

KEYSIGHT TECHNOLOGIES (AGILENT HP)

4396A

The Keysight (Agilent/HP) 4396A is a high-performance RF Vector Network, Spectrum, and Impedance Analyzer designed for laboratory and production applications. Operating from 100 kHz to 1.8 GHz in network analyzer mode and 2 Hz to 1.8 GHz in spectrum analyzer mode, it provides excellent dynamic range, fast sweep speeds, and highly accurate magnitude and phase measurements.

SPECIFICATIONS

General

Interfaces	GPIB (IEEE-488), Centronics parallel, mini-DIN keyboard, External Video (VGA)
Display	7.5-inch color CRT
Calibration and Instrument State Retention	SRAM backed up by lithium battery

Physical

Power Supply	90 V to 132 V / 198 V to 264 V, 47 to 66 Hz, 300 VA max
Operating Temperature	0 to 55 °C °C
Dimensions (W×H×D)	425 mm × 235 mm × 553 mm mm
Weight	27.2 kg kg

Network Analyzer - General

Frequency Range (Network Analyzer Mode)	100 kHz to 1.8 GHz
Frequency Resolution (Network Analyzer Mode)	1 mHz

Network Analyzer - Receiver

Measurement Channels	2 channels
Measurement Parameters	S11, S21, S12, S22 (with S-parameter test set)
Receiver Number of Inputs	3 inputs (R, A, B)
Receiver Input Noise Level	<-129 dBm (at 10 Hz IFBW, >= 10 MHz)
Receiver Maximum Safe Input Level	+20 dBm
Receiver Dynamic Range	>120 dB (at 10 Hz IFBW, >= 10 MHz)
Receiver IF Bandwidth (IFBW) Range	10 Hz to 40 kHz (1-3-10 steps)
Trace Noise (Magnitude)	<0.003 dB rms (IFBW = 10 kHz)
Trace Noise (Phase)	<0.02 deg rms (IFBW = 10 kHz)
Magnitude Dynamic Accuracy	±0.05 dB (for -10 to -70 dBm input)
Phase Dynamic Accuracy	±0.3 deg (for -10 to -70 dBm input)
Group Delay Display Resolution	10 ps

Network Analyzer - Source

Source Output Frequency Range	100 kHz to 1.8 GHz
Source Output Power Range	-60 to +20 dBm
Source Power Resolution	0.1 dB
Source Power Accuracy	± 0.5 dB (at 50 MHz, 0 dBm)
Source Harmonics	<-30 dBc (at +20 dBm)
Source Non-Harmonic Spurious	<-50 dBc (at 0 dBm)

Spectrum Analyzer - Frequency

Frequency Range (Spectrum Analyzer Mode)	9 kHz to 1.8 GHz
Frequency Span Range	0 Hz (zero span), 10 Hz to 1.8 GHz
Resolution Bandwidth (RBW) Range	10 Hz to 3 MHz (1-3-10 steps)
Video Bandwidth (VBW) Range	1 Hz to 3 MHz (1-3-10 steps)

Spectrum Analyzer - Performance

Displayed Average Noise Level (DANL)	<-150 dBm/Hz (at 10 MHz to 1.8 GHz)
Maximum Safe Input Level	+30 dBm (with ≥ 10 dB attenuation), 0 VDC
1 dB Gain Compression Point	>-5 dBm (mixer input, ≥ 10 MHz)
Second Harmonic Distortion	<-70 dBc (for -30 dBm mixer input, ≥ 10 MHz)
Third-Order Intercept (TOI)	>+7.5 dBm (mixer input, ≥ 10 MHz)
Residual Responses	<-100 dBm (at ≥ 10 MHz, input terminated, 0 dB attenuation)
Spurious Responses	<-70 dBc (for -30 dBm mixer input)
Phase Noise	<-105 dBc/Hz @ 10 kHz offset (carrier frequency ≤ 1 GHz)
Reference Level Accuracy	± 0.3 dB (at -20 dBm)
Frequency Response Flatness	± 1.0 dB (at 10 dB attenuation)
Sweep Time Range	10 ms to 10000 s (span ≥ 10 Hz), 150 μ s to 10000 s (zero span)

Impedance Analyzer

Impedance Frequency Range	100 kHz to 1.8 GHz (with Option 010)
Impedance Measurement Range	0.1 ohm to 20 kohm (typical, fixture dependent)
Impedance Measurement Parameters	Z , Y , Theta, R, X, G, B, C, L, D, Q (with Option 010)
Basic Impedance Accuracy	$\pm 3\%$ (typical, fixture dependent)

Connectivity

RF Input Connector Type	Type-N female (50 ohm)
RF Output Connector Type	Type-N female (50 ohm)
External Reference Input Frequency	10 MHz (± 10 ppm)
External Reference Input Level	-5 dBm to +5 dBm
Internal Reference Output Frequency	10 MHz
Internal Reference Output Level	≥ 0 dBm
External Trigger Input	BNC female, TTL level
External Video Output Port	15-pin D-sub (VGA)
GPIO (IEEE-488) Interface	24-pin IEEE-488
Keyboard Interface Port	6-pin mini-DIN

Control & Features

Calibration Types	1-port calibration, 2-port calibration, Response, Response & Isolation, S-parameter calibration
Error Correction Algorithms	Vector error correction (12-term, 3-term)
Limit Line Testing Capacity	Yes (upper/lower limit lines, segment-by-segment)
Marker Functions	Marker search (Max, Min, Peak, Target), Delta marker, Bandwidth search, Noise marker, RF impedance marker
Internal Storage Type	3.5-inch floppy disk drive (720 KB/1.44 MB DOS or LIF format)
Instrument State Save/Recall Slots	Yes (internal non-volatile RAM or floppy disk)
Programming Language	HP Instrument BASIC (IBASIC) (Option 1C2)

Physical & Environmental

Storage Temperature Range	-20 to +60 °C
Operating Humidity Limit	15% to 95% RH (non-condensing)
Operating Altitude Limit	Up to 4,500 meters
EMC Compliance Standards	Conforms to CISPR 11, EN 55011, EN 50082-1
Safety Compliance Standards	Conforms to CSA C22.2 No. 231, IEC 1010-1

Receiver

Measurement Points per Sweep	2 to 801
Receiver Input SWR	≤ 1.2 (100 kHz to 1.8 GHz, Ports R, A, B)

Source

Sweep Types	Linear frequency, Logarithmic frequency, List frequency, Power sweep
Source Output SWR	≤ 1.3 (at power level ≤ -17 dBm), ≤ 1.9 (at power level > -17 dBm)

Spectrum Analyzer Mode

Spectrum Analyzer Input SWR	≤ 1.2 (attenuation ≥ 10 dB), ≤ 1.9 (attenuation = 0 dB)
RBW Selectivity (60 dB/3 dB ratio)	< 15
Option 1D6 Gate Delay Range	6 μ s to 3.2 s
Option 1D6 Gate Length Range	1 μ s to 3.2 s

Reference Frequency

Option 1D5 Frequency Stability	Temp stability: $\pm 5 \times 10^{-8}$ (0 °C to 55 °C); Aging rate: $< \pm 1 \times 10^{-8}$ / day
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Interfaces

Probe Power Output	+15 V (≤ 150 mA), -12.6 V (≤ 160 mA)
Test Set Interface Port	25-pin D-sub connector (for HP 85046A/B or 87512A/B S-parameter test sets)
24-bit I/O Port	36-pin ribbon connector on rear panel
Keyboard Connector	5-pin DIN, PC-AT layout compatible

Storage

Floppy Disk Formats	3.5-inch, LIF and DOS formats (720 KB / 1.44 MB)
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Impedance Analyzer Mode

Option 010 Compatibility	Compatible with HP 43961A RF Impedance Test Kit
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Spectrum Analyzer Specifications

RF Input Attenuation Range	0 to 50 dB in 10 dB steps
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Frequency Reference

Standard Reference Oscillator Temperature Stability	± 20 ppm (0 °C to 55 °C, referenced to 25 °C)
Standard Reference Oscillator Aging Rate	$< \pm 5$ ppm / year

Receiver Inputs

Nominal Port Input Impedance	50 Ω
Maximum DC Input Voltage	0 V (Inputs R, A, B, and S)

Display

Network Analyzer Display Formats	Log/Linear Magnitude, Phase, Group Delay, Smith Chart, Polar, SWR, Real, Imaginary
Impedance Analyzer Display Formats	Log/Linear Magnitude of $ Z $, $ Y $, Phase, R, X, G, B, Cp, Cs, Lp, Ls, D, Q (requires Option 010)

Sweep & Trigger

Sweep Trigger Modes	Free Run, Single, Number of Groups, Manual, External, GPIB
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Environmental

Storage Humidity Limit	5% to 95% RH (non-condensing, wet-bulb temperature ≤ 40 °C)
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TECHNOLOGY

RF Vector Network & Spectrum Analysis

APPLICATIONS

RF Component and Circuit Characterization

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