

SIGNAL ANALYZERS

General Information (cont'd)

The vector signal analyzer is also capable of modulation analysis. Similar to Fourier analyzers, vector signal analyzers extend the capabilities of DSP through the RF range. Since both the magnitude and the phase of signals are captured, vector signal analyzers can provide a broad range of measurements including spectrum, modulation, and power on baseband, IF, or RF signals. Vector or I and Q formats can be analyzed in addition to AM, FM, and PM formats. Vector signal analyzers are especially useful when a broad range of measurements is required, for example, in the development of digital communication systems.

Microwave Modulation Analyzers

Most modern microwave communication and radar/EW system designers are turning to the use of complex modulations, which involves the use of quadrature or "vector" modulation formats such as QPSK or 16QAM in the case of communication systems and complex, coded formats in the case of radar/EW systems.

In all these receivers, the signal processing is not handled in the traditional one-channel, amplitude-only mode, but instead is demodulated into in-phase and quadrature-phase signals that provide dynamic phase and amplitude information about the carrier's modulation.

The high bandwidth requirement has led to the introduction of the HP 8981B vector modulation analyzer, which contains a matched dual-channel, sampling oscilloscope with dc to 350 MHz baseband capability.

The HP 8981B contains an internal I/Q demodulator that takes an IF signal from 50 to 200 MHz and demodulates it into I and Q signals for display and analysis. Other demodulation frequency ranges are available up to 1400 MHz. Extensive application information is available in Application Notes 343-2, 343-3, and 343-4, as well as in related data sheets and product notes.

Modulation domain analyzers represent an extension of Hewlett-Packard's counter/timer technology. They provide helpful views

of a signal's frequency, phase, or timing versus time. They also provide histograms and statistical analysis, making it easy to quickly analyze large amounts of measurement data. Modulation domain analyzers allow you to directly view frequency switching and settling of VCOs, PLLs, and synthesizers. They also make it easy to analyze complex phase and frequency modulations found in modern communications systems. See page 180 for a complete overview.

Peak Power Analysis

For comprehensive measurement and analysis of RF and microwave pulsed power, the HP 8990A peak power analyzer measures eight time parameters and five amplitude parameters. Its powerful waveform math routines can measure ratios and differences and can determine statistics of parameters measured with two RF channels or two video (100 MHz) channels.

Signal Analyzer Selection Guide

Spectrum Analyzers¹

Frequency range	Frequency accuracy (\pm)	Resolution bandwidth range	Average noise level (narrowest RBW)	Optimum dynamic range 2nd/3rd order	Amplitude accuracy (\pm) ^{2,3}	HP model number	Page
20 Hz to 40.1 MHz	40 Hz	3 Hz to 30 kHz	-137 dBm	105 dB/86 dB	0.4 dB	3585B	228, 229
10 Hz to 150 MHz	150 Hz	0.004 Hz to 17 kHz	-132 dBm	80 dB/80 dB	0.3 dB	3588A, 3589A	235, 236, 237
10 Hz to 500 MHz	1 kHz	3 Hz to 300 kHz	-140 dBm	85 dB/89 dB	1 dB	4195A	294
10 kHz to 1500 MHz	5 kHz ²	1 kHz to 3 MHz	-115 dBm ²	72 dB/83 dB	2 dB	8567A	253
100 Hz to 1500 MHz	260 Hz ²	10 Hz to 3 MHz	-135 dBm ²	88 dB/97 dB	2 dB	8568B	253
0.0002 Hz to 1800 MHz	110 Hz ²	350 μ Hz to 1 MHz	-170 dBm	70 dB/70 dB	1.8 dB	89440A	231, 232, 233
2 Hz to 1800 MHz	130 Hz	1 Hz to 3 MHz	-147 dBm ³	91 dB/103 dB	1 dB	4396A	290
9 kHz to 1800 MHz	5 MHz ^{2*}	1 kHz to 3 MHz	-115 dBm ³	70 dB/80 dB	1.7 dB	8590D	240
1 to 1800 MHz	210 ³	1 kHz to 3 MHz	\leq -88 dBmV (with preamp)	TBD	TBD	8591C	238
9 kHz to 1800 MHz	210 Hz ²	30 Hz to 3 MHz	-130 dBm ³	77 dB/90 dB	1.7 dB	8591E	242
9 kHz to 2.9 GHz	210 Hz ²	30 Hz to 3 MHz	-127 dBm ³	78 dB/88 dB	1.7 dB	8594E	242
30 Hz to 2.9 GHz + mm	106 Hz ²	1 Hz to 2 MHz	-145 dBm ³	88 dB/103 dB	1.85 dB	8560E	248
100 Hz to 2.9 GHz + mm + lightwave	110 Hz ²	10 Hz to 300 kHz (3 MHz option)	-134 dBm ³ (-156 dBm option)	82 dB/92 dB	1.5 dB (0.9 dB) ⁴	71100C	256
9 kHz to 6.5 GHz	210 Hz ²	30 Hz to 3 MHz	-125 dBm ³	77 dB/86 dB	1.7 dB	8595E	242
30 Hz to 6.5 GHz + mm	106 Hz ²	1 Hz to 2 MHz	-145 dBm ³	88 dB/103 dB	1.85 dB	8561E	248
9 kHz to 12.8 GHz	1.2 kHz ²	30 Hz to 3 MHz	-115 dBm ³	102 dB/80 dB	2.7 dB ⁵	8596E	242
9 kHz to 22 GHz (26.5 GHz)	11 MHz ²	1 kHz to 3 MHz	-102 dBm ⁵	96 dB/71 dB	2.7 dB ⁵	8592D	244
9 kHz to 22 GHz (26.5 GHz)	1.2 kHz ²	30 Hz to 3 MHz	-117 dBm ⁵	103 dB/81 dB	2.7 dB ⁵	8593E	242
9 kHz to 26.5 GHz + mm 30 Hz to 26.5 GHz (Opt 006)	1 kHz ²	1 Hz to 2 MHz	-145 dBm ⁵	114 dB/109 dB	3 dB ⁵	8563E	248
100 Hz to 22 GHz + mm	2.5 kHz ²	10 Hz to 3 MHz	-125 dBm ⁵	107 dB/86 dB	2.7 dB ⁵	8566B	253
50 kHz to 22 GHz + mm	1 kHz ²	10 Hz to 300 kHz (3 MHz option)	-109 dBm ⁵ (-135 dBm option)	70 dB/88 dB (84 dB/91 dB) ⁶	2.0 dB ⁵ (0.9 dB) ⁴	71200C ⁷	256
100 Hz to 26.5 GHz + mm 100 Hz to 40 GHz (Opt Z40)	1 kHz ²	10 Hz to 3 MHz	-137 dBm ⁵ (-155 dBm option)	98 dB/93 dB	2.0 dB ⁵ (0.9 dB) ⁴	71209A	256
100 Hz to 22 GHz + mm + lightwave	1 kHz ²	10 Hz to 3 MHz	-136 dBm ⁵ (-153 dBm option)	96 dB/98 dB	2.5 dB ⁵ (0.9 dB) ⁴	71210C	256
9 kHz to 40 GHz	1 kHz ²	1 Hz to 2 MHz	\leq -120 dBm @ 40 GHz, 10 Hz RBW	114 dB/109 dB	3 dB ⁵	8564E	246
9 kHz to 50 GHz	1 kHz ²	1 Hz to 2 MHz	\leq -117 dBm @ 50 GHz, 10 Hz RBW	114 dB/109 dB	3 dB ⁵	8565E	246

¹ Includes optional performance

² Relative accuracy = relative performance + lesser of either scale fidelity or IF gain accuracy

³ CF = 1 GHz

⁴ = 0.75 dB transfer accuracy using HP 70100A-H01 modular power meter

⁵ CF = 10 GHz

⁷ Unpreselected system unless otherwise noted

^{*} 2.1 kHz optional