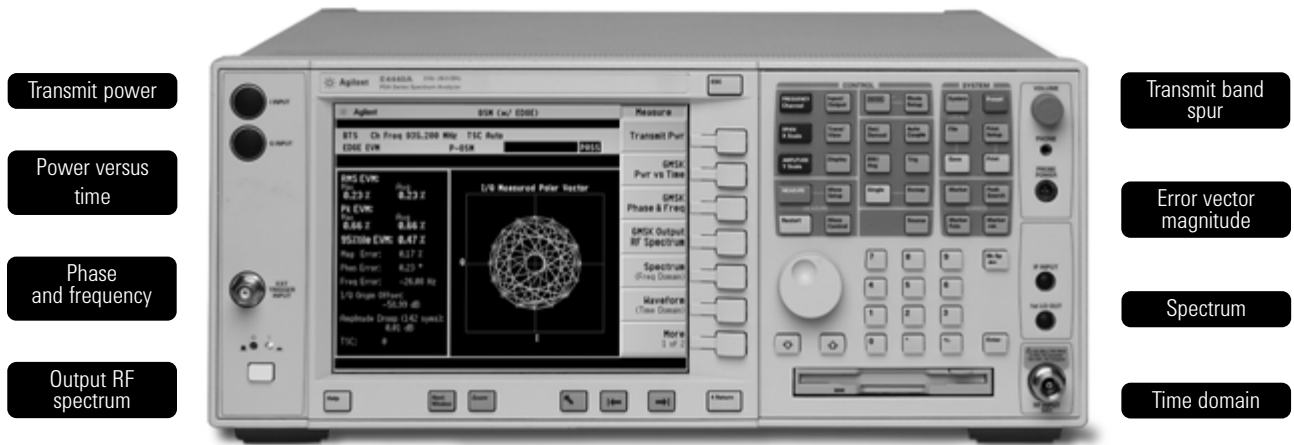
- expand design possibilities with powerful measurement capability and flexibility
- expedite troubleshooting and design verification with numerous features and an intuitive user interface
- streamline manufacturing with speed, reliability, and ease of use
- improve yields with highly accurate measurements and operator independent results
- simplify test systems with digital demodulation, RF power measurements, spur searches, and general high-performance spectrum analysis in one analyzer

The PSA series of high-performance spectrum analyzers provides exceptional levels of speed, accuracy, flexibility, and dynamic range. It also offers the most complete and easy-to-use, one-button RF power measurements with format-based setups for popular communications standards.

The GSM with EDGE measurement personality for the PSA series provides some unique benefits to help you make better measurements in both R&D and manufacturing environments:

- sophisticated spectrum and modulation analysis
- examine multiple layers of a signal with comprehensive analysis from EVM to power versus time
- in-channel and out-of-channel measurements
- easy to use customizable limits and intuitive displays with pass/fail indicators and color graphics
- measurements derived from Agilent's E44406A vector signal analyzer (VSA) GSM with EDGE measurement personality incorporating three iterations of customer feedback

GSM and EDGE measurements



Transmit power

Power versus time

Phase and frequency

Output RF spectrum

Transmit band spur

Error vector magnitude

Spectrum

Time domain

GSM measurements

- transmit power
- power versus time
- phase and frequency
- output RF spectrum
- transmit band spur

EDGE measurements

- transmit power
- power versus time
- EDGE EVM
- output RF spectrum
- transmit band spur

Basic measurements

- spectrum (frequency domain)
- waveform (time domain, I and Q)

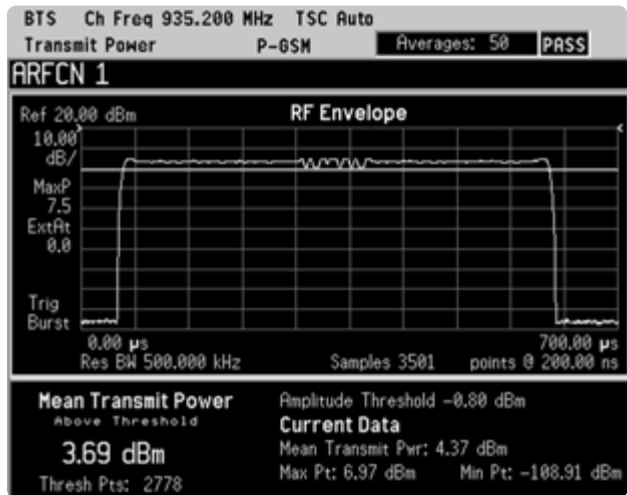
Global settings

(set in main personality)

- band: P-GSM/E-GSM/R-GSM/DCS 1800/PCS 1900/GSM 450/GSM 480/GSM 700/GSM 850
- frequency: choose by channel number or direct frequency
- burst type: normal/sync/access
- device: base station/mobile
- base station type: normal/micro/pico
- frequency hopping: on/off
- carrier type: bursted/continuous
- triggering: RF burst/video/external
- burst search threshold: used by power versus time for low-level burst detection

Settings available in all measurements

- averaging: burst/trace or exponential/repeating, depending on measurement
- average type: true rms/video/max/min/max and min
- trigger source: free run/video/RF burst/external/frame
- burst sync: training sequence/RF amplitude
- PASS/FAIL : all measurements have pass/fail results available

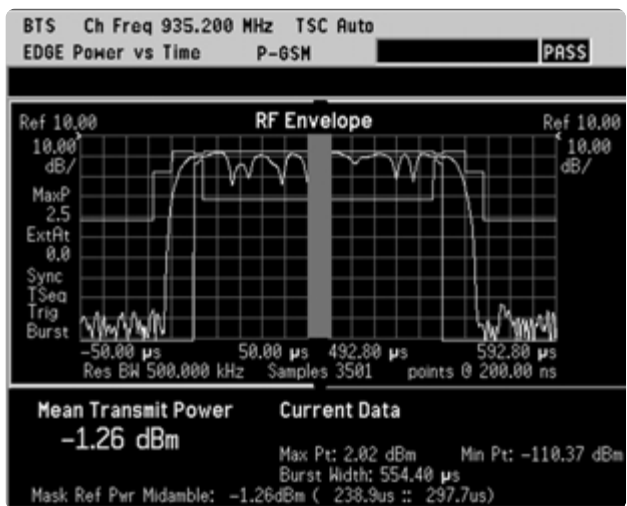


GSM/EDGE transmit power

Quickly measure the mean transmit power above a set power threshold from 1 to 50 slots.

You control the following unique transmit power measurement parameters:

- number of averages
- average type (rms/log)
- threshold level
- measurement time (default of 1 slot)
- RBW filter width and shape

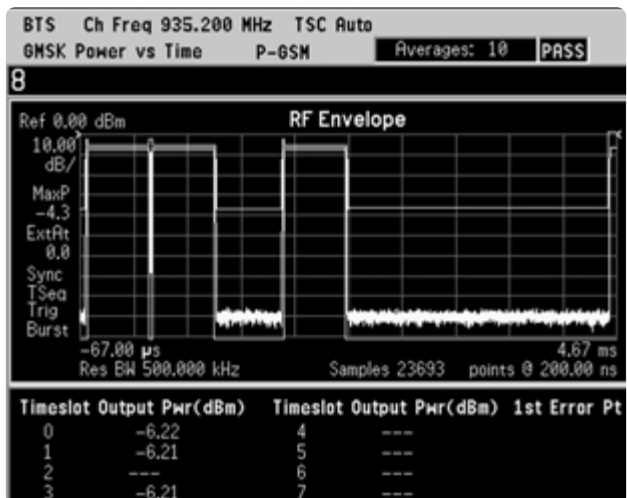


GSM/EDGE power versus time

Easily measure the RF envelope of a GSM/EDGE burst, and receive pass/fail result based on the GSM/EDGE standard. This measurement provides a visual display of power versus time, helping you see transient characteristics at the edges of a burst or power control throughout the burst.

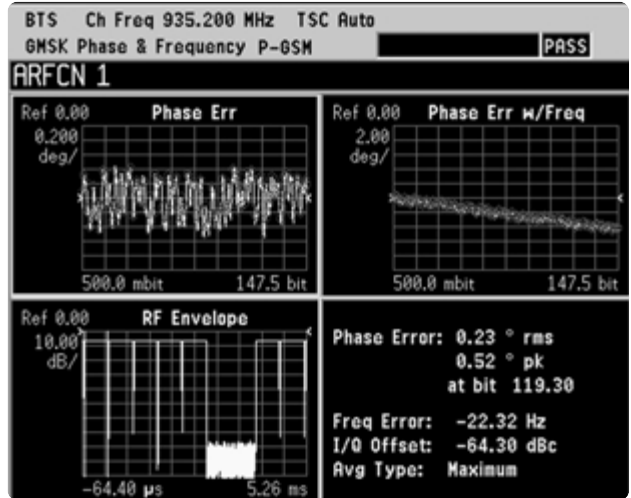
This measurement allows you to focus on the rise and fall time of the burst or the whole burst, and provides an on-screen mask to help you visually determine where any violations may occur.

It can also measure multislot bursts, with 2 to 8 frames active, and compute pass/fail results over the whole burst.



You control the following unique GSM/EDGE power versus time measurement parameters:

- measurement time (defaults to 1 slot)
- power control level
- burst search threshold
- number of bursts to average over
- RBW filter width and shape
- average mode and type

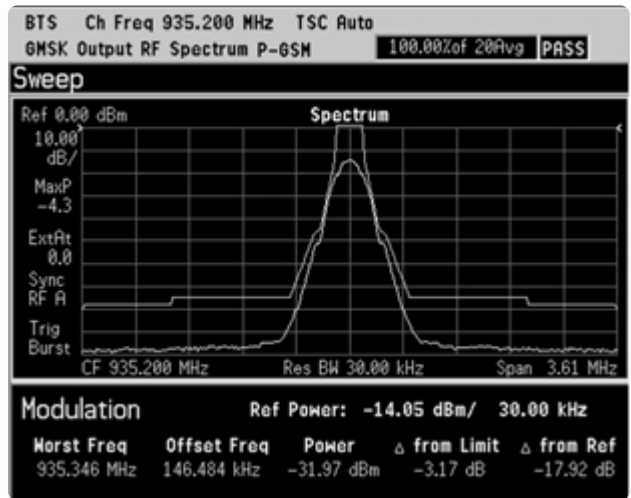


GSM phase and frequency

Diagnose and correct modulation errors with displays of phase error versus time and demodulated bits.

GSM phase and frequency parameters:

- burst averaging
- average mode
- mean or max averaging

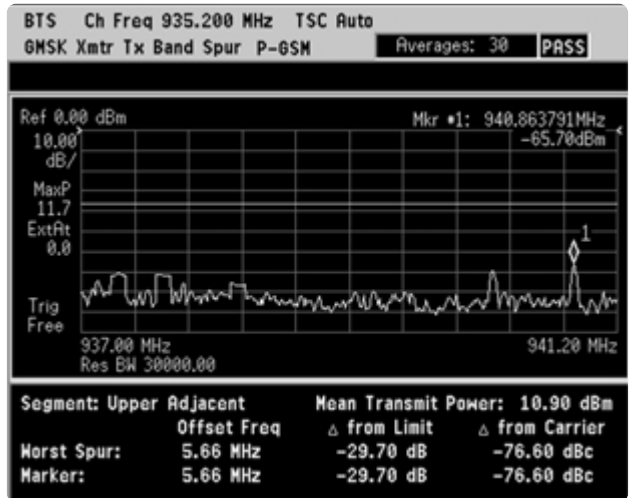


GSM/EDGE output RF spectrum (ORFS)

The ORFS measurement verifies that the radio is not transmitting excess power outside of its assigned bandwidth and into adjacent channels. You can view the GSM/EDGE standard-compliant offsets for ORFS modulation or switching transients in tabular format. And a graphical view for ORFS modulation is also available. In addition, the ORFS switching transients algorithm has speed optimizations for excellent throughput.

GSM/EDGE output RF spectrum parameters:

- burst averaging
- multi or single offset
- discrete or swept frequencies
- short, standard, or custom frequency offsets
- fast averaging
- RBWs at various offsets

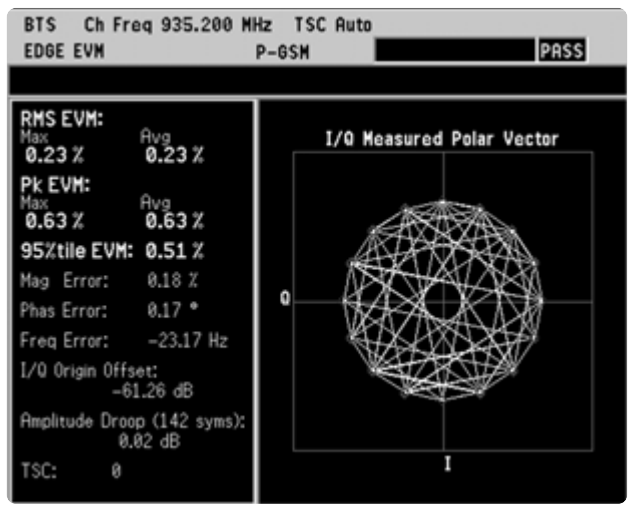


GSM/EDGE transmit band spur

Quickly examine the full transmit band of your GSM/EDGE radio for spurious emissions.

Control the following transmit band spur measurement parameters:

- measurement type: examine/full
- averaging type, mode, and amount
- limit line in dBm or dBc



EDGE error vector magnitude (EVM)

This measurement lets you easily analyze the EVM of an EDGE radio with a constellation diagram and a tabular list of measurement results. This display helps diagnose modulation or amplification distortions that lead to bit errors in the receiver. Agilent's unique algorithm provides a zero-ISI (inter-symbol interface) constellation that maintains the same pinpoint accuracy and methods for diagnosis as the traditional Nyquist-filtered systems.

EDGE EVM settings:

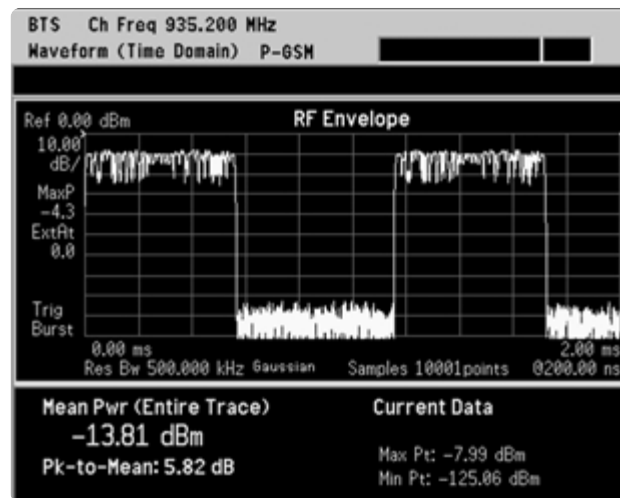
- droop compensation on/off
- extreme limits on/off
- averaging amount, type



Spectrum

View the frequency spectrum of a GSM or EDGE signal along with the I/Q waveform over time.

- change the span range up to 10 MHz
- select the resolution bandwidth
- choose from three types of averaging: RMS, video, and voltage
- view the minimum and maximum value of the spectrum



Time domain

Display the analog signal in amplitude versus time. You can also adjust the scale and time span for a closer look at the signal.

- select ADC range, auto or manual (0 to 24 dB)
- choose from three average types: rms, video, and voltage
- adjust the sweep time and resolution bandwidth
- view the I/Q wave form or RF envelope
- resolution bandwidth filter type can be selected (Gaussian or flat)
- trigger types are free run, video, RF burst, frame or line

Key specifications¹

	E4443A/E4445A/E4440A	E4446A/E4448A
Frequency range	3 Hz to 6.7/13.2/26.5 GHz	3 Hz to 44/50 GHz
Speed		
Sweep time, span ≥ 10 Hz	1 ms to 2000 s	1 ms to 2000 s
Sweep time span = 0 Hz	1 μs to 6000 s	1 μs to 6000 s
Local measurement update rate	≥ 50 measurements/sec	≥ 50 measurements/sec
Remote measurement update rate	≥ 22 measurements/sec	≥ 22 measurements/sec
Resolution		
Resolution bandwidth range, swept and FFT	1 Hz to 3 MHz (10% steps), 4, 5, 8 MHz	1 Hz to 3 MHz (10% steps), 4, 5, 8 MHz
Variable sweep (trace) point range	101 to 8192	101 to 8192
Phase noise at 1 GHz		
10 kHz offset	-114 dBc/Hz	-114 dBc/Hz
1 MHz offset	-117 dBc/Hz (typical)	-117 dBc/Hz (typical)
10 MHz offset	-144 dBc/Hz	-144 dBc/Hz
10 MHz offset	-148 dBc/Hz (nominal)	-148 dBc/Hz (nominal)
10 MHz offset	-151 dBc/Hz	-151 dBc/Hz
10 MHz offset	-157 dBc/Hz (nominal)	-157 dBc/Hz (nominal)
Residual FM	< (1 Hz x N ²) p-p in 1 s	< (1 Hz x N ²) p-p in 1 s
Dynamic range		
Displayed average noise level (DANL)		
10 MHz to 3 GHz	-152 dBm	-151 dBm
3 GHz to 20 GHz	-146 dBm	-144 dBm
20 GHz to 26.5 GHz	-143 dBm	-140 dBm
26.5 GHz to 44 GHz	N.A.	-131 dBm
44 GHz to 50 GHz	N.A.	-126 dBm
Preamplifier (DANL) - 10 MHz to 3 GHz	-166 dBm	-164 dBm
1 dB gain compression		
200 MHz to 3 GHz	+3 dBm (+7 dBm nominal)	+3 dBm (+7 dBm nominal)
Input attenuator range	0 to 70 dB in 2 dB steps	0 to 70 dB in 2 dB steps
TOI - 1.7 GHz to 3.0 GHz	+17 dBm (+19 dBm typical)	+18 dBm (+21 dBm typical)
SHI - 400 MHz to 1.25 GHz	+52 dBm	+51 dBm
ACPR, W-CDMA (5 MHz offset)		
Dynamic range	-74.5 dB (typical)	-74.5 dB (typical)
Dynamic range w/noise correction	-81 dB (typical)	-81 dB (typical)
Accuracy		
Absolute amplitude accuracy	±(0.24 dB + frequency response) ±(0.06 dB + frequency response), (typical)	±(0.24 dB + frequency response) ±(0.06 dB + frequency response), (typical)
95% confidence, 3 Hz to 3 GHz	±0.24 dB	±0.24 dB
Frequency response, 3 Hz to 3 GHz	±0.38 dB (±0.10 dB typical)	±0.38 dB (±0.10 dB typical)
Frequency accuracy at 1 GHz and a stable temperature	±100 Hz	±100 Hz
Span accuracy	±0.2% + $\frac{\text{span}}{\text{sweep points} - 1}$	±0.2% + $\frac{\text{span}}{\text{sweep points} - 1}$
W-CDMA ACPR accuracy (5 MHz offset)		
Mobile station	±0.12 dB	±0.12 dB
Base station	±0.22 dB	±0.22 dB
Warranty	3 years (standard)	3 years (standard)

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

2. N is harmonic mixing mode.

GSM/EDGE measurement personality

The following specifications are nominal for models E4446A and E4448A.

Power versus time measurement (GSM/EDGE)

Minimum carrier power at RF input	-40 dBm (nominal)
Absolute power accuracy for in-band signal (excluding mismatch error)	
Attenuation > 2 dB	-0.11 ±0.66 dB (-0.11 ±0.18 dB, typical)
Attenuation ≤ 2 dB	-0.11 ±0.75 dB (-0.11 ±0.24 dB, typical)
Power ramp relative accuracy (referenced to mean transmitted power)	
RF input range = auto	
+6 dB to noise	±0.13 dB
Mixer Level ≤ -12 dBm	
0 to +6 dB	±0.13 dB
0 to noise	±0.08 dB
Mixer level ≤ -18 dBm	
+6 dB to noise	±0.08 dB
Measurement floor	-88 dBm + input attenuation (nominal)
Time resolution	200 ns
Burst to mask uncertainty	±0.2 bit (approximately ±0.7 μs)

Output RF spectrum measurement (GSM/EDGE)

Minimum carrier power at RF input	-20 dBm (nominal)	
ORFS relative RF power uncertainty		
Due to modulation		
Offsets ≤ 1.2 MHz	±0.15 dB	
Offsets ≥ 1.8 MHz	±0.25 dB	
Due to switching	±0.15 dB (nominal)	
ORFS absolute RF power accuracy		
Attenuation > 2 dB	±0.72 dB (±0.18 dB, typical)	
Attenuation ≤ 2 dB	±0.81 dB (±0.24 dB, typical)	
Dynamic range, spectrum due to modulation 20 to 30°C		
Offset frequency	GSM/EDGE	
100 kHz	67.3 dB	
200 kHz	74.5 dB	
250 kHz	76.9 dB	
	GSM	EDGE
400 kHz	81.5 dB	81.3 dB
600 kHz	85.6 dB	85.1 dB
1.2 MHz	91.0 dB	89.4 dB
1.8 MHz	90.3 dB	90.2 dB
6.0 MHz	94.0 dB	93.7 dB
Dynamic range, spectrum due to switching		
Offset frequency		
400 kHz	72.1 dB	
600 kHz	75.9 dB	
1.2 MHz	80.2 dB	
1.8 MHz	84.6 dB	

Phase and frequency error measurement (GSM)

Carrier power range at RF input	+27 to -45 dBm (nominal)
Phase error (phase trajectory)	
Range	-180° to +180°
Resolution	±0.01°
Peak measurement accuracy	±2°
RMS measurement accuracy	± 0.5°
Frequency error	
Initial frequency error range	±8 kHz (nominal)
Accuracy	5 Hz +(transmitter frequency x frequency reference error)
I/Q offset	
Range	-46 to -10 dBc
Burst sync time uncertainty	±0.1 bit (approximately ±0.4 µs)

EVM measurement (EDGE)

Carrier power range at RF Input	+24 to -45 dBm (nominal)
EVM	
Range	0 to 25%
Floor	0.5% (0.3% typical)
Accuracy EVM range 1% to 10%	±0.5%
Resolution	0.01% display resolution

In-band frequency range (GSM/EDGE)

GSM 900, P-GSM	890 to 915 MHz 935 to 960 MHz
GSM 900, E-GSM	880 to 915 MHz 925 to 960 MHz
DCS1800	1710 to 1785 MHz 1805 to 1880 MHz
PCS1900	1850 to 1910 MHz
GSM850	824 to 849 MHz 869 to 894 MHz

Alternative frequency ranges

Down-band GSM	400 to 500 MHz 1930 to 1990 MHz
GSM450	450.4 to 457.6 MHz 460.4 to 467.6 MHz
GSM480	478.8 to 486 MHz 488.8 to 496 MHz
GSM700	447.2 to 761.8 MHz

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

Digital demodulation hardware

E444xA-B7J	Digital demodulation hardware (required for digital demodulation measurement personalities)
------------	---

Digital demodulation measurements

E444xA-BAF	W-CDMA measurement personality
E444xA-202	GSM w/ EDGE measurement personality
E444xA-B78	cdma2000 measurement personality
E444xA-204	1xEV-DO measurement personality
E444xA-BAC	cdmaOne measurement personality
E444xA-BAE	NADC, PCD measurement personality

Phase noise measurement

E444xA-226	Phase noise measurement personality
------------	-------------------------------------

Amplifiers

E444xA-1DS	100 kHz to 3 GHz built-in preamplifier
------------	--

Inputs and outputs

E4440A-BAB	Replaces type "N" input connector with APC 3.5 connector
------------	--

Connectivity software

E444xA-230	BenchLink Web Remote Control Software
------------	---------------------------------------

Code compatibility

E444xA-266	HP 8566B/8568B code compatibility measurement personality
------------	---

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

Documentation

E444xA-0B1	Extra manual set including CD ROM
------------	-----------------------------------

Calibration documentation

E444xA-UK6	Commercial calibration certificate with test data
------------	---

Warranty and 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
-------	---

Calibration¹

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

1.Options not available in all countries.

Product literature

PSA Series - The Next Generation, brochure, literature number 5980-1283E

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

Phase Noise Measurement Personality, product overview, literature number 5988-3698EN

W-CDMA Measurement Personality, product overview, literature number 5988-2388EN

GSM with EDGE Measurement Personality, product overview, literature number 5988-2389EN

cdma2000 Measurement Personality, product overview, literature number 5988-3694EN

1xEV-DO Measurement Personality, product overview, literature number 5988-4828EN

cdmaOne Measurement Personality, product overview, literature number 5988-3695EN

NADC/PDC Measurement Personality, product overview, literature number 5988-3697EN

PSA Series Spectrum Analyzers, Option H70, 70 MHz IF Output, product overview, literature number 5988-5261EN

Self-Guided Demonstration for Spectrum Analysis, product note, literature number 5988-0735EN

Self-Guided Demonstration for Phase Noise Measurements, product note, literature number 5988-3704EN

Self-Guided Demonstration for W-CDMA Measurements, product note, literature number 5988-3699EN

Self-Guided Demonstration for GSM and EDGE Measurements, product note, literature number 5988-3700EN

Self-Guided Demonstration for cdma2000 Measurements, product note, literature number 5988-3701EN

Self-Guided Demonstration for 1xEV-DO Measurements, product note, literature number 988-6208EN

Self-Guided Demonstration for cdmaOne Measurements, product note, literature number 5988-3702EN

Self-Guided Demonstration for NADC and PDC Measurements, product note, literature number 5988-3703EN

PSA Series Demonstration CD, literature number 5988-2390EN

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

PSA Series Spectrum Analyzer Performance Guide Using 89601A Vector Signal Analysis Software, product note, literature number 5988-5015EN

Selecting the Right Signal Analyzer for Your Needs, selection guide, literature number 5968-3413E

8 Hints for Millimeter Wave Spectrum Measurements, application note, literature number 5988-5680EN

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 OFDM Measurements, product note, literature number 5988-4094EN

N4256A Amplifier Distortion Test Set, product overview, literature number 5988-2925EN

BenchLink Web Remote Control Software, product overview, literature number 5988-2610EN

HP 8566B/68B Programming Code Compatibility for PSA and ESA-E Series Spectrum Analyzers, product overview, literature number 5988-5808EN

IntuiLink Software, Data Sheet, Literature Number 5980-3115EN

Agilent Technologies Wireless/GSM Solutions, application note, literature number 5968-2320E

Measuring EDGE Signals - New and Modified Techniques and Measurement Requirements, application note, literature number 5980-2508EN

For more information on the PSA series, please visit:

www.agilent.com/find/psa

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 on-site 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.

By internet, phone, or fax, get assistance with all your test and measurement needs

Online assistance:

www.agilent.com/find/assist

Phone or Fax

United States:
(tel) 800 452 4844

Canada:
(tel) 877 894 4414
(fax) 905 282 6495

China:
(tel) 800 810 0189
(fax) 800 820 2816

Europe:
(tel) (31 20) 547 2323
(fax) (31 20) 547 2390

Japan:
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Korea:
(tel) (82 2) 2004 5004
(fax) (82 2) 2004 5115

Latin America:
(tel) (305) 269 7500
(fax) (305) 269 7599

Taiwan:
(tel) 0800 047 866
(fax) 0800 286 331

Other Asia Pacific Countries:
(tel) (65) 6375 8100
(fax) (65) 6836 0252
Email: tm_asia@agilent.com

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2002
Printed in USA, May 28, 2002
5988-2389EN



Agilent Email Updates

www.agilent.com/find/emailupdates
Get the latest information on the products and applications you select.



Agilent Technologies