HP 4396A 1.8GHz Network/Spectrum Analyzer Specifications

NETWORK MEASUREMENT					
Frequency Characteristics					
Range	100kHz to 1.8GHz				
Resolution	1mHz				
Accuracy	< ± 5.5 ppm (Option 1D5: < ± 0.13 ppm)				
Output Characteristics					
Power Range	-60 to +20 dBm				
Resolution	0.1 dB				
Level Accuracy	± 0.5 dB				
Level Linearity	± 0.7 dB (-20 to +20 dBm) ± 1.0 dB (-40 to -20 dBm) ± 1.5 dB (-60 to -40 dBm)				
Flatness	± 1.0 dB				
Spectral Purity (+15 dBm output)					
Harmonics	< -30 dBc				
Non-harmonics spurious	< -30 dBc				
Receiver Characteristics					
Frequency Range	100 kHz to 1.8 GHz				
Noise Level (10 Hz IFBW, ³ 10 MHz, f = frequency in GHz)	< (-125 + 3Xf) dBm (A, B inputs) < (-100 + 3Xf) dBm (R input)				
Full scale input level	-5 dBm (A, B), +20 dBm (R)				
IF bandwidth (Hz)	10, 30, 100, 300, 1k, 3k, 10k, 40k				
Dynamic Accuracy					
Magnitude dynamic accuracy	**Input level (relative to full scale input level)**				
	0 dB -10 to -70 dB -80 dB -90 dB -100 dB -110 dB -120 dB	< ± 0.3 dB < ± 0.05 dB < ± 0.1 dB < ± 0.3 dB < ± 1.0 dB < ± 0.8 dB < ± 2.5 dB			
Phase Dynamic Accuracy	**Input Level (relative to full scale input level)**				
	0 dB -10 dB -20 to -70 dB -80 dB -90 dB -100 dB -110 dB -120 dB	< ± 3° < ± 0.6° < ± 0.3° < ± 0.7° < ± 2.4° < ± 7° < ± 8° typical < ± 25° typical			
Measurement Throughput Summary (IFBW 40 kHz, ms)	**Measurement (uncorrected)**	**Number of Points**			
		51	**201**	**401**	**801**
	(1) Magnitude	30	80	150	280
	(2) Phase	30	90	160	310
	(3) Group Delay (t)	35	120	220	420
	(4) Magnitude and Phase	45	150	290	560
	(5) Magnitude and Group Delay	55	180	350	680
	(6) Magnitude/return loss	34	140	270	530
SPECTRUM MEASUREMENT					
Frequency Characteristics					
Frequency Range	2 Hz to 1.8 GHz				
Frequency Reference	**Accuracy:** < ± 5.5 ppm (**Option 1D5:** < ± 0.13 ppm)				
Resolution Bandwidth (RBW)					
Range	1 Hz to 3 MHz, 1-3-10 step				
Selectivity (60 dB/3 dB)	**RBW ³ 10 kHz:** < 10 **RBW £ 3 kHz:** < 3				
Video Bandwidth (VBW)	**Range:** 3 MHz to 3 MHz, 1-3-10 step, 1 £ RBW/VBW £ 300				
Noise Sidebands					
Center frequency £ 1 GHz					
Offset	³**1 kHz:** < -95 dBc/Hz ³**10 kHz:** < -105 dBc/Hz ³**1 MHz:** < -110 dBc/Hz				
Residual FM (typical)	(f = frequency in GHz)				
RBW £ 10 Hz	**Standard:** 1 X f Hz peak-peak in 10 sec **Option 1D5:** < 0.1 X f Hz peak-peak in 10 sec **RBW £?1 kHz:** < 3 Hz peak-peak in 100 ms				
Amplitude Characteristics					
Amplitude Range	Displayed average noise level to +30 dBm				
Displayed average noise level (0 dB attn, VBW = RBW/100, f in GHz)	< -125 dBm/Hz (10 kHz to 10 MHz) < (-150 + 3 X f) dBm/Hz (³ 10 MHz)				
Input Attenuator Range	0 to 60 dB, 10 dB step				
Spurious Responses					
Second Harmonic Distortion (each input mixer level of two tones = -30 dBm, separation ³ 20 kHz)	< -75 dBc (³ 10 MHz) <-65 dBc (<10 MHz)				
Other Spurious (-30 dBm mixer output)	< -70 dBc (frequency offset ³ 1 kHz)				
Residual Response	< -100 dBm (³ 3 MHz, 0 dB attn) < -90 dBm (1 kHz to 3 MHz, 0 dB attn)				
Reference Level Range	-100 to +30 dBm in 0.1 dB step				
GENERAL CHARACTERISTICS					
Operating Temperature/Humidity	0° to 55° C, 15% < RH <95%				
Storage Temperature	-40° to -60°C				
Power Requirement	100/120/220/240 V ± 10%, 48 to 66 Hz, 500 VA max				
Weight	30 kg (66 lb) typical				
Size	425 mm W X 235 mm H X 553 mm D				

The 4396A provides excellent RF vector network and spectrum measurements for lab and production applications. Gain, phase, group delay, distortion, spurious, CN, and noise measurements often required for evaluating components and circuits can be measured using one instrument. When combined with a test set, the 4396A provides reflection measurements, such as return loss, and SWR, and S parameters. As a vector network analyzer, the 4396A operates from 100kHz to 1.8GHz with 1mHz resolution and its integrated synthesized source provides -60 to +20dBm of output power with 0.1dB resolution. The dynamic magnitude and phase accuracy are ±0.05 dB and ±0.3 deg so that it can accurately measure gain and group delay flatness, which are becoming more important in modern electronics systems.

As a spectrum analyzer, the 3496A operates from 2Hz to 1.8GHz with resolution-bandwidths (RBWs) spanning 1Hz to 3MHz and accurate frequency analysis. Direct A/D conversion (no LOG amplifier is used) results in ±1.0dB overall level accuracy. Noise sidebands fall below -105dBc/Hz offset 10kHz from carriers below 1GHz, while sensitivity is -150dBm/Hz at 10MHz and -147dBm at 1GHz. In addition, with two independent display channels available, you can simultaneously view network and spectrum (or transmission and reflection) characteristics of the device under test in split-screen format. For example, an amplifier's frequency response (network measurement) and distortion (spectrum measurement) can be shown at the same time.

A built-in 1.44 MB floppy disk drive lets you save and recall test setups, calibration data, measurement data, and HP IBASIC programs in either LIF or MS-DOS format. An internal RAM disk (volatile memory) is useful for quick saving and recalling.

Network Analysis with Wide Dynamic Range and Fast Sweep Times

The advanced design that provides the low noise floor for spectrum analysis also results in a high speed, wide dynamic range network analyzer. For real-time tuning of test devices, the 4396A offers sweep time with 90 dB dynamic range (typical) with 350 µsec/point sweep time (70 ms sweep time with 201 display points) using 40 kHz IF bandwidth. At 10Hz IF bandwidth, the analyzer provides 120dB dynamic range. For easy go/no-go testing, test limit lines are available.

Extremely Fast Spectrum Measurement

The 4396A features a stepped Fast Fourier Transform (FFT) digital-signal-processing (DSP) technique for 20 to 100 times faster narrow band spectrum measurement than swept-tuned spectrum analyzers. The stepped FFT is performed when the resolution bandwidth (RBW) is set at 3kHz or below. For example, with a 30Hz RBW and 10kHz span, the 4396A has a sweep time of 400 ms, while swept-tuned spectrum analyzers take a few tens of seconds. The stepped FFT can greatly improve the efficiency of narrow band spectrum measurement such as frequency tuning of a VCO or CN measurements.

In addition, the 4396A has list sweep capability for both network and spectrum measurements. This powerful feature sweeps only desired frequency spans, and allows different RBWs to greatly improve test throughput. For example, when you want to view a fundamental signal and its low-level third harmonic, you no longer have to sweep all frequency ranges with a narrow RBW and endure the long wait for results. By using list sweep and selecting only frequencies of interest (using a narrow RBW around the low-level signal and a wide RBW for the rest of the sweep), you can clearly view both the fundamental and the third harmonic in much less time compared to using conventional spectrum analyzers.

Time-Gated Spectrum Analyzers

With Option 1D6, the 4396A offers time-gated spectrum analysis capability to capture and measure repetitive burst signals in video, disk drives, communication equipment, and more. The minimum gate length is 2µsec so that even narrow burst signals can be analyzed. Furthermore, since the video bandwidth (VBW) filter is digitally implemented, you can use narrow VBWs for noise smoothing without considering the response time of the VBW filter. This is very useful for time-gated CN measurement of narrow burst signals, where the filter delay of conventional analog VBW filtering would make the measurement impractical.

Easy Test Automation and Customization

You can control additional equipment (via HP-IB or TTL interface) and create test programs without an external computer. When equipped with Option 1C2, the 4396A includes a built-in instrument controller and HP Instrument BASIC (HP IBASIC), which is a subset of the HP BASIC programming language for instruments. An external keyboard connects directly to the 4396A for programming convenience. Programs can also be created by storing front-panel keystrokes. By adding some external signal sources and RF switches controlled by the analyzer, you can easily construct a cost-effective and easy-to-program test system for component characterization or production test. IBASIC provides the flexibility to tailor the system for changing needs quickly and easily. And the analysis capability coupled with flexible disk data storage provides tools for quality-monitoring baseline and calibration checks, all under program control.