

Agilent PSA Series Spectrum Analyzers cdmaOne Measurement Personality

Product Overview

The PSA series of high-performance spectrum analyzers from Agilent Technologies provide a superior combination of speed, accuracy, flexibility, and dynamic range. In addition, the PSA series offers a suite of standards-based power measurements and digital modulation analysis for cdmaOne applications in the same analyzer.



Agilent Technologies

Stay on track and make it a fast track: simplify cdmaOne testing

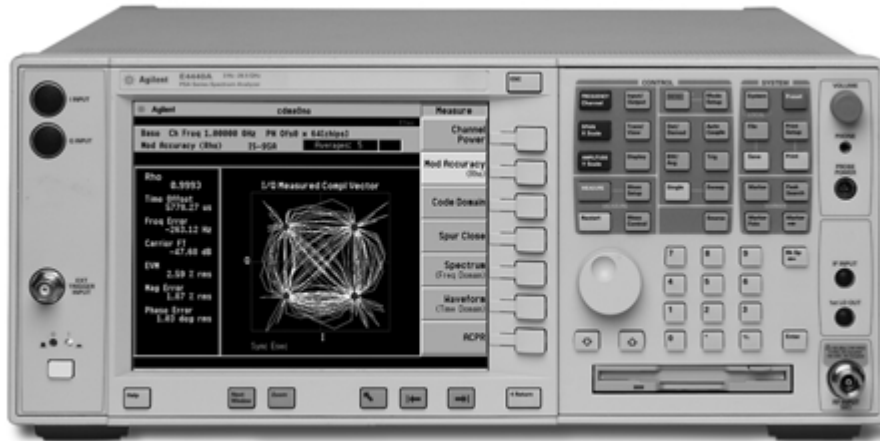
Evaluating base station and mobile transmitter performance for cdmaOne systems requires a broad series of tests and measurements. The PSA series, Agilent's highest performing spectrum analyzers, offer one of the most comprehensive solution sets in a single analyzer. In addition to new levels of capability in speed, accuracy, flexibility, and dynamic range, it provides a complete suite of easy-to-use, one-button RF power measurements with format-based setups. This cdmaOne measurement personality (Option BAC) expands the analyzer's capability by adding advanced power measurements and digital modulation analysis for cdmaOne.

Realize the benefits of the PSA with cdmaOne measurement capability in the R&D and manufacturing environments for base stations, mobile devices, and their components.

- Promote productivity in research and development
 - extensive capability in one analyzer
 - robust, repeatable, high-performance communications measurements
 - intuitive user-interface
 - graphical and numerical results
 - in-channel and out-of-channel analysis
- Streamline manufacturing with improved yields
 - intuitive displays with color graphics
 - one-button measurement setups
 - superior accuracy minimizes measurement uncertainty resulting in reduced test margins
 - SCPI programmable and backwards compatible with Agilent's E4406A vector signal analyzer (VSA) cdmaOne measurement personality
 - fast switching between spectrum analysis, cdmaOne and other wireless format measurements

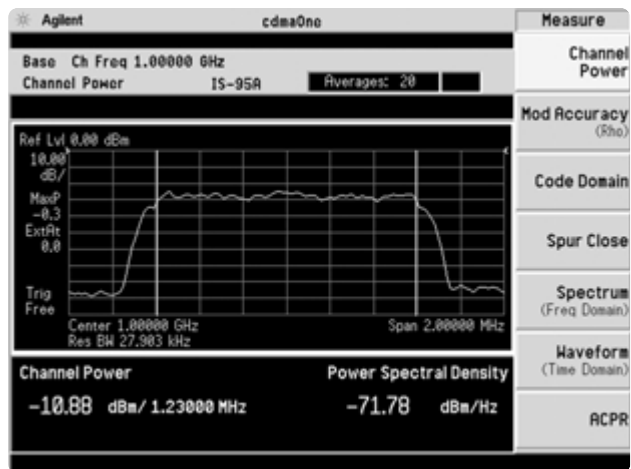
cdmaOne measurements

Built on Agilent's pioneering efforts in CDMA measurement techniques, this measurement personality enables the PSA to quickly and efficiently perform accurate cdmaOne measurements (for forward and reverse link signals).



- Channel power
- Adjacent channel power ratio (ACPR)
- Close-in spur search

- Spectrum and waveform
- Modulation accuracy (rho)
- Code domain analysis

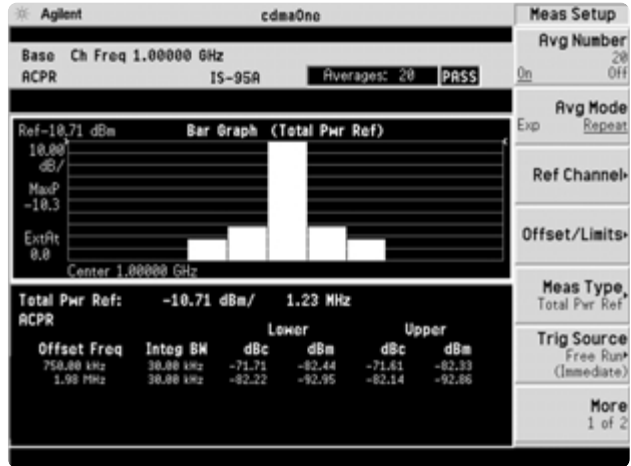


Channel power

The channel power measurement determines the total rms power in a user-specified bandwidth. The power spectral density (PSD) is also displayed in dBm/Hz.

Control the following channel power measurement parameters:

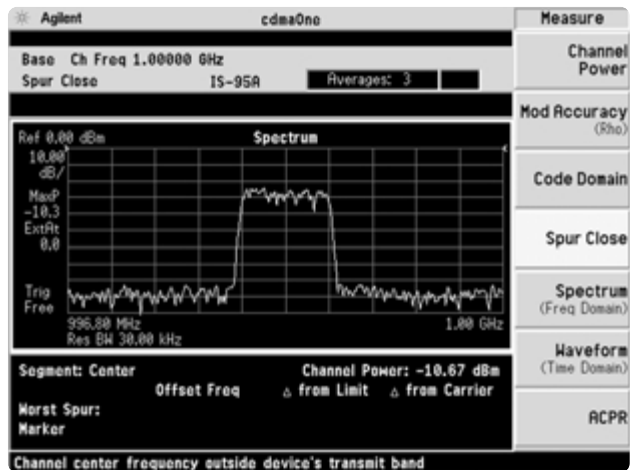
- integration bandwidth (defaults to 1.23 MHz)
- channel power span (defaults to 2 MHz)
- number of trace averages (defaults to 20)
- data points displayed (64 to 65536, defaults to 512)



Adjacent channel power ratio (ACPR)

To maintain a quality call by avoiding channel interference, it is important to measure and reduce any adjacent channel leakage power transmitted from a base station. The adjacent channel power ratio is a measure of the power in adjacent channels relative to the transmitted power.

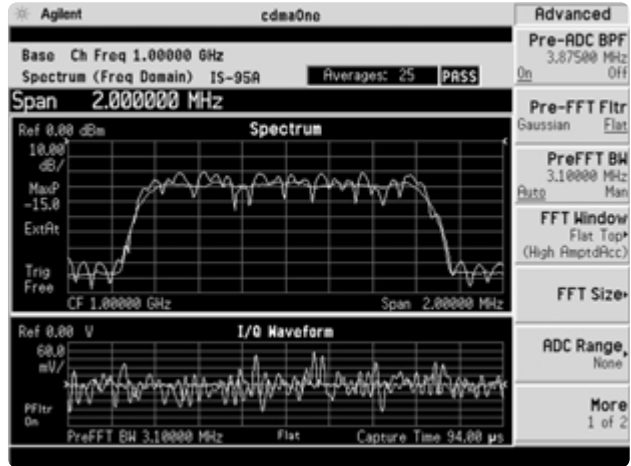
- select fast ACP or high dynamic range
- adjust integration BW (defaults to 1.23 MHz)
- use averaging for rms or maximum values
- evaluate up to five adjacent channel pairs
- choose adjacent channel offset frequency, reference bandwidth, and limit values
- adjust and display both absolute and relative limits
- measure the total power in dBm or the PSD in dBm/Hz
- view bar graph or spectrum



Close-in spur search

This measurement makes it easy to identify spurs that are in the transmitting band. It locates the worst spur and measures its power relative to the limit and relative to the carrier power.

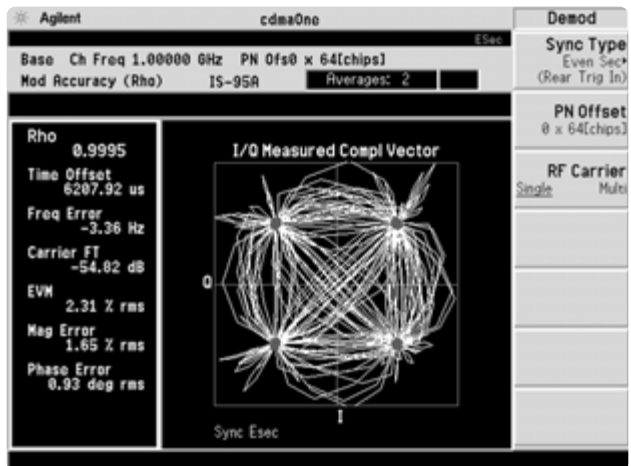
- choose number of averages (defaults to 15)
- measure the entire band or examine a single segment



Spectrum and waveform

View the frequency spectrum, I/Q waveform, or RF envelope (time domain) of a cdmaOne signal.

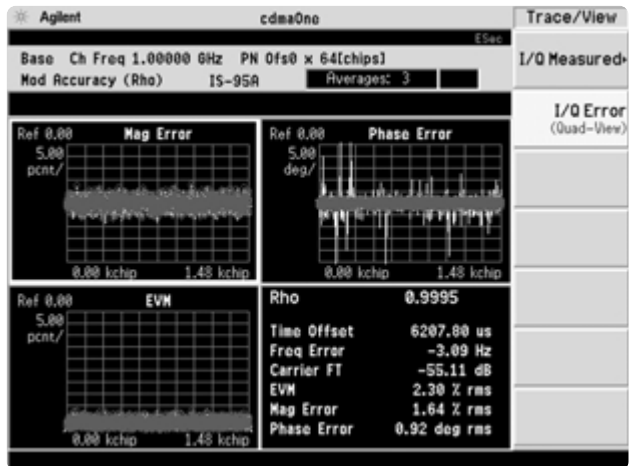
- take advantage of advanced FFT windowing and filtering options
- control the analog-to-digital converter (ADC) to maximize dynamic range
- obtain I/Q pairs via GPIB or LAN

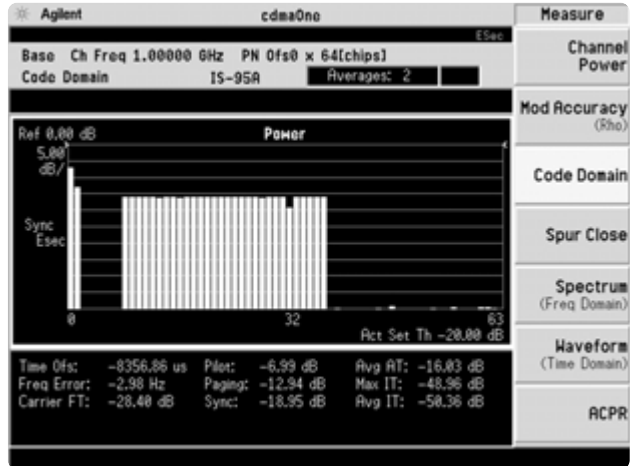


Modulation accuracy

An important measure of modulation accuracy for cdmaOne signals is rho. Rho is the ratio of the correlated power to the total power. The correlated power is computed by removing frequency, phase, and time offsets and performing a cross correlation between the corrected signal and an ideal reference. This measurement offers a multi-carrier filter that enables demodulation in the presence of multiple and adjacent cdmaOne signals.

- specify PN (pseudonoise sequence) offset
- set the measurement interval (defaults to 1.25 ms)
- view magnitude error, phase error, and EVM plots
- complimentary filtered constellation diagram available for zero-ISI analysis
- parametric results based on IS-95 filtering standard

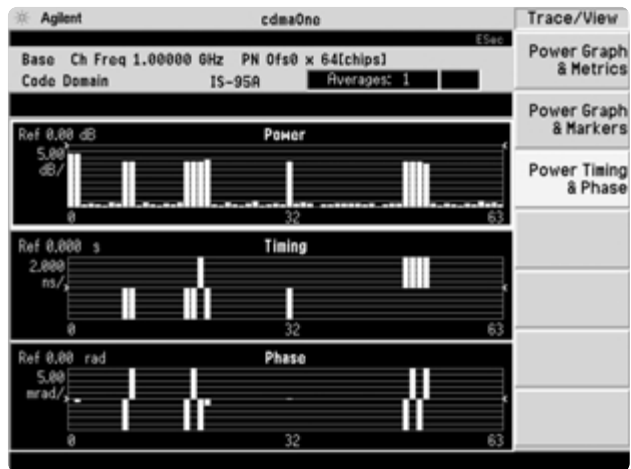




Code domain analysis

Walsh codes are the fundamental channelization mechanism for cdmaOne. To analyze the cdmaOne modulated waveform, the analyzer receives the signal and decodes each code channel using a Walsh code correlation algorithm. Once the channels are decoded, the analyzer determines the power in each relative to the total signal power.

- specify PN offset
- set the measurement interval (defaults to 1.25 ms)
- view power graph and metrics table
- examine power, timing, and phase plots



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
	-148 dBc/Hz (nominal)	-148 dBc/Hz (nominal)
	-151 dBc/Hz	-151 dBc/Hz
	-157 dBc/Hz (nominal)	-157 dBc/Hz (nominal)
Residual FM	< (1 Hz x N2) p-p in 1 s	< (1 Hz x N2) 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.

cdmaOne measurement personality (7 MHz to 3 GHz)

The following specifications are nominal for models E4446A and E4448A.

Channel power

Minimum RF input	–75 dBm (nominal)
Absolute power accuracy: (20 to 30°C)	
Manual attenuator setting	±0.67 dB (±0.18 dB typical)
Automatic attenuator setting	±0.76 dB (±0.24 dB typical)
Relative power accuracy: (between two different power level signals, mixer level –52 to –12 dBm)	±0.08 dB (±0.03 dB typical)

Code domain (base station)

Minimum power at RF input	–40 dBm (nominal)
Code domain power:	
Dynamic range	50 dB (nominal)
Accuracy (Walsh channel power within 20 dB of total power)	±0.3 dB
Frequency error accuracy	±10 Hz + (transmitter frequency x frequency reference accuracy)
Pilot time offset accuracy	± 300 ns
Code domain timing accuracy	±10 ns
Code domain phase accuracy	± 10 mrad

Modulation accuracy

Minimum power at RF input	–40 dBm (nominal)
Measurement interval range	0.5 ms to 30 ms
Rho (waveform quality) accuracy	±0.001
Frequency error accuracy	±10 Hz + (transmitter frequency x frequency reference accuracy)
Base station pilot time offset accuracy (from even second signal to start of PN sequence)	±300 ns
EVM accuracy	±0.5%
Carrier feed-through accuracy	±2.0 dB

ACPR

Minimum power at RF input	–39 dBm (nominal)
ACPR relative accuracy	±0.09 dB

Spur close

Minimum power at RF input	–35 dBm (nominal)
Amplitude accuracy:	
Absolute accuracy	±0.89 dB
Relative accuracy	±0.09 dB

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)
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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
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Amplifiers

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

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

E444xA-230	BenchLink Web Remote Control Software
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Code compatibility

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

E444xA-UK6	Commercial calibration certificate with test data
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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
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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 ODFM 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

Digital Modulation in Communications Systems - An Introduction, application note, literature number 5965-7160E

Understanding CDMA Measurements for Base Stations and their Components, application note, literature number 5968-0953E

For more information on the PSA series, please visit:

www.agilent.com/find/psa

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