Specifications Guide

Agilent Technologies EMC Analyzers

This manual provides documentation for the following instruments:

Agilent Technologies
E7401A (9 kHz – 1.5 GHz)
E7402A (9 kHz – 3.0 GHz)
E7403A (9 kHz – 6.7 GHz)
E7404A (9 kHz – 13.2 GHz)
E7405A (9 kHz – 26.5 GHz)

Agilent Technologies

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WARNING ***Warning*** **denotes a hazard. It calls attention to a procedure which, if not correctly performed or adhered to, could result in injury or loss of life. Do not proceed beyond a warning note until the indicated conditions are fully understood and met.**

WARNING **This is a Safety Class 1 Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protected earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.**

WARNING **If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.**

CAUTION *Caution* denotes a hazard. It calls attention to a procedure that, if not correctly performed or adhered to, could result in damage to or destruction of the instrument. Do not proceed beyond a caution sign until the indicated conditions are fully understood and met.

CAUTION Always use the three-prong ac power cord supplied with this product. Failure to ensure adequate earth grounding by not using this cord may cause product damage.

CAUTION This instrument has autoranging line voltage input, be sure the supply voltage is within the specified range.

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Documentation is updated periodically. For the latest information about Agilent Spectrum Analyzers, including firmware upgrades and application information, please visit the following Internet URL: http//www.agilent.com/find/emc.

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1 Agilent E7401A Specifications and Characteristics

About This Chapter

This chapter contains specifications and characteristics for the Agilent E7401A spectrum analyzer. The distinction between specifications and characteristics is described as follows.

- Specifications describe the performance of parameters covered by the product warranty. (The temperature range is 0 °C to 55 °C, unless otherwise noted.)
- Characteristics describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- Typical performance describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- Nominal values indicate the expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.

The following conditions must be met for the analyzer to meet its specifications.

- The analyzer is within the one year calibration cycle.
- If **Auto Align All** is selected:
  - After 2 hours of storage within the operating temperature range.
  - 5 minutes after the analyzer is turned on with sweep times less than 4 seconds[1].
- If **Auto Align Off** is selected:
  - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
  - After the analyzer is turned on for a minimum of 90 minutes and **Align Now All** has been run.
  - When **Align Now All** is run:
    - Every hour
    - If the ambient temperature changes more than 3 °C
    - If the 10 MHz reference changes

1. A Warm-up time of 25 minutes is required for a sweep time of 20 seconds.

- If **Auto Align All but RF** is selected:
  - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
  - After the analyzer is turned on for a minimum of 90 minutes and **Align Now RF** has been run.
  - When **Align Now RF** is run:
    - Every hour
    - If the ambient temperature changes more than 3 °C

Frequency

	Specifications	Supplemental Information
Frequency Range		
50 Ω	9 kHz to 1.5 GHz	
50 Ω, Preamp On	100 kHz to 1.5 GHz	

	Specifications	Supplemental Information
Frequency Reference		
Aging Rate	$\pm 2 \times 10^{-6}$/year	$\pm 1.0 \times 10^{-7}$/day, characteristic
Settability	$\pm 5 \times 10^{-7}$	
Temperature Stability	$\pm 5 \times 10^{-6}$	

	Specifications	Supplemental Information
High Stability Frequency Reference *(Option 1D5)*		
Aging Rate	$\pm 1 \times 10^{-7}$/year	$\pm 5 \times 10^{-10}$/day, 7-day average after being powered on for 7 days, characteristic
Settability	$\pm 1 \times 10^{-8}$	
Temperature Stability		
20 to 30 °C	$\pm 1 \times 10^{-8}$	
0 to 55 °C	$\pm 5 \times 10^{-8}$	
Warm-up (Internal frequency reference selected)		
After 5 minutes		$< \pm 1 \times 10^{-7}$ of final frequency,[a] characteristic
After 15 minutes		$< \pm 1 \times 10^{-8}$ of final frequency,[a] characteristic

a. Final frequency is defined as frequency 60 minutes after power-on with analyzer set to internal frequency reference.

	Specifications	Supplemental Information
Frequency Readout Accuracy		
(Start, Stop, Center, Marker)	±((frequency indication × frequency reference error[a]) + 0.5% of span + $\frac{\text{span}}{\text{sweep points} - 1}$ + 15% of RBW + 10 Hz)	

a. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).

	Specifications	Supplemental Information
Marker Frequency Counter		
Resolution	Selectable from 1 Hz to 100 kHz	
Accuracy[a]	±(marker frequency × frequency reference error[b] + counter resolution)	For RBW ≥ 1 kHz

a. Marker level to displayed noise level > 25 dB, RBW/ Span ≥ 0.002, frequency offset = 0 Hz.
b. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).

	Specifications	Supplemental Information
Frequency Span		
Range	0 Hz (zero span), 100 Hz to 1.5 GHz	
Resolution	2 Hz	
Accuracy	±(0.5% of span + $2 \times \frac{\text{span}}{\text{sweep points} - 1}$)	

	Specifications	Supplemental Information
Sweep Time		
Range		
Span > 0 Hz	1 ms to 4000 s[a]	$\frac{\text{sweep points} - 1}{100\ \text{kHz}}$ to 4000 s
Span = 0 Hz	10 µs to 4000 s[a]	
Tracking Generator On *(Option 1DN)*		50 ms is the minimum sweep time

	Specifications	Supplemental Information
Fast Time-domain Sweep *(Option AYX)* (For Span = 0 Hz, RBW ≥ 1 kHz)	50 ns to 4000 s[b]	$\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to 4000 s
Accuracy (Span = 0 Hz)		
10 µs to 4000 s[a]	±1%	
(Option AYX) 50 ns to 4000 s[b]	±1%	
Sweep Trigger[c,d]	Free Run, Single, Line, Video[e], External, Delayed, Offset[f]	
(Option 1D6)	Add Gate	
Delayed Trigger[c,d,g]		
Range	1 µs to 400 s	
Resolution	$\frac{\text{delay in seconds}}{65000}$ rounded up to nearest µs	
Accuracy	±(500 ns + (0.01% of delay))	
Offset Trigger[f]		
Resolution	$\frac{\text{sweep time}}{\text{sweep points} - 1}$	
Range	±327 ms to ±12.3 ks	Where ST = sweep time and SP = sweep points $\frac{-32766 \times ST}{SP - 1}$ to $\frac{(32766 - SP) \times ST}{SP - 1}$
Fast Time-domain sweep *(Option AYX)* (For sweep times $\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$)	±1.23 ms to ±245 ms	$\frac{-32766 \times ST}{SP - 1}$ to $\frac{(32766 - SP) \times ST}{SP - 1}$

a. For firmware revisions prior to A.06.00, 5 ms to 2000 s.
b. For firmware revisions prior to A.06.00, 20 µs to 2000 s.
c. Gate cannot be used simultaneously with delayed trigger.
d. Auto align is suspended in video, external, gate, and delayed trigger modes while waiting for a trigger event to occur.
e. Unavailable when RBW ≤ 300 Hz.
f. For firmware revision A.06.00 or later.
g. Delayed trigger is available with line and external trigger.

	Specifications	Supplemental Information
Sweep (trace) Points		
Range		
Span > 0 Hz	101 to 8192[a]	
Span = 0 Hz	2 to 8192[a]	

a. For firmware revisions prior to A.06.00, 401 points.

	Specifications	Supplemental Information
Resolution Bandwidth (RBW)		
Range	10 Hz to 300 Hz (–3 dB) bandwidths in 1-3-10 sequence	Only available in spans ≤ 5 MHz, sweep times ≥ $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$, and not usable with tracking generator on. (*Option 1DN*)
	1 kHz to 3 MHz (–3 dB) bandwidths in 1-3-10 sequence	
	5 MHz (–3 dB) bandwidth	
	200 Hz (–6 dB) EMI bandwidth	Only available in spans ≤ 5 MHz, sweep times ≥ $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$, and not usable with tracking generator on. (*Option 1DN*)
	9 kHz, 120 kHz (–6 dB) EMI bandwidth	
	1 MHz (–6 dB) EMI bandwidth	
	1 MHz (Impulse) EMI bandwidth	
Accuracy		
10 Hz to 300 Hz (–3 dB) RBW	±10%	
1 kHz to 3 MHz (–3 dB) RBW	±15%	
5 MHz (–3 dB) RBW	±30%	
200 Hz (–6 dB) RBW	±10%	
9 kHz, 120 kHz (–6 dB) RBW	±15%	
1 MHz (–6 dB) RBW	±10%	
1 MHz (Impulse) RBW	±15%[a]	

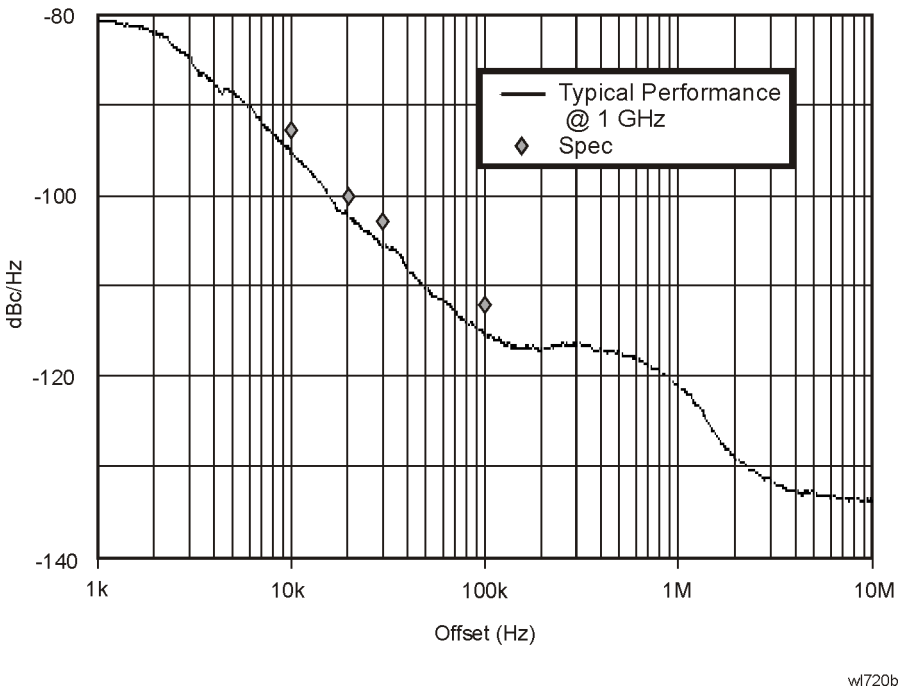
	Specifications	Supplemental Information
Shape		
10 Hz to 300 Hz (–3 dB) RBW		Digital, approximately Gaussian shape
1 kHz to 5 MHz (–3 dB) RBW		Synchronously tuned four poles, approximately Gaussian shape
200 Hz (–6 dB) RBW		Digital, Kaiser Window
9 kHz, 120 kHz, 1 MHz (–6 dB) RBW		Synchronously tuned four poles, approximately Gaussian shape
1 MHz (Impulse) RBW		Synchronously tuned four poles, approximately Gaussian shape
Selectivity		
10 Hz to 300 Hz (–3 dB) RBW		< 5:1, 60 dB / 3 dB bandwidth ratio, characteristic
1 kHz to 5 MHz (–3 dB) RBW		< 15:1, 60 dB / 3 dB bandwidth ratio, characteristic
200 Hz (–6 dB) RBW		< 3:1, 40 dB / 6 dB bandwidth ratio, characteristic
9 kHz, 120 kHz, 1 MHz (–6 dB) RBW		< 10:1, 60 dB / 6 dB bandwidth ratio, characteristic
1 MHz (Impulse) RBW		< 10:1, 60 dB / 6 dB bandwidth ratio, characteristic

a. Scale Linear, VBW 3 MHz, signal 0 to –10 dB from reference level.

	Specifications	Supplemental Information
Video Bandwidth (VBW) (–3 dB)		
Range	30 Hz to 1 MHz in 1-3-10 sequence 1, 3, 10 Hz for RBW's <1 kHz	3 MHz, characteristic
Accuracy		±30%, characteristic
Shape		Post detection, single pole low-pass filter used to average displayed noise Video bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

	Specifications	Supplemental Information
Stability		
Noise Sidebands (Offset from CW signal with 1 kHz RBW, 30 Hz VBW and sample detector)		
≥1 kHz *(Option 1D5)*		≤ –79 dBc/Hz, typical
≥10 kHz	≤ –93 dBc/Hz	≤ –95 dBc/Hz, typical
≥20 kHz	≤ –100 dBc/Hz	≤ –102 dBc/Hz, typical
≥30 kHz	≤ –104 dBc/Hz	≤ –106 dBc/Hz, typical
≥100 kHz	≤ –113 dBc/Hz	≤ –116 dBc/Hz, typical
Residual FM		
1 kHz RBW, 1 kHz VBW	≤150 Hz p–p in 100 ms	
(Option 1D5)	≤100 Hz p–p in 100 ms	
10 Hz RBW, 10 Hz VBW *(Option 1D5)*	≤2 Hz p–p in 20 ms	
10 Hz RBW, 10 Hz VBW		≤10 Hz p–p in 20 ms, characteristic
System-Related Sidebands, offset from CW signal		
≥30 kHz	≤ –65 dBc	
Line-Related Sidebands, offset from CW signal		
<300 Hz		≤ –50 dBc, characteristic
>300 Hz to 30 kHz		≤ –55 dBc, characteristic

Noise Sidebands Normalized to 1 Hz Versus Offset from Carrier



Amplitude

Amplitude specifications do not apply for the negative peak detector mode.

	Specifications	Supplemental Information
Measurement Range	Displayed Average Noise Level to Maximum Safe Input Level	
Input Attenuator Range	0 to 60 dB, in 5 dB steps	

	Specifications	Supplemental Information
Maximum Safe Input Level		
Input attenuator setting ≥15 dB		Signals > +33 dBm (2 W) nominal may trigger input protection, which disconnects the input path.
Average Continuous Power or Peak Pulse Power	+30 dBm (1 W)	
dc	100 Vdc	dc transients may momentarily trigger input protection.
Input attenuator setting <15 dB		Signals > +6 dBm (4 mW) nominal may trigger input protection, which automatically increases input attenuation to 15 dB.
Average Continuous Power or Peak Pulse Power	+3 dBm (2 mW)	
dc	100 Vdc	dc transients may trigger input protection.

	Specifications	Supplemental Information
1 dB Gain Compression		
Total power at input mixer [a,b]		
50 MHz to 1.5 GHz	0 dBm	
Preamp On		
Total power at the preamp[c]		–20 dBm, characteristic

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).
b. For resolution bandwidths 1 kHz to 30 kHz, the maximum input signal amplitude must be ≤ reference level +10 dB.
c. Total power at the preamp = total power at the input (dBm).

	Specifications		Supplemental Information	
Displayed Average Noise Level (Input terminated, 0 dB attenuation, sample detector, Reference Level = –70 dBm)				
	1 kHz RBW 30 HzVBW	10 Hz RBW 1 Hz VBW	1 kHz RBW 30 HzVBW (typical)	10 Hz RBW 1 Hz VBW (typical)
400 kHz to 10 MHz	≤ –115 dBm	≤ –134 dBm	≤ –119 dBm	≤ –139 dBm
10 MHz to 500 MHz	≤ –119 dBm	≤ –138 dBm	≤ –121 dBm	≤ –141 dBm
500 MHz to 1.0 GHz	≤ –117 dBm	≤ –136 dBm	≤ –121 dBm	≤ –140 dBm
1.0 GHz to 1.5 GHz	≤ –114 dBm	≤ –133 dBm	≤ –118 dBm	≤ –138 dBm
Preamp On	1 kHz RBW 30 Hz VBW	10 Hz RBW 1 Hz VBW	1 kHz RBW 30 Hz VBW (typical)	10 Hz RBW 1 Hz VBW (typical)
400 kHz to 10 MHz	≤ –131 dBm	≤ –150 dBm	≤ –135 dBm	≤ –155 dBm
10 MHz to 500 MHz	≤ –135 dBm	≤ –154 dBm	≤ –136 dBm	≤ –156 dBm
500 MHz to 1.0 GHz	≤ –133 dBm	≤ –152 dBm	≤ –136 dBm	≤ –156 dBm
1.0 GHz to 1.5 GHz	≤ –131 dBm	≤ –150 dBm	≤ –135 dBm	≤ –155 dBm

	Specifications	Supplemental Information
Display Range		
Log Scale	Ten divisions displayed; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps	
RBW ≥ 1 kHz	Calibrated 0 to –85 dB from Reference Level	
RBW ≤ 300 Hz	Calibrated 0 to –120 dB[a] from Reference Level	
Linear Scale	Ten divisions	
Scale Units	dBm, dBmV, dBµV, dBµA, A, V, W, and Hz	

a. 0 to –70 dB range when span = 0 Hz, or when IF Gain fixed: (:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF).

	Specifications	Supplemental Information
Marker Readout Resolution		
Log scale		
RBW ≥ 1 kHz		
0 to –85 dB from ref level	0.04 dB	
RBW ≤ 300 Hz		
0 to –120 dB from ref level	0.04 dB	
Linear scale	0.01% of Reference Level	
Fast Sweep Times for Zero Span		
(Option AYX)[a]		
For sweep times $\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$		
Log		
0 to –85 dB from ref level	0.3 dB	
Linear	0.3% of Reference Level for linear scale	

a. For firmware revisions prior to A.06.00, 20 µs to <5 ms.

	Specifications	Supplemental Information
Frequency Response[a]		
9 kHz to 1.5 GHz		
10 dB attenuation		
20 to 30 °C	±0.5 dB	
0 to 55 °C	±1.0 dB	
0 dB, 5 dB, 15 to 60 dB attenuation		±1.0 dB, characteristic
Preamp On		
100 kHz to 1.5 GHz		
0 dB attenuation		
20 to 30 °C	±1.0 dB	
0 to 55 °C	±1.5 dB	
5 dB to 20 dB attenuation		±1.5 dB, characteristic

a. Frequency response values are referenced to the amplitude at 50 MHz.

	Specifications	Supplemental Information
Input Attenuation Switching Uncertainty at 50 MHz		
Attenuator Setting		
0 dB to 5 dB	±0.3 dB	
10 dB	Reference	
15 dB	±0.3 dB	
20 to 60 dB attenuation	±(0.1 dB + 0.01 × Attenuator Setting)	

	Specifications	Supplemental Information
Preamp		Refer also to Displayed Average Noise Level specification
Gain		+20 dB, nominal[a]
Noise figure		4 dB, characteristic

a. Amplifier is before the input attenuator.

	Specifications	Supplemental Information
Absolute Amplitude Accuracy		
At reference settings[a]	±0.30 dB	±0.10 dB, typical
Preamp On[b]	±0.37 dB	±0.14 dB, typical
Overall Amplitude Accuracy[c]		
20 to 30 °C	± (0.54 dB + Absolute Frequency Response)	

a. Settings are: reference level –25 dBm; input attenuation 10 dB; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled, sample detector, signal at reference level.
b. Settings are: reference level –30 dBm; input attenuation 0 dB; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled, signal at reference level.
c. For reference level 0 to –50 dBm; input attenuation 10 dB; RBW 1 kHz; VBW 1 kHz; scale log, log range 0 to –50 dB from reference level; sweep time coupled; signal input 0 to –50 dBm; span ≤20 kHz.

	Specifications	Supplemental Information
RF Input VSWR (at tuned frequency)		
Attenuator setting		
50 Ω		
0 to 5 dB attenuation		≤1.55:1, characteristic
10 to 60 dB attenuation		≤1.35:1, characteristic
Input protection is tripped		Open input, characteristic
Amptd Ref is On		Open input, characteristic
Auto Align All is selected		Open input momentarily during retrace, characteristic

	Specifications	Supplemental Information
Auto Alignment[a]		
Sweep-to-sweep variation		±0.1 dB, characteristic

a. Set **Auto Align** to **Off** and use **Align Now, All** to eliminate this variation.

	Specifications	Supplemental Information
Resolution Bandwidth Switching Uncertainty (at Reference Level)		
1 kHz RBW	Reference	
3 kHz to 3 MHz RBW	±0.3 dB	
5 MHz RBW	±0.6 dB	
10 Hz to 300 Hz RBW	±0.3 dB	

	Specifications	Supplemental Information
Reference Level		
Range	–149.9 dBm to maximum mixer level + attenuator setting	
Resolution		
Log Scale	±0.1 dB	
Linear Scale	±0.12% of Reference Level	

	Specifications	Supplemental Information
Accuracy (at a fixed frequency, a fixed attenuator, and referenced to –35 dBm(–10 dBm, Preamp On)		
Reference Level (dBm) – input attenuator setting (dB) + preamp gain (dB)		
–10 dBm to > –60 dBm	±0.3 dB	
–60 dBm to > –85 dBm	±0.5 dB	
–85 dBm to –90 dBm	±0.7 dB	

	Specifications	Supplemental Information
Display Scale Switching Uncertainty		
Switching between Linear and Log	±0.15 dB at reference level	
Log Scale Switching	No error	

	Specifications	Supplemental Information
Display Scale Fidelity		
Log Maximum Cumulative		
RBW ≥ 1 kHz		
dB Below Reference Level		
0 dB Reference	0 dB	
> 0 to 10 dB	±0.22 dB	±0.08 dB, typical
> 10 to 20 dB	±0.24 dB	±0.09 dB, typical
> 20 to 30 dB	±0.26 dB	±0.10 dB, typical
> 30 to 40 dB	±0.40 dB	±0.23 dB, typical
> 40 to 50 dB	±0.57 dB	±0.35 dB, typical
> 50 to 60 dB	±0.57 dB	±0.35 dB, typical
> 60 to 70 dB	±0.66 dB	±0.39 dB, typical
>70 to 80 dB	±0.66 dB	±0.46 dB, typical
>80 to 85 dB	±1.15 dB	±0.79 dB, typical

	Specifications	Supplemental Information
RBW = 200 Hz		
0 to 30 dB below reference level	±(0.3 dB + 0.01 × dB from reference level)	
RBW = 10 Hz, 30 Hz, 100 Hz, or 300 Hz		
Span > 0 Hz		
Auto range On		
0 to 98 dB below reference level	±(0.3 dB + 0.01 × dB from reference level)	
> 98 to 120 dB below reference level		±2.0 dB, characteristic
Auto range Off		
0 to 60 dB below reference level	±(0.3 dB + 0.015 × dB from reference level)	
> 60 to 70 dB below reference level	±1.5 dB	
Span = 0 Hz[a]		
0 to 60 dB below reference level	±(0.3 dB + 0.015 × dB from reference level)	
> 60 to 70 dB below reference level	±1.5 dB	
Log Incremental Accuracy		
0 to 80 dB[b] below reference level	±0.4 dB/4 dB	
Linear Accuracy	±2% of Reference Level	

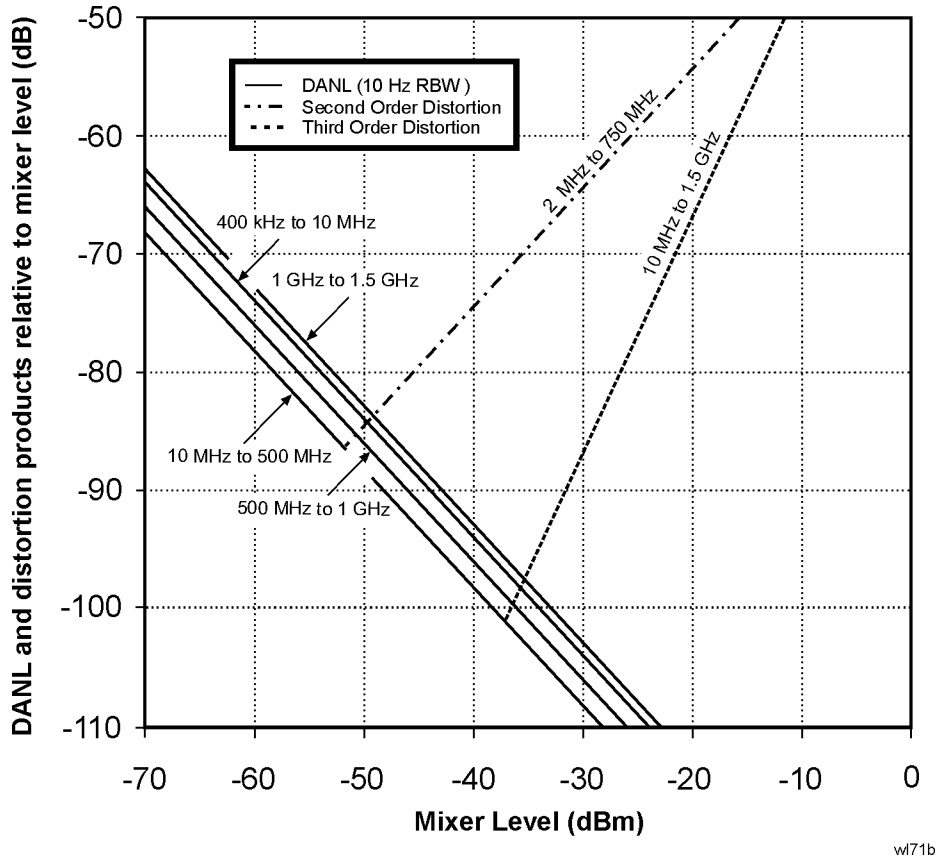
a. The SCPI command for auto range off is:
(:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF)

b. 0 to –50 dB for RBWs ≤ 300 Hz and span = 0 Hz, or when auto ranging is off.

	Specifications	Supplemental Information
Spurious Responses		
Second Harmonic Distortion		
Input Signal		
2 MHz to 750 MHz	< –75 dBc for –40 dBm signal at input mixer[a]	+35 dBm SHI (second harmonic intercept)
Preamp On 2 MHz to 750 MHz		0 dBm SHI, characteristic
Third Order Intermodulation Distortion		
2 MHz to 10 MHz		+14.5 dBm TOI (third order intercept), typical
10 MHz to 1.5 GHz	< –87 dBc[b] for two –30 dBm signals at input mixer[a] and >50 kHz separation.	+13.5 dBm[b] TOI +19 dBm TOI, typical
Preamp On 10 MHz to 1.5 GHz		–16 dBm TOI, characteristic
Other Input Related Spurious		
30 kHz ≤ offset ≤1200 MHz	< –65 dBc for –20 dBm signals at input mixer[a] ≤1.5 GHz.	
Offset >1200 MHz	< –45 dBc for –20 dBm signal at input mixer[a] ≤1.5 GHz.	
Noise Floor Degradation		
Input frequency = 1210.7 MHz ± RBW		< –62 dBc for –45 dBm signal at input mixer[a]

a. Mixer Power Level (dBm) = Input Power (dBm) – Input Attenuation (dB).
b. For serial numbers < US40240379, < –80 dBc for two –30 dBm signals at the input mixer and > 50 kHz separation, +10 dBm TOI, +15 dBm, typical.

Specified Dynamic Range



	Specifications	Supplemental Information
Residual Responses (Input terminated and 0 dB attenuation)		
150 kHz to 1.5 GHz	< –90 dBm	

	Specifications	Supplemental Information
Quasi-Peak Detector	The quasi-peak detector provides the quasi-peak amplitude of pulsed radio frequency (RF) or continuous wave (CW) signals. The amplitude response conforms to Publication 16 of CISPR Section 1, Clause 2, except as indicated in the Relative Quasi-Peak Response Table.	

Relative Quasi-Peak Response to a CISPR Pulse (dB)			
Frequency Band			
Pulse Repetition Frequency	**120 kHz EMI BW 0.03 to 1 GHz**	**9 kHz EMI BW 0.15 to 30 MHz**	**200 Hz EMI BW 9 to 150 kHz**
1000 Hz	+8.0 ± 1.0	+4.5 ± 1.0	N/A
100 Hz	0 dB reference[a]	0 dB reference[a]	+4.0 ± 1.0
60 Hz	N/A	N/A	+3.0 ± 1.0
25 Hz	N/A	N/A	0 dB reference[a]
20 Hz	–9.0 ± 1.0	–6.5 ± 1.0	N/A
10 Hz	–14.0 ± 1.5	–10.0 ± 1.5	–4.0 ± 1.0
5 Hz	N/A	N/A	–7.5 ± 1.5
2 Hz	–26.0 ± 2.0	–20.5 ± 2.0	–13.0 ± 2.0
1 Hz		–22.5 ± 2.0	–17.0 ± 2.0
Isolated Pulse		–23.5 ± 2.0	–19.0 ± 2.0

a. Reference pulse amplitude accuracy relative to a 66 dBµV CW signal is <1.5 dB as specified in CISPR Publication 16. CISPR reference pulse: 0.044 µVs for 30 MHz to 1.0 GHz, 0.316 µVs for 15 kHz to 30 MHz, and 13.5 µVs for 9 to 150 kHz.

	Specifications	**Supplemental Information**
FM Demodulation		
Input level		(–60 dBm + attenuator setting), characteristic
Signal level		0 to –30 dB below reference level, characteristic

Options

Time Gated Spectrum Analysis (Option 1D6)

	Specifications	Supplemental Information
Gate Delay		
Range	1 µs to 400 s	
Accuracy	±(500 ns + (0.01% × (maximum of gate delay or length)))	From gate trigger input to positive edge of gate output
Gate Length		
Range	1 µs to 400 s	
Accuracy	±(500 ns + (0.01% × (maximum of gate delay or length)))	From positive edge to negative edge of gate output
Resolution	((maximum of gate delay or length in seconds)/65000) rounded up to nearest µs	Dependent on the greater of gate delay or gate length
Additional Amplitude Error[a]		
Log Scale	±0.2 dB	
Linear Scale	±0.1% of reference level	

a. While in gate mode.

Tracking Generator (Option 1DN)

	Specifications	Supplemental Information
Warm-up	5 minutes	

	Specifications	Supplemental Information
Output Frequency Range	9 kHz to 1.5 GHz	

	Specifications	Supplemental Information
Minimum Resolution BW	1 kHz	Not usable with resolution bandwidths ≤300 Hz

	Specifications	Supplemental Information
Output Power Level		
Range		
0 to 55 °C	0 to −70 dBm	
20 to 30 °C	2 to −70 dBm	
Resolution	0.1 dB	
Absolute Accuracy (at 50 MHz with coupled source attenuator)		
referenced to 0 dBm	± 0.5 dB	
Vernier		
Range	10 dB	
Accuracy (with coupled source attenuator)		
referenced to 0 dBm	±0.75 dB, for 0 to −10 dBm	
Output Attenuator Range	0 to 60 dB in 10 dB steps	

	Specifications	Supplemental Information
Maximum Safe Reverse Level[a]		+20 dBm (0.1 W), 100 Vdc, characteristic

a. dc transients may trigger reverse power protection.

	Specifications	Supplemental Information
Output Power Sweep		
Range	(–15 to 0 dBm) – (Source Attenuator Setting)	
Resolution	0.1 dB	
Accuracy (zero span)	<1.5 dB peak-to-peak	

	Specifications	Supplemental Information
Output Flatness		
Referenced to 50 MHz, 0 dB attenuator		
9 kHz to 10 MHz	±2 dB	
10 MHz to 1.5 GHz	±1.5 dB	

	Specifications	Supplemental Information
Spurious Outputs		
(0 dBm output)		
Harmonic Spurs		
9 kHz to 20 MHz	< –20 dBc	
20 MHz to 1.5 GHz	< –25 dBc	
Non-harmonic Spurs	< –35 dBc	

	Specifications	Supplemental Information
Dynamic Range	Maximum Output Power Level – Displayed Average Noise Level	

	Specifications	Supplemental Information
Output Tracking		
Drift		No error
Swept Tracking Error		No error for coupled sweep times

	Specifications	Supplemental Information
RF Power-Off Residuals		
100 kHz to 1.5 GHz		< –120 dBm, characteristic

	Specifications	Supplemental Information
Output Attenuator Repeatability		±0.2 dB, characteristic

	Specifications	Supplemental Information
Output VSWR		<2.5:1, characteristic

	Specifications	Supplemental Information
Output Attenuator Accuracy		
0 dB	Reference	
10 dB		±0.6 dB, characteristic
20 dB		±0.9 dB, characteristic
30 dB		±1.2 dB, characteristic
40 dB		±1.5 dB, characteristic
50 dB		±1.8 dB, characteristic
60 dB		±2.1 dB, characteristic

Tracking Generator Output Accuracy
Relative Accuracy (Referred to 0 dBm) = Output Attenuator Accuracy + Vernier Accuracy + Output Flatness
Absolute Accuracy = Relative Accuracy (Referred to 0 dBm) + Absolute Accuracy at 50 MHz

General

	Specifications	Supplemental Information
Temperature Range		
Operating	0 to 55 °C	Floppy disk 10 to 40 °C
Storage	–40 to 75 °C	

	Specifications	Supplemental Information
Audible Noise (ISO 7779)		
Sound Pressure at 25 °C		<40 dBa, (<4.6 Bels power)

	Specifications	Supplemental Information
Military Specification	Has been type tested to the environmental specifications of MIL-PRF-28800F class 3.	

	Specifications	Supplemental Information
EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class B[a].	

a. Meets Class A performance during dc operation or serial number US41110000 or lower.

	Specifications	Supplemental Information
Immunity Testing		
Radiated Immunity		Testing was done at 3 V/m according to IEC 801-3/1984. When the analyzer tuned frequency is identical to the immunity test signal frequency, there may be signals of up to –60 dBm displayed on the screen.
Electrostatic Discharge		Air discharges of up to 8 kV were applied according to IEC 801-2/1991. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

	Specifications	Supplemental Information
Power Requirements		
ac Operation		
Voltage, frequency	90 to 132 Vrms, 47 to 440 Hz 195 to 250 Vrms, 47 to 66 Hz	
Power Consumption, On	<300 W	
Power Consumption, Standby	<5 W	
dc Operation		
Voltage	12 to 20 Vdc	
Power Consumption	<200 W	
Power Consumption, Standby	<100 mW	

	Specifications	Supplemental Information
Measurement Speed		
Local Measurement and Display Update rate[a,b]		
Sweep points = 101		≥ 50/s, characteristic
Sweep points = 401		≥ 35/s, characteristic
Remote Measurement and GPIB Transfer Rate[b,c,d]		
Sweep points = 101		≥ 45/s, characteristic
Sweep points =401		≥ 30/s, characteristic
RF Center Frequency Tune, Measure, and GPIB Transfer Time[b,c,e]		
Sweep points = 101		≤ 75 ms, characteristic
Sweep points = 401		≤ 90 ms, characteristic

a. Factory preset, auto align Off, fixed center frequency, RBW = 1 MHz, and spans >102 MHz and ≤400 MHz.
b. Sweeping through 425.6 MHz or 914.6 MHz will cause the measurement speed to degrade.
c. Display Off (:DISPlay:ENABle OFF), and 32-bit integer data format (:FORMat:DATA INT,32), if *Option AYX* or *A4J* is installed, disable sweep ramp, (:SYSTem:PORTs:IFVSweep:ENABle OFF), markers off, single sweep, measured with IBM compatible PC with 550 MHz Pentium® III running Windows® NT 4.0, one meter GPIB cable, National Instruments PCI-GPIB card and NI-488.2 DLL.
d. Factory preset, auto align Off, RBW = 1 MHz, span= 20 MHz, fixed center frequency, average of 100 measurements.
e. Factory preset, auto align Off, RBW = 1 MHz, span= 20 MHz, and center frequency tune step size = 50 MHz.

	Specifications	Supplemental Information
Data Storage		
Internal		200 Traces or States[a]
External (10 to 40 °C) 3.5" 1.44 MB, MS-DOS® compatible floppy disk		200 Traces or States[a]

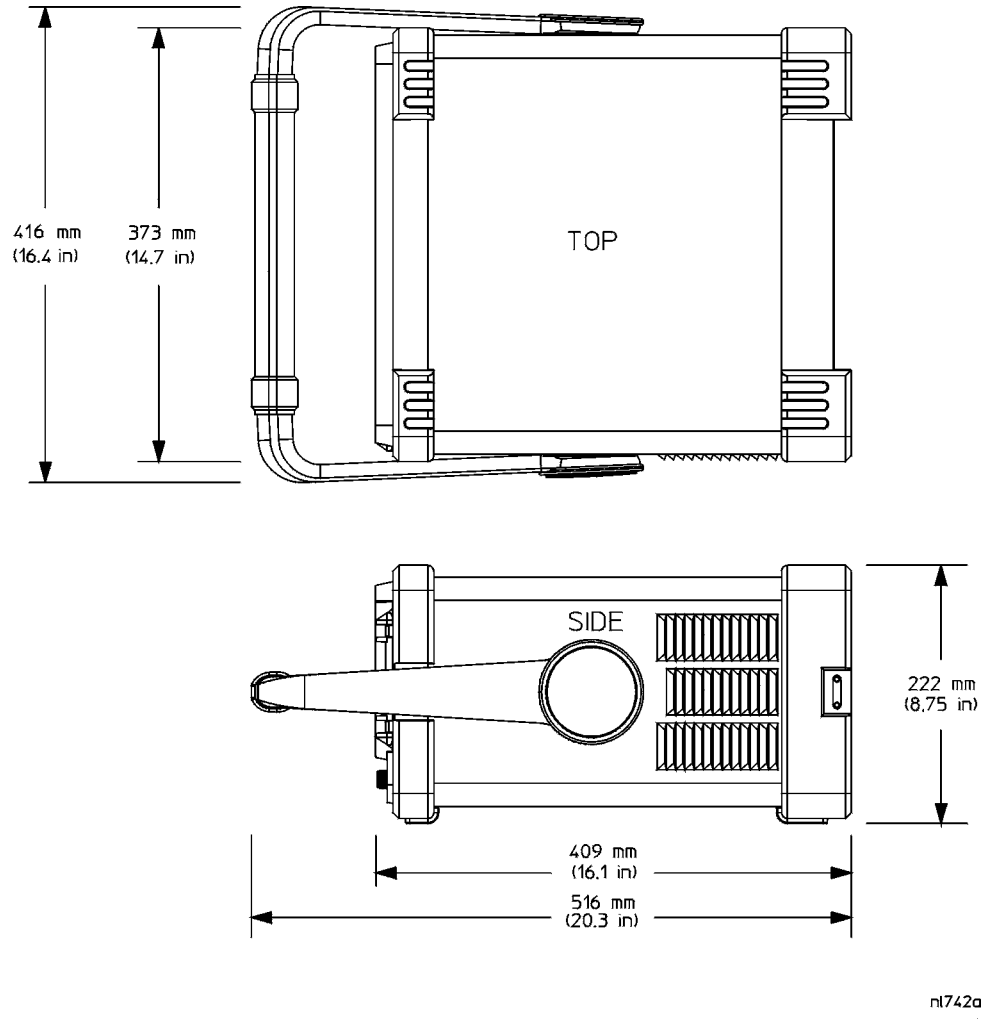
a. When storing traces set to 401 points.

	Specifications	Supplemental Information
Downloadable Program Memory		10 MB available memory

	Specifications	Supplemental Information
Demod Tune and Listen		Internal speaker, front-panel earphone jack and front-panel volume control.
Demod	AM and FM	An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

	Specifications	Supplemental Information
Weight (without options)		
Net		12.6 kg (27.7 lb), characteristic
Shipping		27.3 kg (60 lb), characteristic

Dimensions


416 mm
(16.4 in)
373 mm
(14.7 in)
TOP
SIDE
222 mm
(8.75 in)
409 mm
(16.1 in)
516 mm
(20.3 in)
nl742a

Inputs and Outputs

Internal

	Specifications	Supplemental Information
Amptd Ref[a]		Amplitude reference
Frequency		50 MHz
Frequency Accuracy		Frequency reference error[b]
50 Ω Amplitude		–25 dBm[c], nominal

a. Turn the amplitude reference signal on/off by pressing the keys: **Input/Output**, **Amptd Ref**.
b. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).
c. The internal amplitude reference actual power is stored internally.

Front Panel

	Specifications	Supplemental Information
INPUT 50 Ω		
Connector	Type-N female	
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
RF OUT 50 Ω, *(Option 1DN)*		
Connector	Type-N female	
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
PROBE POWER		
Voltage/Current		+15 Vdc, ±7% at 150 mA max., characteristic –12.6 Vdc ±10% at 150 mA max., characteristic

	Specifications	Supplemental Information
EXT KEYBOARD[a]		Used for entering screen titles and filenames only. Interface compatible with most IBM-compatible PC keyboards.
Connector	6-pin mini-DIN	

a. The feature is not implemented in firmware revisions prior to A.06.00.

	Specifications	Supplemental Information
Speaker		Front panel knob controls volume

	Specifications	Supplemental Information
Headphone		Front panel knob controls volume
Connector	3.5 mm (1/8 inch) miniature audio jack	
Power Output		0.2 W into 4 Ω, characteristic

Rear Panel

	Specifications	Supplemental Information
10 MHz REF OUT		
Connector	BNC female	
Impedance		50 Ω, nominal
Output Amplitude		>0 dBm, characteristic

	Specifications	Supplemental Information
10 MHz REF IN		
Connector	BNC female	Note: Analyzer noise sidebands and spurious response performance may be affected by the quality of the external reference used.
Impedance		50 Ω, nominal
Input Amplitude Range		–15 to +10 dBm, characteristic
Frequency		10 MHz, nominal

	Specifications	Supplemental Information
GATE TRIG/EXT TRIG IN		
Connector	BNC female	
External Trigger Input		
Trigger Level		Selectable positive or negative edge initiates sweep in EXT TRIG mode (5 V TTL)
Gate Trigger Input *(Option 1D6)*		
Minimum Pulse Width		>30 ns (5 V TTL)

	Specifications	Supplemental Information
GATE/HI SWP OUT		
Connector	BNC female	
High Sweep Output		
Level		High = sweep[a]; Low = retrace (5 V TTL)
Gate Output *(Option 1D6)*		
Level		High = gate on; Low = gate off (5 V TTL)

a. High sweep may be high longer than the indicated sweep times.

	Specifications	Supplemental Information
VGA OUTPUT		
Connector	VGA compatible, 15-pin mini D-SUB	
Format		VGA (31.5 kHz horizontal, 60 Hz vertical sync rates, non-interlaced) Analog RGB
Resolution	640 × 480	

	Specifications	Supplemental Information
AUX IF OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Frequency		21.4 MHz, nominal

	Specifications	Supplemental Information
Amplitude (for signal at reference level and for reference levels – input attenuation + preamp gain of –10 to –70 dBm)		–10 dBm (uncorrected), characteristic
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
AUX VIDEO OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Amplitude Range (into >10 kΩ)		0 to 1 V (uncorrected), characteristic

	Specifications	Supplemental Information
HI SWP IN *(Option A4J or AYX)*		
Connector	BNC female	
Input		Open collector, low resets and holds the sweep (5 V TTL)

	Specifications	Supplemental Information
HI SWP OUT *(Option A4J or AYX)*		
Connector	BNC female	
Output		High = sweep[a], Low = retrace (5 V TTL)

a. High sweep may be high longer than the indicated sweep times.

	Specifications	Supplemental Information
SWP OUT *(Option A4J or AYX)*		
Connector	BNC female	
Amplitude		0 to +10 V ramp, characteristic

	Specifications	Supplemental Information
GPIB Interface		
Connector	IEEE-488 bus connector	
GPIB Codes		SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28

	Specifications	Supplemental Information
Serial Interface *(Option 1AX)*		
Connector	9-pin D-SUB male	RS-232

	Specifications	Supplemental Information
Parallel Interface		Printer port only
Connector	25-pin D-SUB female	

Regulatory Information

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.

NOTE This product has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

The CE mark is a registered trademark of the European Community (if accompanied by a year, it is the year when the design was proven).

The CSA mark is the Canadian Standards Association safety mark.

ISM 1-A This is a symbol of an Industrial Scientific and Medical Group 1 Class A product. (CISPR 11, Clause 4)

Declaration of Conformity

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name: Agilent Technologies, Inc.

Manufacturer's Address: 1400 Fountaingrove Parkway
Santa Rosa, CA 95403-1799
USA

Declares that the products

Product Name: Spectrum Analyzer

Model Number: HP E7401A, HP E7402A, HP E7403A,
HP E7404A, HP E7405A

Product Options: This declaration covers all options of the above products.

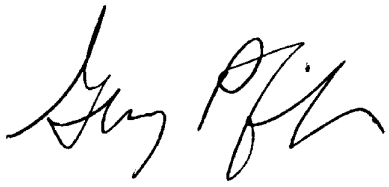
Conform to the following product specifications:

EMC: IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998

Standard	Limit
CISPR 11:1990 / EN 55011-1991	Group 1, Class A
IEC 61000-4-2:1995+A1998 / EN 61000-4-2:1995	4 kV CD, 8 kV AD
IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80 - 1000 MHz
IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5 kV sig., 1 kV power
IEC 61000-4-5:1995 / EN 61000-4-5:1996	0.5 kV L-L, 1 kV L-G
IEC 61000-4-6:1996 / EN 61000-4-6:1998	3 V, 0.15 – 80 MHz
IEC 61000-4-11:1994 / EN 61000-4-11:1998	1 cycle, 100%

Safety: IEC 61010-1:1990 + A1:1992 + A2:1995 / EN 61010-1:1993 +A2:1995
CAN/CSA-C22.2 No. 1010.1-92

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.



Santa Rosa, CA, USA 4 Feb. 2000

Greg Pfeiffer/Quality Engineering Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.

2 Agilent E7402A Specifications and Characteristics

About This Chapter

This chapter contains specifications and characteristics for the Agilent E7402A spectrum analyzer. The distinction between specifications and characteristics is described as follows.

- Specifications describe the performance of parameters covered by the product warranty. (The temperature range is 0 °C to 55 °C, unless otherwise noted.)
- Characteristics describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- Typical performance describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- Nominal values indicate the expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.

The following conditions must be met for the analyzer to meet its specifications.

- The analyzer is within the one year calibration cycle.
- If **Auto Align All** is selected:
  - After 2 hours of storage within the operating temperature range.
  - 5 minutes after the analyzer is turned on with sweep times less than 4 seconds[1].
  - After the front-panel amplitude reference is connected to the INPUT, and **Align Now RF** has been run, after the analyzer is turned on. And, once every 24 hours, or if ambient temperature changes more than 30 °C[2].

1. A Warm-up time of 25 minutes is required for a sweep time of 20 seconds.
2. 10 °C if preamp is on.

- If **Auto Align Off** is selected:
  - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
  - After the analyzer is turned on for a minimum of 90 minutes, the front panel amplitude reference has been connected to the INPUT, and **Align Now All** has been run.
  - When **Align Now All** is run:
    - Every hour
    - If the ambient temperature changes more than 3 °C
    - If the 10 MHz reference changes
  - When **Align Now RF** is run (with the front-panel amplitude reference connected to the INPUT):
    - Every 24 hours
    - If the ambient temperature changes more than 30 °C[1]
- If **Auto Align All but RF** is selected:
  - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
  - After the analyzer is turned on for a minimum of 90 minutes, the front panel amplitude reference has been connected to the INPUT, and **Align Now RF** has been run.
  - When **Align Now RF** is run (with the front-panel amplitude reference connected to the INPUT):
    - Every hour
    - If the ambient temperature changes more than 3 °C

1. 10 °C if preamp is on.

Frequency

	Specifications	Supplemental Information
Frequency Range		
	9 kHz to 3.0 GHz	
(Option UKB)		
dc Coupled	100 Hz to 3.0 GHz	30 Hz to 3.0 GHz, characteristic
ac Coupled	100 kHz to 3.0 GHz	
Preamp On	1 MHz to 3.0 GHz	

	Specifications	Supplemental Information
Frequency Reference		
Aging Rate	$\pm 2 \times 10^{-6}$/year	$\pm 1.0 \times 10^{-7}$/day, characteristic
Settability	$\pm 5 \times 10^{-7}$	
Temperature Stability	$\pm 5 \times 10^{-6}$	

	Specifications	Supplemental Information
High Stability Frequency Reference *(Option 1D5)*		
Aging Rate	$\pm 1 \times 10^{-7}$/year	$\pm 5 \times 10^{-10}$/day, 7-day average after being powered on for 7 days, characteristic
Settability	$\pm 1 \times 10^{-8}$	
Temperature Stability		
20 to 30 °C	$\pm 1 \times 10^{-8}$	
0 to 55 °C	$\pm 5 \times 10^{-8}$	
Warm-up (Internal frequency reference selected)		
After 5 minutes		$< \pm 1 \times 10^{-7}$ of final frequency,[a] characteristic
After 15 minutes		$< \pm 1 \times 10^{-8}$ of final frequency,[a] characteristic

a. Final frequency is defined as frequency 60 minutes after power-on with analyzer set to internal frequency reference.

	Specifications	Supplemental Information
Frequency Readout Accuracy		
(Start, Stop, Center, Marker)	±((frequency indication × frequency reference error[a]) + 0.5% of span + $\frac{\text{span}}{\text{sweep points} - 1}$ + 15% of RBW + 10 Hz)	

a. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).

	Specifications	Supplemental Information
Marker Frequency Counter		
Resolution	Selectable from 1 Hz to 100 kHz	
Accuracy[a]	±(marker frequency × frequency reference error[b] + counter resolution)	For RBW ≥ 1 kHz

a. Marker level to displayed noise level > 25 dB, RBW/ Span ≥ 0.002, frequency offset = 0 Hz.
b. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).

	Specifications	Supplemental Information
Frequency Span		
Range	0 Hz (zero span), 100 Hz to 3 GHz	
Resolution	2 Hz	
Accuracy	±(0.5% of span + 2 × $\frac{\text{span}}{\text{sweep points} - 1}$)	

	Specifications	Supplemental Information
Sweep Time		
Range		
Span > 0 Hz	1 ms to 4000 s[a]	$\frac{\text{sweep points} - 1}{100\ \text{kHz}}$ to 4000 s
Span = 0 Hz	10 µs to 4000 s[a]	
Tracking Generator On *(Option 1DN)*		50 ms is the minimum sweep time

	Specifications	Supplemental Information
Fast Time-domain Sweep *(Option AYX)* (For Span = 0 Hz, RBW ≥ 1 kHz)	50 ns to 4000 s[b]	$\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to 4000 s
Accuracy (Span = 0 Hz)		
10 µs to 4000 s[a]	±1%	
(Option AYX) 50 ns to 4000 s[b]	±1%	
Sweep Trigger[c,d]	Free Run, Single, Line, Video[e], External, Delayed, Offset[f]	
(Option 1D6)	Add Gate	
Delayed Trigger[c,d,g]		
Range	1 µs to 400 s	
Resolution	$\frac{\text{delay in seconds}}{65000}$ rounded up to nearest µs	
Accuracy	±(500 ns + (0.01% of delay))	
Offset Trigger[f]		
Resolution	$\frac{\text{sweep time}}{\text{sweep points} - 1}$	
Range	±327 ms to ±12.3 ks	Where ST = sweep time and SP = sweep points $\frac{-32766 \times ST}{SP - 1}$ to $\frac{(32766 - SP) \times ST}{SP - 1}$
Fast Time-domain sweep *(Option AYX)* (For sweep times $\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$)	±1.23 ms to ±245 ms	$\frac{-32766 \times ST}{SP - 1}$ to $\frac{(32766 - SP) \times ST}{SP - 1}$

a. For firmware revisions prior to A.06.00, 5 ms to 2000 s.
b. For firmware revisions prior to A.06.00, 20 µs to 2000 s.
c. Gate cannot be used simultaneously with delayed trigger.
d. Auto align is suspended in video, external, gate, and delayed trigger modes while waiting for a trigger event to occur.
e. Unavailable when RBW ≤ 300 Hz.
f. For firmware revision A.06.00 or later.
g. Delayed trigger is available with line and external trigger.

	Specifications	Supplemental Information
Sweep (trace) Points		
Range		
Span > 0 Hz	101 to 8192[a]	
Span = 0 Hz	2 to 8192[a]	

a. For firmware revisions prior to A.06.00, 401 points.

	Specifications	Supplemental Information
Resolution Bandwidth (RBW)		
Range	10 Hz to 300 Hz (–3 dB) bandwidths in 1-3-10 sequence	Only available in spans ≤ 5 MHz, sweep times ≥ $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$, and not usable with tracking generator on. (*Option 1DN*)
	1 kHz to 3 MHz (–3 dB) bandwidths in 1-3-10 sequence	
	5 MHz (–3 dB) bandwidth	
	200 Hz (–6 dB) EMI bandwidth	Only available in spans ≤ 5 MHz, sweep times ≥ $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$, and not usable with tracking generator on. (*Option 1DN*)
	9 kHz, 120 kHz (–6 dB) EMI bandwidth	
	1 MHz (–6 dB) EMI bandwidth	
	1 MHz (Impulse) EMI bandwidth	
Accuracy		
10 Hz to 300 Hz (–3 dB) RBW	±10%	
1 kHz to 3 MHz (–3 dB) RBW	±15%	
5 MHz (–3 dB) RBW	±30%	
200 Hz (–6 dB) RBW	±10%	
9 kHz, 120 kHz (–6 dB) RBW	±15%	
1 MHz (–6 dB) RBW	±10%	
1 MHz (Impulse) RBW	±15%[a]	

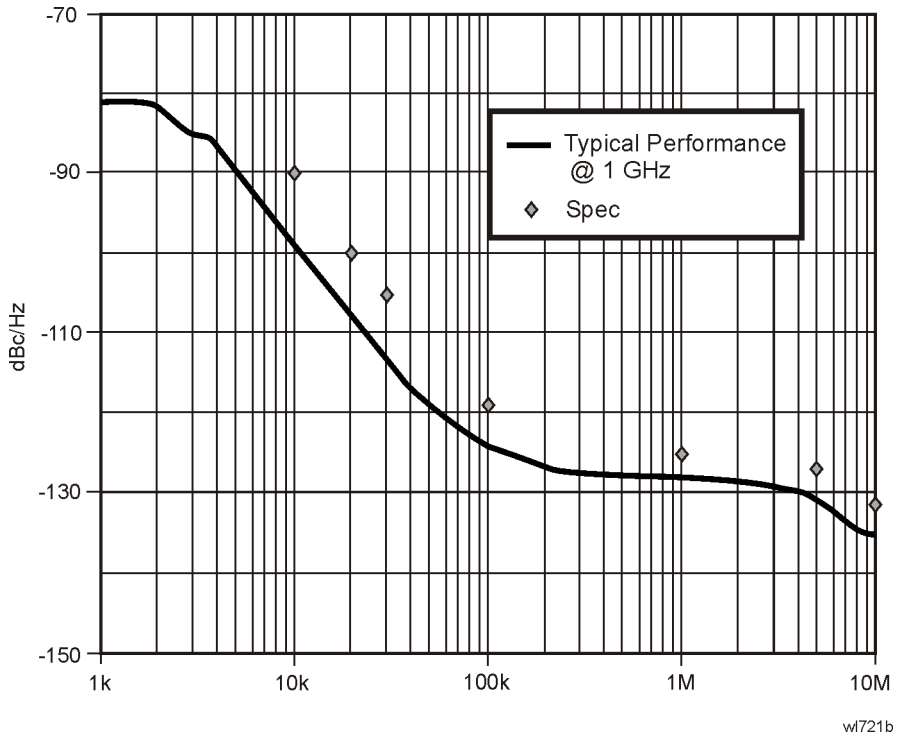
	Specifications	Supplemental Information
Shape		
10 Hz to 300 Hz (–3 dB) RBW		Digital, approximately Gaussian shape
1 kHz to 5 MHz (–3 dB) RBW		Synchronously tuned four poles, approximately Gaussian shape
200 Hz (–6 dB) RBW		Digital, Kaiser Window
9 kHz, 120 kHz, 1 MHz (–6 dB) RBW		Synchronously tuned four poles, approximately Gaussian shape
1 MHz (Impulse) RBW		Synchronously tuned four poles, approximately Gaussian shape
Selectivity		
10 Hz to 300 Hz (–3 dB) RBW		< 5:1, 60 dB / 3 dB bandwidth ratio, characteristic
1 kHz to 5 MHz (–3 dB) RBW		< 15:1, 60 dB / 3 dB bandwidth ratio, characteristic
200 Hz (–6 dB) RBW		< 3:1, 40 dB / 6 dB bandwidth ratio, characteristic
9 kHz, 120 kHz, 1 MHz (–6 dB) RBW		< 10:1, 60 dB / 6 dB bandwidth ratio, characteristic
1 MHz (Impulse) RBW		< 10:1, 60 dB / 6 dB bandwidth ratio, characteristic

a. Scale Linear, VBW 3 MHz, signal 0 to –10 dB from reference level.

	Specifications	Supplemental Information
Video Bandwidth (VBW) (–3 dB)		
Range	30 Hz to 1 MHz in 1-3-10 sequence 1, 3, 10 Hz for RBW's <1 kHz	3 MHz, characteristic
Accuracy		±30%, characteristic
Shape		Post detection, single pole low-pass filter used to average displayed noise Video bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

	Specifications	Supplemental Information
Stability		
Noise Sidebands (Offset from CW signal with 1 kHz RBW, 30 Hz VBW and sample detector)		
≥1 kHz *(Option 1D5)*		≤ –78 dBc/Hz, typical
≥10 kHz	≤ –90 dBc/Hz	≤ –94 dBc/Hz, typical
≥20 kHz	≤ –100 dBc/Hz	≤ –105 dBc/Hz, typical
≥30 kHz	≤ –106 dBc/Hz	≤ –112 dBc/Hz, typical
≥100 kHz	≤ –119 dBc/Hz	≤ –122 dBc/Hz, typical
≥1 MHz	≤ –125 dBc/Hz	≤ –127 dBc/Hz, typical
≥5 MHz	≤ –127 dBc/Hz	≤ –129 dBc/Hz, typical
≥10 MHz	≤ –131 dBc/Hz	≤ –136 dBc/Hz, typical
Residual FM		
1 kHz RBW, 1 kHz VBW	≤150 Hz p–p in 100 ms	
(Option 1D5)	≤100 Hz p–p in 100 ms	
10 Hz RBW, 10 Hz VBW *(Option 1D5)*	≤2 Hz p–p in 20 ms	
10 Hz RBW, 10 Hz VBW		≤10 Hz p–p in 20 ms, characteristic
System-Related Sidebands, offset from CW signal		
≥30 kHz	≤ –65 dBc	
Line-Related Sidebands, offset from CW signal		
<300 Hz		≤ –50 dBc, characteristic
>300 Hz to 30 kHz		≤ –55 dBc, characteristic

Noise Sidebands Normalized to 1 Hz Versus Offset from Carrier



Amplitude

Amplitude specifications do not apply for the negative peak detector mode.

	Specifications	Supplemental Information
Measurement Range	Displayed Average Noise Level to Maximum Safe Input Level	
Input Attenuator Range	0 to 65 dB, in 5 dB steps	0 to 75 dB, in 5 dB steps, characteristic

	Specifications	Supplemental Information
Maximum Safe Input Level		
Average Continuous Power	+30 dBm (1 W)	
(Input attenuator setting ≥5 dB)		
Peak Pulse Power (for <10 µsec pulse width, <1% duty cycle, and input attenuation ≥30 dB)	+50 dBm (100 W)	
dc	100 Vdc	
(Option UKB)		
dc coupled	0 Vdc	
ac coupled	50 Vdc	

	Specifications	Supplemental Information
1 dB Gain Compression		
Total power at input mixer [a,b]		
50 MHz to 3.0 GHz	0 dBm	
Preamp On		
Total power at the preamp[c]		–20 dBm, characteristic

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).
b. For resolution bandwidths 1 kHz to 30 kHz, the maximum input signal amplitude must be ≤ reference level +10 dB.
c. Total power at the preamp (dBm) = total power at the input (dBm) – input attenuation (dB).

	Specifications		Supplemental Information	
Displayed Average Noise Level				
(Input terminated, 0 dB attenuation, sample detector, Reference Level = –70 dBm)				
	1 kHz RBW 30 Hz VBW	10 Hz RBW 1 Hz VBW	1 kHz RBW 30 Hz VBW (typical)	10 Hz RBW 1 Hz VBW (typical)
30 Hz to 9 kHz *(Option UKB)*				≤ –93 dBm
9 kHz to 100 kHz				≤ –109 dBm
100 kHz to 1 MHz				≤ –135 dBm
1 MHz to 10 MHz			≤ –117 dBm	≤ –136 dBm
10 MHz to 1.0 GHz	≤ –117 dBm	≤ –136 dBm	≤ –120 dBm	≤ –140 dBm
1.0 GHz to 2.0 GHz	≤ –116 dBm	≤ –135 dBm	≤ –120 dBm	≤ –140 dBm
2.0 GHz to 3.0 GHz	≤ –114 dBm	≤ –133 dBm	≤ –120 dBm	≤ –140 dBm
Preamp On	1 kHz RBW 30 Hz VBW	10 Hz RBW 1 Hz VBW	1 kHz RBW 30 Hz VBW (typical)	10 Hz RBW 1 Hz VBW (typical)
0 to 55 °C				
10 MHz to 1.0 GHz	≤ –132 dBm	≤ –151 dBm		
1.0 GHz to 2.0 GHz	≤ –132 dBm	≤ –151 dBm		
2.0 GHz to 3.0 GHz	≤ –129 dBm	≤ –148 dBm		
20 to 30 °C				
1 MHz to 10 MHz			≤ –134 dBm	≤ –152 dBm
10 MHz to 1.0 GHz	≤ –133 dBm	≤ –152 dBm	≤ –136 dBm	≤ –156 dBm
1.0 GHz to 2.0 GHz	≤ –134 dBm	≤ –153 dBm	≤ –136 dBm	≤ –156 dBm
2.0 GHz to 3.0 GHz	≤ –132 dBm	≤ –151 dBm	≤ –134 dBm	≤ –154 dBm

	Specifications	Supplemental Information
Display Range		
Log Scale	Ten divisions displayed; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps	
RBW ≥ 1 kHz	Calibrated 0 to –85 dB from Reference Level	
RBW ≤ 300 Hz	Calibrated 0 to –120 dB[a] from Reference Level	
Linear Scale	Ten divisions	
Scale Units	dBm, dBmV, dBµV, dBµA, A, V, W, and Hz	

a. 0 to –70 dB range when span = 0 Hz, or when IF Gain fixed: (:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF).

	Specifications	Supplemental Information
Marker Readout Resolution		
Log scale		
RBW ≥ 1 kHz		
0 to –85 dB from ref level	0.04 dB	
RBW ≤ 300 Hz		
0 to –120 dB from ref level	0.04 dB	
Linear scale	0.01% of Reference Level	
Fast Sweep Times for Zero Span		
(Option AYX)[a] For sweep times $\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$		
Log 0 to –85 dB from ref level	0.3 dB	
Linear	0.3% of Reference Level for linear scale	

a. For firmware revisions prior to A.06.00, 20 µs to <5 ms.

	Specifications	Supplemental Information
Frequency Response[a]		
10 dB attenuation		
9 kHz to 3.0 GHz		
20 to 30 °C	±0.46 dB	±0.12 dB, typical
0 to 55 °C	±0.76 dB	
(Option UKB)		
100 Hz to 3.0 GHz (dc coupled)		
20 to 30 °C	±0.5 dB	
0 to 55 °C	±1.0 dB	
30 Hz to 3.0 GHz (dc coupled)		
20 to 30 °C		±0.5 dB, characteristic
0 to 55 °C		±1.0 dB, characteristic
100 kHz to 3.0 GHz (ac coupled)		
20 to 30 °C	±0.5 dB	
0 to 55 °C	±1.0 dB	
Preamp On *(Option 1DS)*		
0 dB attenuation		
1 MHz to 3.0 GHz		
20 to 30 °C	±1.5 dB	
0 to 55 °C	±2.0 dB	

a. Frequency response values are referenced to the amplitude at 50 MHz.

	Specifications	Supplemental Information
Input Attenuation Switching Uncertainty at 50 MHz		
Attenuator Setting		
0 dB to 5 dB	±0.3 dB	
10 dB	Reference	
15 dB	±0.3 dB	
20 to 65 dB attenuation	±(0.1 dB + 0.01 × Attenuator Setting)	

Attenuation Accuracy Relative to the 10 dB Attenuator Setting, Characteristic		
	Frequency Range	
Attenuation	**dc–3.0 GHz**	
0 dB	±0.3 dB	
5 dB	±0.3 dB	
10 dB	Reference	
15 dB	±0.4 dB	
20 dB	±0.4 dB	
25 dB	±0.5 dB	
30 dB	±0.5 dB	
35 dB	±0.6 dB	
40 dB	±0.6 dB	
45 dB	±0.7 dB	
50 dB	±0.7 dB	
55 dB	±0.9 dB	
60 dB	±0.9 dB	
65 dB	±1.0 dB	

	Specifications	Supplemental Information
Preamp		Refer also to Displayed Average Noise Level specification
Gain		+20 dB, nominal[a]
Noise figure		5 dB, characteristic

a. Amplifier is between the input attenuator and the input mixer.

	Specifications	Supplemental Information
Absolute Amplitude Accuracy		
At reference settings[a]	±0.34 dB	±0.13 dB, typical
Preamp On[b]	±0.37 dB	±0.14 dB, typical
Overall Amplitude Accuracy[c]		
20 to 30 °C	± (0.54 dB + Absolute Frequency Response)	

a. Settings are: reference level –20 dBm; input attenuation 10 dB; dc coupled *(Option UKB)*; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled, sample detector, signal at reference level.

b. Settings are: reference level –30 dBm; input attenuation 0 dB; dc coupled *(Option UKB)*; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled, signal at reference level.

c. For reference level 0 to –50 dBm; input attenuation 10 dB; dc coupled *(Option UKB)*; RBW 1 kHz; VBW 1 kHz; scale log, log range 0 to –50 dB from reference level; sweep time coupled; signal input 0 to –50 dBm; span ≤20 kHz.

	Specifications	Supplemental Information	
RF Input VSWR (at tuned frequency)			
Attenuator setting 0 dB		characteristic	
100 kHz to 3 GHz		≤3.0:1	
Attenuator setting 5 dB			
100 kHz to 3 GHz		≤1.6:1	
Attenuator setting 10 to 65 dB			
9 kHz to 100 kHz		≤2.0:1	
100 kHz to 3 GHz		≤1.4:1	

	Specifications	Supplemental Information	
(Option UKB)		characteristic	characteristic
Attenuator setting 0 dB		(dc coupled)	(ac coupled)
100 Hz to 100 kHz		≤1.1:1	
100 kHz to 3 GHz		≤3.0:1	≤3.0:1
Attenuator setting 5 dB		(dc coupled)	(ac coupled)
100 Hz to 100 kHz		≤1.1:1	
100 kHz to 300 kHz		≤1.1:1	≤2.3:1
300 kHz to 1.0 MHz		≤1.1:1	≤1.6:1
1.0 MHz to 3.0 GHz		≤1.4:1	≤1.4:1
Attenuator setting 10 to 65 dB		(dc coupled)	(ac coupled)
100 Hz to 100 kHz		≤1.1:1	
100 kHz to 300 kHz		≤1.1:1	≤2.1:1
300 kHz to 1.0 MHz		≤1.1:1	≤1.5:1
1.0 MHz to 3.0 GHz		≤1.2:1	≤1.2:1

	Specifications	Supplemental Information
Auto Alignment[a]		
Sweep-to-sweep variation		±0.1 dB, characteristic

a. Set **Auto Align** to **Off** and use **Align Now, All** to eliminate this variation.

	Specifications	Supplemental Information
Resolution Bandwidth Switching Uncertainty (at Reference Level)		
1 kHz RBW	Reference	
3 kHz to 3 MHz RBW	±0.3 dB	
5 MHz RBW	±0.6 dB	
10 Hz to 300 Hz RBW	±0.3 dB	

	Specifications	Supplemental Information
Reference Level		
Range	–149.9 dBm to maximum mixer level + attenuator setting	
Resolution		
Log Scale	±0.1 dB	
Linear Scale	±0.12% of Reference Level	
Accuracy (at a fixed frequency, a fixed attenuator, and referenced to –30 dBm(–10 dBm, Preamp On))		
Reference Level (dBm) – input attenuator setting (dB) + preamp gain (dB)		
–10 dBm to > –60 dBm	±0.3 dB	
–60 dBm to > –85 dBm	±0.5 dB	
–85 dBm to –90 dBm	±0.7 dB	

	Specifications	Supplemental Information
Display Scale Switching Uncertainty		
Switching between Linear and Log	±0.15 dB at reference level	
Log Scale Switching	No error	

	Specifications	Supplemental Information
Display Scale Fidelity		
Log Maximum Cumulative		
RBW ≥ 1 kHz		
dB Below Reference Level		
0 dB Reference	0 dB	
> 0 to 10 dB	±0.22 dB	±0.08 dB, typical
> 10 to 20 dB	±0.24 dB	±0.09 dB, typical
> 20 to 30 dB	±0.26 dB	±0.10 dB, typical
> 30 to 40 dB	±0.40 dB	±0.23 dB, typical

	Specifications	Supplemental Information
> 40 to 50 dB	±0.57 dB	±0.35 dB, typical
> 50 to 60 dB	±0.57 dB	±0.35 dB, typical
> 60 to 70 dB	±0.66 dB	±0.39 dB, typical
>70 to 80 dB	±0.66 dB	±0.46 dB, typical
>80 to 85 dB	±1.15 dB	±0.79 dB, typical
RBW = 200 Hz		
0 to 30 dB below reference level	±(0.3 dB + 0.01 × dB from reference level)	
RBW = 10 Hz, 30 Hz, 100 Hz, or 300 Hz		
Span > 0 Hz		
Auto range On		
0 to 98 dB below reference level	±(0.3 dB + 0.01 × dB from reference level)	
> 98 to 120 dB below reference level		±2.0 dB, characteristic
Auto range Off		
0 to 60 dB below reference level	±(0.3 dB + 0.015 × dB from reference level)	
> 60 to 70 dB below reference level	±1.5 dB	
Span = 0 Hz[a]		
0 to 60 dB below reference level	±(0.3 dB + 0.015 × dB from reference level)	
> 60 to 70 dB below reference level	±1.5 dB	
Log Incremental Accuracy		
0 to 80 dB[b] below reference level	±0.4 dB/4 dB	
Linear Accuracy	±2% of Reference Level	

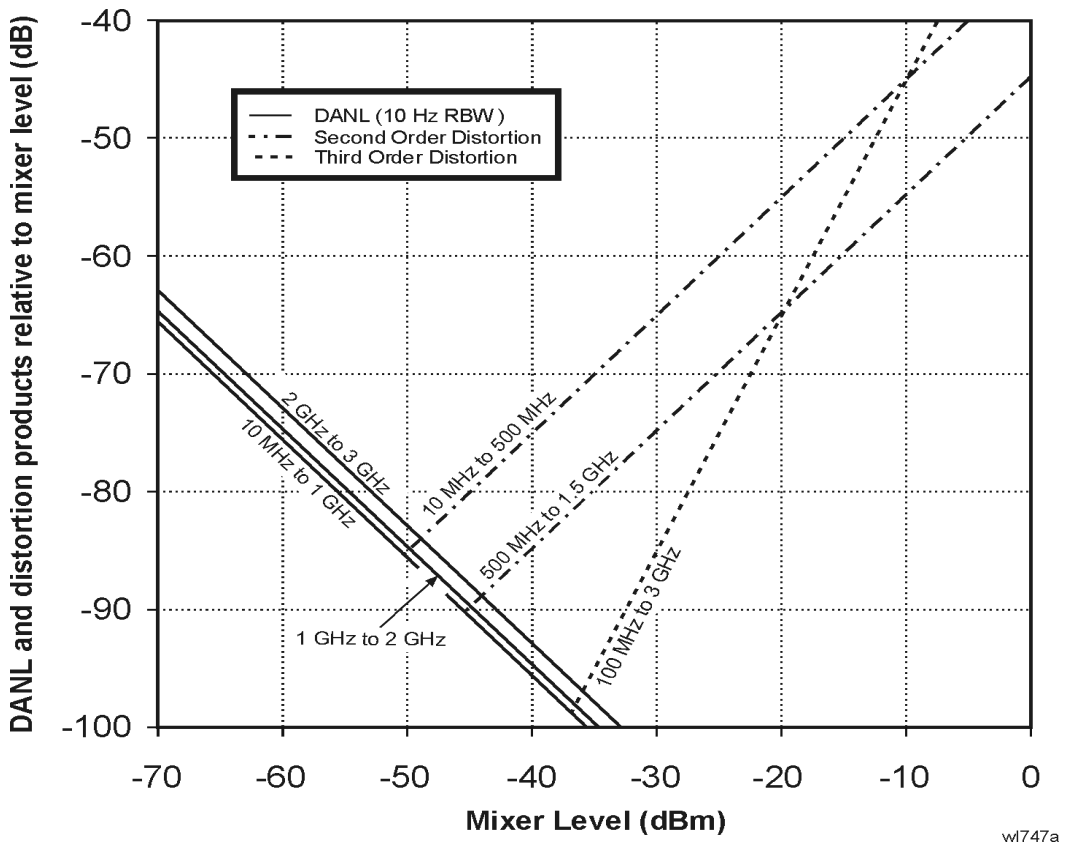
a. The SCPI command for auto range off is:
(:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF)

b. 0 to –50 dB for RBWs ≤ 300 Hz and span = 0 Hz, or when auto ranging is off.

	Specifications	Supplemental Information
Spurious Responses		
Second Harmonic Distortion		
Input Signal		
10 MHz to 500 MHz	< –65 dBc for –30 dBm signal at input mixer[a]	+35 dBm SHI (second harmonic intercept)
500 MHz to 1.5 GHz	< –75 dBc for –30 dBm signal at input mixer[a]	+45 dBm SHI
Preamp On 10 MHz to 1.5 GHz		–5 dBm SHI, characteristic
Third Order Intermodulation Distortion		
10 MHz to 100 MHz		+7 dBm TOI (third order intercept), characteristic
100 MHz to 3 GHz	< –85 dBc for two –30 dBm signals at input mixer[a] and >50 kHz separation	+12.5 dBm TOI +16 dBm TOI, typical
Preamp On 10 MHz to 3 GHz		–16 dBm TOI, characteristic
Other Input Related Spurious		
>30 kHz offset	< –65 dBc for –20 dBm signal at input mixer[a]	

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).

Specified Dynamic Range



	Specifications	Supplemental Information
Residual Responses (Input terminated and 0 dB attenuation) 150 kHz to 3 GHz	 < –90 dBm	

	Specifications	Supplemental Information
Quasi-Peak Detector	The quasi-peak detector provides the quasi-peak amplitude of pulsed radio frequency (RF) or continuous wave (CW) signals. The amplitude response conforms to Publication 16 of CISPR Section 1, Clause 2, except as indicated in the Relative Quasi-Peak Response Table.	

Relative Quasi-Peak Response to a CISPR Pulse (dB)			
Frequency Band			
Pulse Repetition Frequency	**120 kHz EMI BW 0.03 to 1 GHz**	**9 kHz EMI BW 0.15 to 30 MHz**	**200 Hz EMI BW 9 to 150 kHz**
1000 Hz	+8.0 ± 1.0	+4.5 ± 1.0	N/A
100 Hz	0 dB reference[a]	0 dB reference[a]	+4.0 ± 1.0
60 Hz	N/A	N/A	+3.0 ± 1.0
25 Hz	N/A	N/A	0 dB reference[a]
20 Hz	–9.0 ± 1.0	–6.5 ± 1.0	N/A
10 Hz	–14.0 ± 1.5	–10.0 ± 1.5	–4.0 ± 1.0
5 Hz	N/A	N/A	–7.5 ± 1.5
2 Hz	–26.0 ± 2.0	–20.5 ± 2.0	–13.0 ± 2.0
1 Hz		–22.5 ± 2.0	–17.0 ± 2.0
Isolated Pulse		–23.5 ± 2.0	–19.0 ± 2.0

a. Reference pulse amplitude accuracy relative to a 66 dBµV CW signal is <1.5 dB as specified in CISPR Publication 16. CISPR reference pulse: 0.044 µVs for 30 MHz to 1.0 GHz, 0.316 µVs for 15 kHz to 30 MHz, and 13.5 µVs for 9 to 150 kHz.

	Specifications	**Supplemental Information**
FM Demodulation		
Input level		(–60 dBm + attenuator setting), characteristic
Signal level		0 to –30 dB below reference level, characteristic

Options

Time Gated Spectrum Analysis (Option 1D6)

	Specifications	Supplemental Information
Gate Delay		
Range	1 µs to 400 s	
Accuracy	±(500 ns + (0.01% × (maximum of gate delay or length)))	From gate trigger input to positive edge of gate output
Gate Length		
Range	1 µs to 400 s	
Accuracy	±(500 ns + (0.01% × (maximum of gate delay or length)))	From positive edge to negative edge of gate output
Resolution	((maximum of gate delay or length in seconds)/65000) rounded up to nearest µs	Dependent on the greater of gate delay or gate length
Additional Amplitude Error[a]		
Log Scale	±0.2 dB	
Linear Scale	±0.1% of reference level	

a. While in gate mode.

Tracking Generator (Option 1DN)

The spectrum analyzer/tracking generator combination will meet its specification after a cable (8120-5148) and adapter are connected between RF OUT and INPUT and **Align Now**, **TG** has been run.

	Specifications	Supplemental Information
Warm-up	5 minutes	

	Specifications	Supplemental Information
Output Frequency Range	9 kHz to 3.0 GHz	

	Specifications	Supplemental Information
Minimum Resolution BW	1 kHz	Not usable with resolution bandwidths ≤300 Hz

	Specifications	Supplemental Information
Output Power Level		
Range	–2 to –66 dBm	
Resolution	0.1 dB	
Absolute Accuracy (at 50 MHz with coupled source attenuator, referenced to –20 dBm)	± 0.75 dB	
Vernier		
Range	8 dB	
Accuracy (with coupled source attenuator, 50 MHz, –20 dBm)		
Incremental	±0.2 dB/dB	
Cumulative	±0.5 dB, total	
Output Attenuator Range	0 to 56 dB in 8 dB steps	

	Specifications	Supplemental Information
Maximum Safe Reverse Level		+30 dBm (1 W), 50 Vdc, characteristic

	Specifications	Supplemental Information
Output Power Sweep		
Range	(–10 to –2 dBm) – (Source Attenuator Setting)	
Resolution	0.1 dB	
Accuracy (zero span)	<1 dB peak-to-peak	

	Specifications	Supplemental Information
Output Flatness		
Referenced to 50 MHz, –20 dBm		
9 kHz to 10 MHz	±3 dB	
10 MHz to 3 GHz	±2 dB	

	Specifications	Supplemental Information
Spurious Outputs		
(–2 dBm output)		
Harmonic Spurs		
TG Output 9 kHz to 20 kHz	≤ –15 dBc	
TG Output 20 kHz to 3 GHz	≤ –25 dBc	
Non-harmonic Spurs		
TG Output 9 kHz to 2 GHz	≤ –27 dBc	
TG Output 2 GHz to 3 GHz	≤ –23 dBc	
LO Feedthrough		
LO Frequency 3.921409 GHz to 6.9214 GHz	≤ –16 dBm	

	Specifications	Supplemental Information
Dynamic Range	Maximum Output Power Level – Displayed Average Noise Level	

	Specifications	Supplemental Information
Output Tracking		
Drift		1.5 kHz/5 minute, characteristic
Swept Tracking Error		Usable in 1 kHz RBW after 5 minutes of warm-up

	Specifications	Supplemental Information
RF Power-Off Residuals		
9 kHz to 3 GHz		< –120 dBm, characteristic

	Specifications	Supplemental Information
Output Attenuator Repeatability		
9 kHz to 300 MHz		±0.1 dB, characteristic
300 MHz to 2 GHz		±0.2 dB, characteristic
2 GHz to 3 GHz		±0.3 dB, characteristic

	Specifications	Supplemental Information
Output VSWR		
0 dB attenuation		<2.0:1, characteristic
≥ 8 dB attenuation		<1.5:1, characteristic

	Specifications	Supplemental Information
Output Attenuator Accuracy		
0 dB		±0.5 dB, characteristic
8 dB		±0.5 dB, characteristic
16 dB	Reference	
24 dB		±0.5 dB, characteristic
32 dB		±0.6 dB, characteristic
40 dB		±0.8 dB, characteristic
48 dB		±1.0 dB, characteristic
56 dB		±1.1 dB, characteristic

Tracking Generator Output Accuracy
Relative Accuracy (Referred to –20 dBm) = Output Attenuator Accuracy + Vernier Accuracy + Output Flatness
Absolute Accuracy = Relative Accuracy (Referred to –20 dBm) + Absolute Accuracy at 50 MHz

General

	Specifications	Supplemental Information
Temperature Range		
Operating	0 to 55 °C	Floppy disk 10 to 40 °C
Storage	–40 to 75 °C	

	Specifications	Supplemental Information
Audible Noise (ISO 7779)		
Sound Pressure at 25 °C		<40 dBa, (<4.6 Bels power)

	Specifications	Supplemental Information
Military Specification	Has been type tested to the environmental specifications of MIL-PRF-28800F class 3.	

	Specifications	Supplemental Information
EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class B[a].	

a. Meets Class A performance during dc operation or serial number US41110000 or lower.

	Specifications	Supplemental Information
Immunity Testing		
Radiated Immunity		Testing was done at 3 V/m according to IEC 801-3/1984. When the analyzer tuned frequency is identical to the immunity test signal frequency, there may be signals of up to –60 dBm displayed on the screen.
Electrostatic Discharge		Air discharges of up to 8 kV were applied according to IEC 801-2/1991. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

	Specifications	Supplemental Information
Power Requirements		
ac Operation		
Voltage, frequency	90 to 132 Vrms, 47 to 440 Hz 195 to 250 Vrms, 47 to 66 Hz	
Power Consumption, On	<300 W	
Power Consumption, Standby	<5 W	
dc Operation		
Voltage	12 to 20 Vdc	
Power Consumption	<200 W	
Power Consumption, Standby	<100 mW	

	Specifications	Supplemental Information
Measurement Speed		
Local Measurement and Display Update rate[a]		
Sweep points = 101		≥ 45/s, characteristic
Sweep points = 401		≥ 30/s, characteristic
Remote Measurement and GPIB Transfer Rate[b,c]		
Sweep points = 101		≥ 45/s, characteristic
Sweep points =401		≥ 30/s, characteristic
RF Center Frequency Tune, Measure, and GPIB Transfer Time[b,d]		
Sweep points = 101		≤ 75 ms, characteristic
Sweep points = 401		≤ 90 ms, characteristic

a. Factory preset, auto align Off, fixed center frequency, RBW = 1 MHz, and spans >10 MHz and ≤600 MHz.
b. Display Off (:DISPlay:ENABle OFF), and 32-bit integer data format (:FORMat:DATA INT,32), if *Option AYX* or *A4J* is installed, disable sweep ramp, (:SYSTem:PORTs:IFVSweep:ENABle OFF), markers Off, single sweep, measured with IBM compatible PC with 550 MHz Pentium® III running Windows® NT 4.0, one meter GPIB cable, National Instruments PCI-GPIB card and NI-488.2 DLL.
c. Factory preset, auto align Off, RBW = 1 MHz, span= 20 MHz, fixed center frequency, average of 100 measurements.
d. Factory preset, auto align Off, RBW = 1 MHz, span= 20 MHz, and center frequency tune step size = 50 MHz.

	Specifications	Supplemental Information
Data Storage		
Internal		200 Traces or States[a]
External (10 to 40 °C) 3.5" 1.44 MB, MS-DOS® compatible floppy disk		200 Traces or States[a]

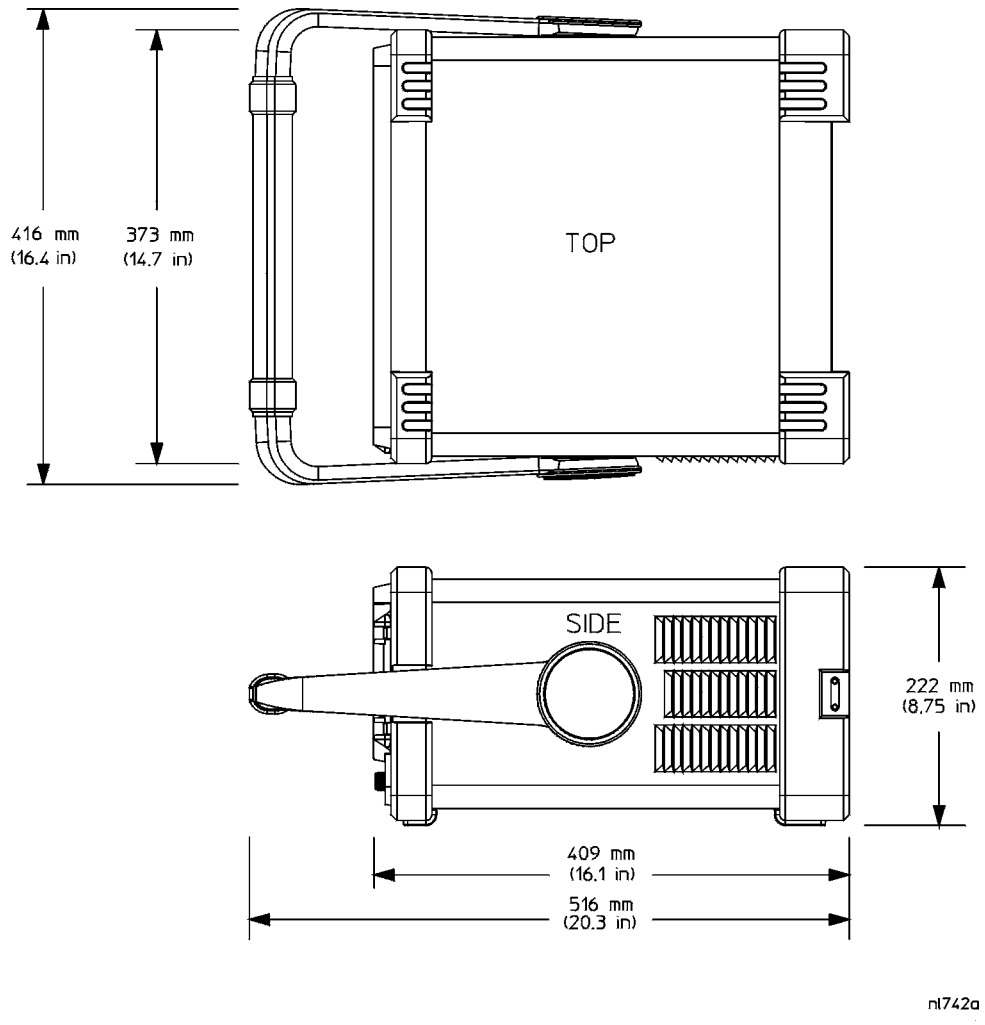
a. When storing traces set to 401 points.

	Specifications	Supplemental Information
Downloadable Program Memory		10 MB available memory

	Specifications	Supplemental Information
Demod Tune and Listen		Internal speaker, front-panel earphone jack and front-panel volume control.
Demod	AM and FM	An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

	Specifications	Supplemental Information
Weight (without options)		
Net		14.9 kg (32.9 lb), characteristic
Shipping		29.5 kg (65 lb), characteristic

Dimensions


416 mm
(16.4 in)
373 mm
(14.7 in)
TOP
SIDE
222 mm
(8.75 in)
409 mm
(16.1 in)
516 mm
(20.3 in)
nt742a

Inputs and Outputs

Front Panel

	Specifications	Supplemental Information
INPUT 50 Ω		
Connector	Type-N female	
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
RF OUT 50 Ω, *(Option 1DN)*		
Connector	Type-N female	
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
AMPTD REF OUT[a]		Amplitude Reference
Connector	BNC female	
Impedance		50 Ω, nominal
Frequency		50 MHz
Frequency Accuracy		Frequency reference error[b]
50 Ω Amplitude[c]		–20 dBm, nominal

a. Turn the amplitude reference on/off by pressing the keys: **Input/Output**, **Amptd Ref Out**.
b. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).
c. The internal amplitude reference actual power is stored internally.

	Specifications	Supplemental Information
PROBE POWER		
Voltage/Current		+15 Vdc, ±7% at 150 mA max., characteristic –12.6 Vdc ±10% at 150 mA max., characteristic

	Specifications	Supplemental Information
EXT KEYBOARD[a]		Used for entering screen titles and filenames only. Interface compatible with most IBM-compatible PC keyboards.
Connector	6-pin mini-DIN	

a. The feature is not implemented in firmware revisions prior to A.06.00.

	Specifications	Supplemental Information
Speaker		Front panel knob controls volume

	Specifications	Supplemental Information
Headphone		Front panel knob controls volume
Connector	3.5 mm (1/8 inch) miniature audio jack	
Power Output		0.2 W into 4 Ω, characteristic

Rear Panel

	Specifications	Supplemental Information
10 MHz REF OUT		
Connector	BNC female	
Impedance		50 Ω, nominal
Output Amplitude		>0 dBm, characteristic

	Specifications	Supplemental Information
10 MHz REF IN		
Connector	BNC female	Note: Analyzer noise sidebands and spurious response performance may be affected by the quality of the external reference used.
Impedance		50 Ω, nominal
Input Amplitude Range		–15 to +10 dBm, characteristic
Frequency		10 MHz, nominal

	Specifications	Supplemental Information
GATE TRIG/EXT TRIG IN		
Connector	BNC female	
External Trigger Input		
Trigger Level		Selectable positive or negative edge initiates sweep in EXT TRIG mode (5 V TTL)
Gate Trigger Input *(Option 1D6)*		
Minimum Pulse Width		>30 ns (5 V TTL)

	Specifications	Supplemental Information
GATE/HI SWP OUT		
Connector	BNC female	
High Sweep Output		
Level		High = sweep[a]; Low = retrace (5 V TTL)
Gate Output *(Option 1D6)*		
Level		High = gate on; Low = gate off (5 V TTL)

a. High sweep may be high longer than the indicated sweep times.

	Specifications	Supplemental Information
VGA OUTPUT		
Connector	VGA compatible, 15-pin mini D-SUB	
Format		VGA (31.5 kHz horizontal, 60 Hz vertical sync rates, non-interlaced) Analog RGB
Resolution	640 × 480	

	Specifications	Supplemental Information
AUX IF OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Frequency		21.4 MHz, nominal
Amplitude (for signal at reference level and for reference levels – input attenuation + preamp gain of –10 to –70 dBm)		–10 dBm (uncorrected), characteristic
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
AUX VIDEO OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Amplitude Range (into >10 kΩ)		0 to 1 V (uncorrected), characteristic

	Specifications	Supplemental Information
HI SWP IN *(Option A4J or AYX)*		
Connector	BNC female	
Input		Open collector, low resets and holds the sweep (5 V TTL)

	Specifications	Supplemental Information
HI SWP OUT *(Option A4J or AYX)*		
Connector	BNC female	
Output		High = sweep[a], Low = retrace (5 V TTL)

a. High sweep may be high longer than the indicated sweep times.

	Specifications	Supplemental Information
SWP OUT *(Option A4J or AYX)*		
Connector	BNC female	
Amplitude		0 to +10 V ramp, characteristic

	Specifications	Supplemental Information
GPIB Interface		
Connector	IEEE-488 bus connector	
GPIB Codes		SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28

	Specifications	Supplemental Information
Serial Interface *(Option 1AX)*		
Connector	9-pin D-SUB male	RS-232

	Specifications	Supplemental Information
Parallel Interface		Printer port only
Connector	25-pin D-SUB female	

Regulatory Information

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.

NOTE This product has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

The CE mark is a registered trademark of the European Community (if accompanied by a year, it is the year when the design was proven).

The CSA mark is the Canadian Standards Association safety mark.

ISM 1-A This is a symbol of an Industrial Scientific and Medical Group 1 Class A product. (CISPR 11, Clause 4)

Declaration of Conformity

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name: Agilent Technologies, Inc.

Manufacturer's Address: 1400 Fountaingrove Parkway
Santa Rosa, CA 95403-1799
USA

Declares that the products

Product Name: Spectrum Analyzer

Model Number: HP E7401A, HP E7402A, HP E7403A,
HP E7404A, HP E7405A

Product Options: This declaration covers all options of the above products.

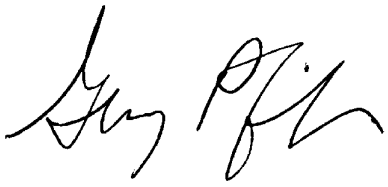
Conform to the following product specifications:

EMC: IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998

Standard	Limit
CISPR 11:1990 / EN 55011-1991	Group 1, Class A
IEC 61000-4-2:1995+A1998 / EN 61000-4-2:1995	4 kV CD, 8 kV AD
IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80 - 1000 MHz
IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5 kV sig., 1 kV power
IEC 61000-4-5:1995 / EN 61000-4-5:1996	0.5 kV L-L, 1 kV L-G
IEC 61000-4-6:1996 / EN 61000-4-6:1998	3 V, 0.15 – 80 MHz
IEC 61000-4-11:1994 / EN 61000-4-11:1998	1 cycle, 100%

Safety: IEC 61010-1:1990 + A1:1992 + A2:1995 / EN 61010-1:1993 +A2:1995
CAN/CSA-C22.2 No. 1010.1-92

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.



Santa Rosa, CA, USA 4 Feb. 2000

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For further information, please contact your local Agilent Technologies sales office, agent or distributor.

3 Agilent E7403A Specifications and Characteristics

About This Chapter

This chapter contains specifications and characteristics for the Agilent E7403A spectrum analyzer. The distinction between specifications and characteristics is described as follows.

- Specifications describe the performance of parameters covered by the product warranty. (The temperature range is 0 °C to 55 °C, unless otherwise noted.)
- Characteristics describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- Typical performance describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- Nominal values indicate the expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.

The following conditions must be met for the analyzer to meet its specifications.

- The analyzer is within the one year calibration cycle.
- If **Auto Align All** is selected:
  - After 2 hours of storage within the operating temperature range.
  - 5 minutes after the analyzer is turned on with sweep times less than 4 seconds[1].
  - After the front-panel amplitude reference is connected to the INPUT, and **Align Now RF** has been run, after the analyzer is turned on. And, once every 24 hours, or if ambient temperature changes more than 30 °C[2].

1. A Warm-up time of 25 minutes is required for a sweep time of 20 seconds.
2. 10 °C if preamp is on.

- If **Auto Align Off** is selected:
  - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
  - After the analyzer is turned on for a minimum of 90 minutes, the front panel amplitude reference has been connected to the INPUT, and **Align Now All** has been run.
  - When **Align Now All** is run:
    - Every hour
    - If the ambient temperature changes more than 3 °C
    - If the 10 MHz reference changes
  - When **Align Now RF** is run (with the front-panel amplitude reference connected to the INPUT):
    - Every 24 hours
    - If the ambient temperature changes more than 30 °C[1]
- If **Auto Align All but RF** is selected:
  - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
  - After the analyzer is turned on for a minimum of 90 minutes, the front panel amplitude reference has been connected to the INPUT, and **Align Now RF** has been run.
  - When **Align Now RF** is run (with the front-panel amplitude reference connected to the INPUT):
    - Every hour
    - If the ambient temperature changes more than 3 °C

1. 10 °C if preamp is on.

Frequency

	Specifications	Supplemental Information
Frequency Range		
dc Coupled	9 kHz to 6.7 GHz	
(Option UKB)	100 Hz to 6.7 GHz	30 Hz to 6.7 GHz, characteristic
ac Coupled	100 kHz to 6.7 GHz	
Preamp On	1 MHz to 3.0 GHz	

	Specifications	Supplemental Information
Frequency Reference		
Aging Rate	$\pm 2 \times 10^{-6}$/year	$\pm 1.0 \times 10^{-7}$/day, characteristic
Settability	$\pm 5 \times 10^{-7}$	
Temperature Stability	$\pm 5 \times 10^{-6}$	

	Specifications	Supplemental Information
High Stability Frequency Reference *(Option 1D5)*		
Aging Rate	$\pm 1 \times 10^{-7}$/year	$\pm 5 \times 10^{-10}$/day, 7-day average after being powered on for 7 days, characteristic
Settability	$\pm 1 \times 10^{-8}$	
Temperature Stability		
20 to 30 °C	$\pm 1 \times 10^{-8}$	
0 to 55 °C	$\pm 5 \times 10^{-8}$	
Warm-up (Internal frequency reference selected)		
After 5 minutes		$< \pm 1 \times 10^{-7}$ of final frequency,[a] characteristic
After 15 minutes		$< \pm 1 \times 10^{-8}$ of final frequency,[a] characteristic

a. Final frequency is defined as frequency 60 minutes after power-on with analyzer set to internal frequency reference.

	Specifications	Supplemental Information
Frequency Readout Accuracy		
(Start, Stop, Center, Marker)	±((frequency indication × frequency reference error[a]) + 0.5% of span + $\frac{\text{span}}{\text{sweep points} - 1}$ + 15% of RBW + 10 Hz)	

a. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).

	Specifications	Supplemental Information
Marker Frequency Counter		
Resolution	Selectable from 1 Hz to 100 kHz	
Accuracy[a]	±(marker frequency × frequency reference error[b] + counter resolution)	For RBW ≥ 1 kHz

a. Marker level to displayed noise level > 25 dB, RBW/ Span ≥ 0.002, frequency offset = 0 Hz.
b. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).

	Specifications	Supplemental Information
Frequency Span		
Range	0 Hz (zero span), 100 Hz to 6.7 GHz	
Resolution	2 Hz	
Accuracy	±(0.5% of span + $2 \times \frac{\text{span}}{\text{sweep points} - 1}$)	

	Specifications	Supplemental Information
Sweep Time		
Range		
Span > 0 Hz	1 ms to 4000 s[a]	$\frac{\text{sweep points} - 1}{100\ \text{kHz}}$ to 4000 s
Span = 0 Hz	10 µs to 4000 s[a]	
Tracking Generator On *(Option 1DN)*		50 ms is the minimum sweep time

	Specifications	Supplemental Information
Fast Time-domain Sweep *(Option AYX)* (For Span = 0 Hz, RBW ≥ 1 kHz)	50 ns to 4000 s[b]	$\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to 4000 s
Accuracy (Span = 0 Hz)		
10 µs to 4000 s[a]	±1%	
(Option AYX) 50 ns to 4000 s[b]	±1%	
Sweep Trigger[c,d]	Free Run, Single, Line, Video[e], External, Delayed, Offset[f]	
(Option 1D6)	Add Gate	
Delayed Trigger[c,d,g]		
Range	1 µs to 400 s	
Resolution	$\frac{\text{delay in seconds}}{65000}$ rounded up to nearest µs	
Accuracy	±(500 ns + (0.01% of delay))	
Offset Trigger[f]		
Resolution	$\frac{\text{sweep time}}{\text{sweep points} - 1}$	
Range	±327 ms to ±12.3 ks	Where ST = sweep time and SP = sweep points $\frac{-32766 \times ST}{SP - 1}$ to $\frac{(32766 - SP) \times ST}{SP - 1}$
Fast Time-domain sweep *(Option AYX)* (For sweep times $\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$)	±1.23 ms to ±245 ms	$\frac{-32766 \times ST}{SP - 1}$ to $\frac{(32766 - SP) \times ST}{SP - 1}$

a. For firmware revisions prior to A.06.00, 5 ms to 2000 s.
b. For firmware revisions prior to A.06.00, 20 µs to 2000 s.
c. Gate cannot be used simultaneously with delayed trigger.
d. Auto align is suspended in video, external, gate, and delayed trigger modes while waiting for a trigger event to occur.
e. Unavailable when RBW ≤ 300 Hz.
f. For firmware revision A.06.00 or later.
g. Delayed trigger is available with line and external trigger.

	Specifications	Supplemental Information
Sweep (trace) Points		
Range		
Span > 0 Hz	101 to 8192[a]	
Span = 0 Hz	2 to 8192[a]	

a. For firmware revisions prior to A.06.00, 401 points.

	Specifications	Supplemental Information
Resolution Bandwidth (RBW)		
Range	10 Hz to 300 Hz (–3 dB) bandwidths in 1-3-10 sequence	Only available in spans ≤ 5 MHz, sweep times ≥ $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$, and not usable with tracking generator on. (*Option 1DN*)
	1 kHz to 3 MHz (–3 dB) bandwidths in 1-3-10 sequence	
	5 MHz (–3 dB) bandwidth	
	200 Hz (–6 dB) EMI bandwidth	Only available in spans ≤ 5 MHz, sweep times ≥ $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$, and not usable with tracking generator on. (*Option 1DN*)
	9 kHz, 120 kHz (–6 dB) EMI bandwidth	
	1 MHz (–6 dB) EMI bandwidth	
	1 MHz (Impulse) EMI bandwidth	
Accuracy		
10 Hz to 300 Hz (–3 dB) RBW	±10%	
1 kHz to 3 MHz (–3 dB) RBW	±15%	
5 MHz (–3 dB) RBW	±30%	
200 Hz (–6 dB) RBW	±10%	
9 kHz, 120 kHz (–6 dB) RBW	±15%	
1 MHz (–6 dB) RBW	±10%	
1 MHz (Impulse) RBW	±15%[a]	

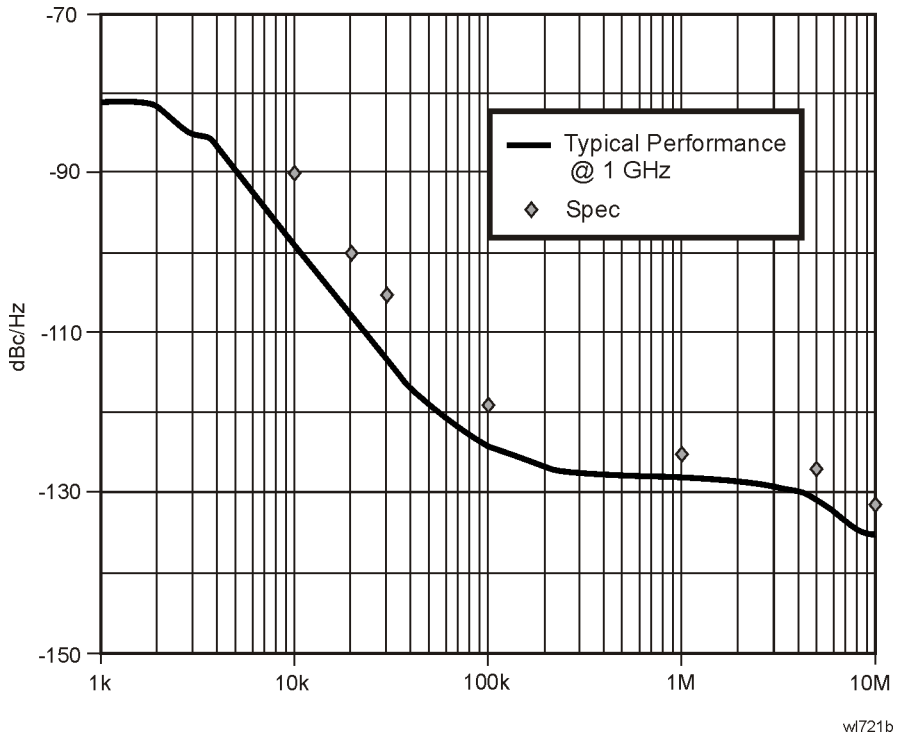
	Specifications	Supplemental Information
Shape		
10 Hz to 300 Hz (–3 dB) RBW		Digital, approximately Gaussian shape
1 kHz to 5 MHz (–3 dB) RBW		Synchronously tuned four poles, approximately Gaussian shape
200 Hz (–6 dB) RBW		Digital, Kaiser Window
9 kHz, 120 kHz, 1 MHz (–6 dB) RBW		Synchronously tuned four poles, approximately Gaussian shape
1 MHz (Impulse) RBW		Synchronously tuned four poles, approximately Gaussian shape
Selectivity		
10 Hz to 300 Hz (–3 dB) RBW		< 5:1, 60 dB / 3 dB bandwidth ratio, characteristic
1 kHz to 5 MHz (–3 dB) RBW		< 15:1, 60 dB / 3 dB bandwidth ratio, characteristic
200 Hz (–6 dB) RBW		< 3:1, 40 dB / 6 dB bandwidth ratio, characteristic
9 kHz, 120 kHz, 1 MHz (–6 dB) RBW		< 10:1, 60 dB / 6 dB bandwidth ratio, characteristic
1 MHz (Impulse) RBW		< 10:1, 60 dB / 6 dB bandwidth ratio, characteristic

a. Scale Linear, VBW 3 MHz, signal 0 to –10 dB from reference level.

	Specifications	Supplemental Information
Video Bandwidth (VBW) (–3 dB)		
Range	30 Hz to 1 MHz in 1-3-10 sequence 1, 3, 10 Hz for RBW's <1 kHz	3 MHz, characteristic
Accuracy		±30%, characteristic
Shape		Post detection, single pole low-pass filter used to average displayed noise Video bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

	Specifications	Supplemental Information
Stability		
Noise Sidebands (Offset from CW signal with 1 kHz RBW, 30 Hz VBW and sample detector)		
≥1 kHz *(Option 1D5)*		≤ –78 dBc/Hz, typical
≥10 kHz	≤ –90 dBc/Hz	≤ –94 dBc/Hz, typical
≥20 kHz	≤ –100 dBc/Hz	≤ –105 dBc/Hz, typical
≥30 kHz	≤ –106 dBc/Hz	≤ –112 dBc/Hz, typical
≥100 kHz	≤ –119 dBc/Hz	≤ –122 dBc/Hz, typical
≥1 MHz	≤ –125 dBc/Hz	≤ –127 dBc/Hz, typical
≥5 MHz	≤ –127 dBc/Hz	≤ –129 dBc/Hz, typical
≥10 MHz	≤ –131 dBc/Hz	≤ –136 dBc/Hz, typical
Residual FM		
1 kHz RBW, 1 kHz VBW	≤150 Hz p–p in 100 ms	
(Option 1D5)	≤100 Hz p–p in 100 ms	
10 Hz RBW, 10 Hz VBW *(Option 1D5)*	≤2 Hz p–p in 20 ms	
10 Hz RBW, 10 Hz VBW		≤10 Hz p–p in 20 ms, characteristic
System-Related Sidebands, offset from CW signal		
≥30 kHz	≤ –65 dBc	
Line-Related Sidebands, offset from CW signal		
<300 Hz		≤ –50 dBc, characteristic
>300 Hz to 30 kHz		≤ –55 dBc, characteristic

Noise Sidebands Normalized to 1 Hz Versus Offset from Carrier



Amplitude

Amplitude specifications do not apply for the negative peak detector mode.

	Specifications	Supplemental Information
Measurement Range	Displayed Average Noise Level to Maximum Safe Input Level	
Input Attenuator Range	0 to 65 dB, in 5 dB steps	0 to 75 dB, in 5 dB steps, characteristic

	Specifications	Supplemental Information
Maximum Safe Input Level		
Average Continuous Power	+30 dBm (1 W)	
(Input attenuator setting ≥5 dB)		
Peak Pulse Power (for <10 µsec pulse width, <1% duty cycle, and input attenuation ≥30 dB)	+50 dBm (100 W)	
dc		
dc Coupled	0 Vdc	
ac Coupled	50 Vdc	

	Specifications	Supplemental Information
1 dB Gain Compression		
Total power at input mixer [a,b]		
50 MHz to 3.0 GHz	0 dBm	
3.0 GHz to 6.7 GHz	0 dBm	
Preamp On		
Total power at the preamp[c]		–20 dBm, characteristic

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).
b. For resolution bandwidths 1 kHz to 30 kHz, the maximum input signal amplitude must be ≤ reference level +10 dB.
c. Total power at the preamp (dBm) = total power at the input (dBm) – input attenuation (dB).

	Specifications		Supplemental Information	
Displayed Average Noise Level				
(Input terminated, 0 dB attenuation, sample detector, Reference Level = –70 dBm)				
	1 kHz RBW 30 Hz VBW	10 Hz RBW 1 Hz VBW	1 kHz RBW 30 Hz VBW (typical)	10 Hz RBW 1 Hz VBW (typical)
30 Hz to 9 kHz *(Option UKB*)				≤ –93 dBm
9 kHz to 100 kHz				≤ –109 dBm
100 kHz to 1 MHz				≤ –135 dBm
1 MHz to 10 MHz			≤ –117 dBm	≤ –137 dBm
10 MHz to 1.0 GHz	≤ –116 dBm	≤ –135 dBm	≤ –119 dBm	≤ –139 dBm
1.0 GHz to 2.0 GHz	≤ –116 dBm	≤ –135 dBm	≤ –120 dBm	≤ –140 dBm
2.0 GHz to 3.0 GHz	≤ –112 dBm	≤ –131 dBm	≤ –118 dBm	≤ –138 dBm
3.0 GHz to 6.0 GHz	≤ –112 dBm	≤ –131 dBm	≤ –118 dBm	≤ –138 dBm
6.0 GHz to 6.7 GHz	≤ –111 dBm	≤ –130 dBm	≤ –117 dBm	≤ –137 dBm
Preamp On	1 kHz RBW 30 Hz VBW	10 Hz RBW 1 Hz VBW	1 kHz RBW 30 Hz VBW (typical)	10 kHz RBW1 Hz VBW (typical)
0 to 55 °C				
10 MHz to 1.0 GHz	≤ –131 dBm	≤ –150 dBm		
1.0 GHz to 2.0 GHz	≤ –131 dBm	≤ –150 dBm		
2.0 GHz to 3.0 GHz	≤ –127 dBm	≤ –146 dBm		
20 to 30 °C				
1 MHz to 10 MHz			≤ –135 dBm	≤ –155 dBm
10 MHz to 1.0 GHz	≤ –132 dBm	≤ –151 dBm	≤ –137 dBm	≤ –157 dBm
1.0 GHz to 2.0 GHz	≤ –132 dBm	≤ –151 dBm	≤ –135 dBm	≤ –155 dBm
2.0 GHz to 3.0 GHz	≤ –130 dBm	≤ –149 dBm	≤ –132 dBm	≤ –152 dBm

	Specifications	Supplemental Information
Display Range		
Log Scale	Ten divisions displayed; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps	
RBW ≥ 1 kHz	Calibrated 0 to –85 dB from Reference Level	
RBW ≤ 300 Hz	Calibrated 0 to –120 dB[a] from Reference Level	
Linear Scale	Ten divisions	
Scale Units	dBm, dBmV, dBµV, dBµA, A, V, W, and Hz	

a. 0 to –70 dB range when span = 0 Hz, or when IF Gain fixed: (:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF).

	Specifications	Supplemental Information
Marker Readout Resolution		
Log scale		
RBW ≥ 1 kHz		
0 to –85 dB from ref level	0.04 dB	
RBW ≤ 300 Hz		
0 to –120 dB from ref level	0.04 dB	
Linear scale	0.01% of Reference Level	
Fast Sweep Times for Zero Span		
(Option AYX)[a] For sweep times $\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$		
Log 0 to –85 dB from ref level	0.3 dB	
Linear	0.3% of Reference Level for linear scale	

a. For firmware revisions prior to A.06.00, 20 µs to <5 ms.

	Specifications	Supplemental Information
Frequency Response		
50 Ω, Absolute[a]/Relative		
10 dB attenuation (dc coupled)		
9 kHz to 3.0 GHz		
20 to 30 °C	±0.46 dB	±0.14 dB, typical
0 to 55 °C	±0.76 dB	
(ac coupled)		
100 kHz to 3.0 GHz		
20 to 30 °C	±0.50 dB	
0 to 55 °C	±1.0 dB	
(Option UKB)		
100 Hz to 3.0 GHz (dc coupled)		
20 to 30 °C	±0.50 dB	
0 to 55 °C	±1.00 dB	
30 Hz to 3.0 GHz (dc coupled)		
20 to 30 °C		±0.5 dB, characteristic
0 to 55 °C		±1.0 dB, characteristic
Preamp On		
0 dB attenuation		
1 MHz to 3.0 GHz		
20 to 30 °C	±1.5 dB	
0 to 55 °C	±2.0 dB	

	Specifications	Supplemental Information
Preselector centered for frequency >3.0 GHz		
10 dB attenuation		
3.0 GHz to 6.7 GHz (ac or dc coupled)		
Absolute[a]		
20 to 30 °C	±1.5 dB	
0 to 55 °C	±2.5 dB	
Relative		
20 to 30 °C	±1.3 dB	
0 to 55 °C	±1.5 dB	

a. Absolute frequency response values are referenced to the amplitude at 50 MHz.

	Specifications	Supplemental Information
Input Attenuation Switching Uncertainty at 50 MHz		
Attenuator Setting		
0 dB to 5 dB	±0.3 dB	
10 dB	Reference	
15 dB	±0.3 dB	
20 to 65 dB attenuation	±(0.1 dB + 0.01 × Attenuator Setting)	

Attenuation Accuracy Relative to the 10 dB Attenuator Setting, Characteristic		
	Frequency Range	
Attenuation	**dc–3.0 GHz**	**3.0–6.7 GHz**
0 dB	±0.3 dB	±0.5 dB
5 dB	±0.3 dB	±0.5
10 dB	Reference	Reference
15 dB	±0.4 dB	±0.5 dB
20 dB	±0.4 dB	±0.5 dB
25 dB	±0.5 dB	±0.6 dB

Attenuation Accuracy Relative to the 10 dB Attenuator Setting, Characteristic		
	Frequency Range	
Attenuation	**dc–3.0 GHz**	**3.0–6.7 GHz**
30 dB	±0.5 dB	±0.6 dB
35 dB	±0.6 dB	±0.7 dB
40 dB	±0.6 dB	±0.7 dB
45 dB	±0.7 dB	±1.0 dB
50 dB	±0.7 dB	±1.0 dB
55 dB	±0.9 dB	±1.1 dB
60 dB	±0.9 dB	±1.1 dB
65 dB	±1.0 dB	±1.6 dB

	Specifications	**Supplemental Information**
Preamp		Refer also to Displayed Average Noise Level specification
Gain		+20 dB, nominal[a]
Noise figure		5 dB, characteristic

a. Amplifier is between the input attenuator and the input mixer.

	Specifications	**Supplemental Information**
Absolute Amplitude Accuracy		
At reference settings[a]	±0.34 dB	±0.13 dB, typical
Preamp On[b]	±0.37 dB	±0.14 dB, typical
Overall Amplitude Accuracy[c]		
20 to 30 °C	± (0.54 dB + Absolute Frequency Response)	

a. Settings are: reference level –20 dBm; input attenuation 10 dB; dc coupled; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled, sample detector, signal at reference level.
b. Settings are: reference level –30 dBm; input attenuation 0 dB; dc coupled; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled, signal at reference level.
c. For reference level 0 to –50 dBm; input attenuation 10 dB; dc coupled; RBW 1 kHz; VBW 1 kHz; scale log, log range 0 to –50 dB from reference level; sweep time coupled; signal input 0 to –50 dBm; span ≤20 kHz.

	Specifications	Supplemental Information	
RF Input VSWR (at tuned frequency)		characteristic	characteristic
Attenuator setting 0 dB		(dc coupled)	(ac coupled)
9 kHz to 100 kHz		≤3.0:1	
100 kHz to 6.7 GHz		≤3.0:1	≤3.0:1
100 Hz to 100 kHz *(Option UKB)*		≤1.1:1	
Attenuator setting 5 dB		(dc coupled)	(ac coupled)
9 kHz to 100 kHz		≤2.0:1	
100 kHz to 300 kHz		≤1.4:1	≤2.3:1
300 kHz to 1.0 MHz		≤1.4:1	≤1.6:1
1.0 MHz to 3.0 GHz		≤1.4:1	≤1.4:1
3.0 GHz to 6.7 GHz		≤1.4:1	≤1.7:1
100 Hz to 100 kHz *(Option UKB)*		≤1.1:1	
Attenuator setting 10 to 65 dB		(dc coupled)	(ac coupled)
9 kHz to 100 kHz		≤2.0:1	
100 kHz to 300 kHz		≤1.3:1	≤2.1:1
300 kHz to 1.0 MHz		≤1.3:1	≤1.5:1
1.0 MHz to 3.0 GHz		≤1.3:1	≤1.3:1
3.0 GHz to 6.7 GHz		≤1.3:1	≤1.5:1
100 Hz to 100 kHz *(Option UKB)*		≤1.1:1	

	Specifications	Supplemental Information
Auto Alignment[a]		
Sweep-to-sweep variation		±0.1 dB, characteristic

a. Set **Auto Align** to **Off** and use **Align Now, All** to eliminate this variation.

	Specifications	Supplemental Information
Resolution Bandwidth Switching Uncertainty (at Reference Level)		
1 kHz RBW	Reference	
3 kHz to 3 MHz RBW	±0.3 dB	
5 MHz RBW	±0.6 dB	
10 Hz to 300 Hz RBW	±0.3 dB	

	Specifications	Supplemental Information
Reference Level		
Range	–149.9 dBm to maximum mixer level + attenuator setting	
Resolution		
Log Scale	±0.1 dB	
Linear Scale	±0.12% of Reference Level	
Accuracy (at a fixed frequency, a fixed attenuator, and referenced to –30 dBm(–10 dBm, Preamp On))		
Reference Level (dBm) – input attenuator setting (dB) + preamp gain (dB)		
–10 dBm to > –60 dBm	±0.3 dB	
–60 dBm to > –85 dBm	±0.5 dB	
–85 dBm to –90 dBm	±0.7 dB	

	Specifications	Supplemental Information
Display Scale Switching Uncertainty		
Switching between Linear and Log	±0.15 dB at reference level	
Log Scale Switching	No error	

	Specifications	Supplemental Information
Display Scale Fidelity		
Log Maximum Cumulative		
RBW ≥ 1 kHz		
dB Below Reference Level		
0 dB Reference	0 dB	
> 0 to 10 dB	±0.22 dB	±0.08 dB, typical
> 10 to 20 dB	±0.24 dB	±0.09 dB, typical
> 20 to 30 dB	±0.26 dB	±0.10 dB, typical
> 30 to 40 dB	±0.40 dB	±0.23 dB, typical
> 40 to 50 dB	±0.57 dB	±0.35 dB, typical
> 50 to 60 dB	±0.57 dB	±0.35 dB, typical
> 60 to 70 dB	±0.66 dB	±0.39 dB, typical
>70 to 80 dB	±0.66 dB	±0.46 dB, typical
>80 to 85 dB	±1.15 dB	±0.79 dB, typical
RBW = 200 Hz		
0 to 30 dB below reference level	±(0.3 dB + 0.01 × dB from reference level)	
RBW = 10 Hz, 30 Hz, 100 Hz, or 300 Hz		
Span > 0 Hz		
Auto range On		
0 to 98 dB below reference level	±(0.3 dB + 0.01 × dB from reference level)	
> 98 to 120 dB below reference level		±2.0 dB, characteristic
Auto range Off		
0 to 60 dB below reference level	±(0.3 dB + 0.015 × dB from reference level)	
> 60 to 70 dB below reference level	±1.5 dB	

	Specifications	Supplemental Information
Span = 0 Hz[a]		
0 to 60 dB below reference level	±(0.3 dB + 0.015 × dB from reference level)	
> 60 to 70 dB below reference level	±1.5 dB	
Log Incremental Accuracy		
0 to 80 dB[b] below reference level	±0.4 dB/4 dB	
Linear Accuracy	±2% of Reference Level	

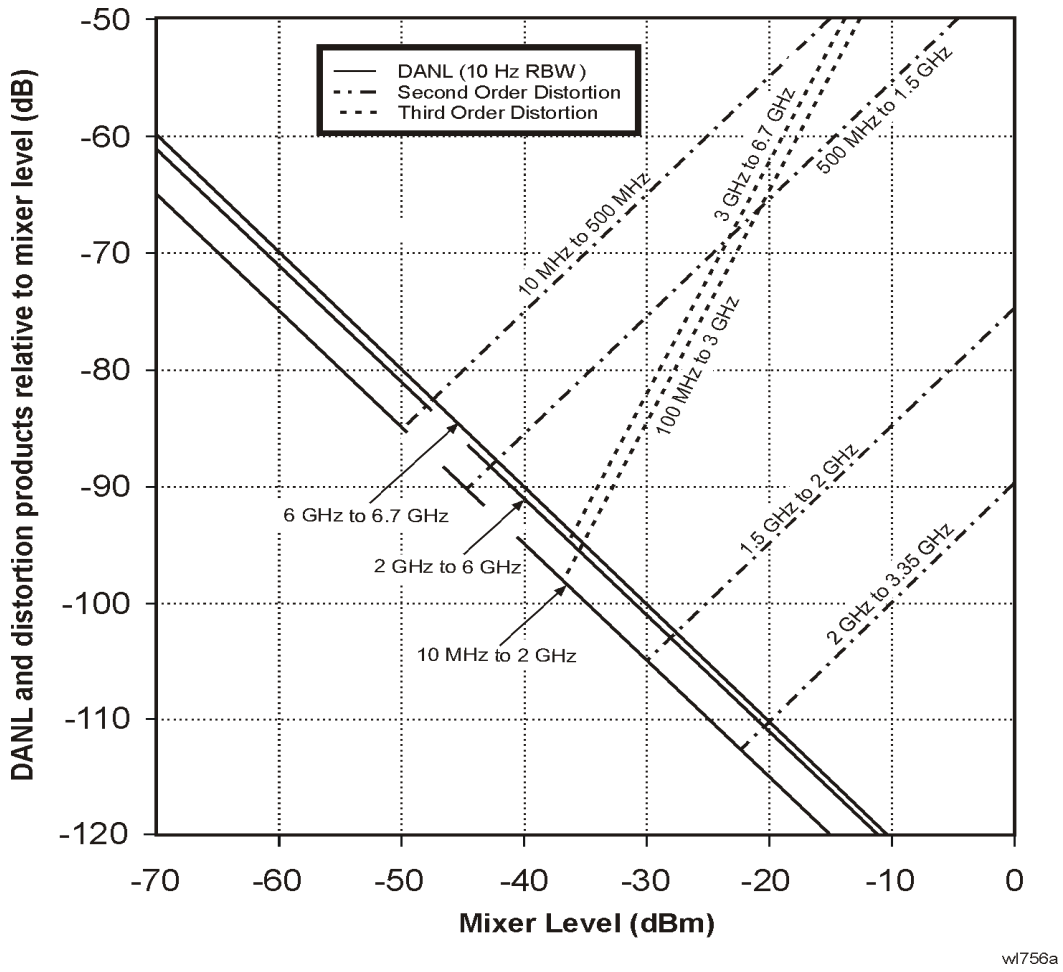
a. The SCPI command for auto range off is:
(:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF)
b. 0 to –50 dB for RBWs ≤ 300 Hz and span = 0 Hz, or when auto ranging is off.

	Specifications	Supplemental Information
Spurious Responses		
Second Harmonic Distortion		
Input Signal		
10 MHz to 500 MHz	< –65 dBc for –30 dBm signal at input mixer[a]	+35 dBm SHI (second harmonic intercept)
500 MHz to 1.5 GHz	< –75 dBc for –30 dBm signal at input mixer[a]	+45 dBm SHI
1.5 GHz to 2.0 GHz	< –85 dBc for –10 dBm signal at input mixer[a]	+75 dBm SHI
2.0 GHz to 3.35 GHz	< –100 dBc[b] for –10 dBm signal at input mixer[a]	+90 dBm SHI
Preamp On 10 MHz to 1.5 GHz		–5 dBm SHI, characteristic
Third Order Intermodulation Distortion		
10 MHz to 100 MHz		+7 dBm TOI (third order intercept), characteristic
100 MHz to 3 GHz	< –85 dBc for two –30 dBm signals at input mixer[a] and >50 kHz separation	+12.5 dBm TOI +16 dBm TOI, typical

	Specifications	Supplemental Information
3.0 GHz to 6.7 GHz	< –82 dBc for two –30 dBm signals at input mixer[a] and >50 kHz separation	+11 dBm TOI +18 dBm TOI, typical
Preamp On 10 MHz to 3 GHz		–16 dBm TOI, characteristic
Other Input Related Spurious		
Inband Responses		
>30 kHz offset	< –65 dBc for –20 dBm signal at input mixer[a]	
Out-of-band Responses	< –80 dBc for –10 dBm signal at input mixer[a]	

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).
b. or signal below displayed average noise level.

Specified Dynamic Range



	Specifications	Supplemental Information
Residual Responses (Input terminated and 0 dB attenuation)		
150 kHz to 6.7 GHz	< –90 dBm	

	Specifications	Supplemental Information
Quasi-Peak Detector	The quasi-peak detector provides the quasi-peak amplitude of pulsed radio frequency (RF) or continuous wave (CW) signals.	

	Specifications	Supplemental Information
	The amplitude response conforms to Publication 16 of CISPR Section 1, Clause 2, except as indicated in the Relative Quasi-Peak Response Table.	

Relative Quasi-Peak Response to a CISPR Pulse (dB)			
Frequency Band			
Pulse Repetition Frequency	**120 kHz EMI BW 0.03 to 1 GHz**	**9 kHz EMI BW 0.15 to 30 MHz**	**200 Hz EMI BW 9 to 150 kHz**
1000 Hz	+8.0 ± 1.0	+4.5 ± 1.0	N/A
100 Hz	0 dB reference[a]	0 dB reference[a]	+4.0 ± 1.0
60 Hz	N/A	N/A	+3.0 ± 1.0
25 Hz	N/A	N/A	0 dB reference[a]
20 Hz	–9.0 ± 1.0	–6.5 ± 1.0	N/A
10 Hz	–14.0 ± 1.5	–10.0 ± 1.5	–4.0 ± 1.0
5 Hz	N/A	N/A	–7.5 ± 1.5
2 Hz	–26.0 ± 2.0	–20.5 ± 2.0	–13.0 ± 2.0
1 Hz		–22.5 ± 2.0	–17.0 ± 2.0
Isolated Pulse		–23.5 ± 2.0	–19.0 ± 2.0

a. Reference pulse amplitude accuracy relative to a 66 dBµV CW signal is <1.5 dB as specified in CISPR Publication 16. CISPR reference pulse: 0.044 µVs for 30 MHz to 1.0 GHz, 0.316 µVs for 15 kHz to 30 MHz, and 13.5 µVs for 9 to 150 kHz.

	Specifications	Supplemental Information
FM Demodulation		
Input level		(–60 dBm + attenuator setting), characteristic
Signal level		0 to –30 dB below reference level, characteristic

Options

Time Gated Spectrum Analysis (Option 1D6)

	Specifications	Supplemental Information
Gate Delay		
Range	1 µs to 400 s	
Accuracy	±(500 ns + (0.01% × (maximum of gate delay or length)))	From gate trigger input to positive edge of gate output
Gate Length		
Range	1 µs to 400 s	
Accuracy	±(500 ns + (0.01% × (maximum of gate delay or length)))	From positive edge to negative edge of gate output
Resolution	((maximum of gate delay or length in seconds)/65000) rounded up to nearest µs	Dependent on the greater of gate delay or gate length
Additional Amplitude Error[a]		
Log Scale	±0.2 dB	
Linear Scale	±0.1% of reference level	

a. While in gate mode.

Tracking Generator (Option 1DN)

The spectrum analyzer/tracking generator combination will meet its specification after a cable (8120-5148) and adapter are connected between RF OUT and INPUT and **Align Now**, **TG** has been run.

	Specifications	Supplemental Information
Warm-up	5 minutes	

	Specifications	Supplemental Information
Output Frequency Range	9 kHz to 3.0 GHz	

	Specifications	Supplemental Information
Minimum Resolution BW	1 kHz	Not usable with resolution bandwidths ≤300 Hz

	Specifications	Supplemental Information
Output Power Level		
Range	–2 to –66 dBm	
Resolution	0.1 dB	
Absolute Accuracy (at 50 MHz with coupled source attenuator, referenced to –20 dBm)	± 0.75 dB	
Vernier		
Range	8 dB	
Accuracy (with coupled source attenuator, 50 MHz, –20 dBm)		
Incremental	±0.2 dB/dB	
Cumulative	±0.5 dB, total	
Output Attenuator Range	0 to 56 dB in 8 dB steps	

	Specifications	Supplemental Information
Maximum Safe Reverse Level		+30 dBm (1 W), 50 Vdc, characteristic

	Specifications	Supplemental Information
Output Power Sweep		
Range	(–10 to –2 dBm) – (Source Attenuator Setting)	
Resolution	0.1 dB	
Accuracy (zero span)	<1 dB peak-to-peak	

	Specifications	Supplemental Information
Output Flatness		
Referenced to 50 MHz, –20 dBm		
9 kHz to 10 MHz	±3 dB	
10 MHz to 3 GHz	±2 dB	

	Specifications	Supplemental Information
Spurious Outputs		
(–2 dBm output)		
Harmonic Spurs		
TG Output 9 kHz to 20 kHz	≤ –15 dBc	
TG Output 20 kHz to 3 GHz	≤ –25 dBc	
Non-harmonic Spurs		
TG Output 9 kHz to 2 GHz	≤ –27 dBc	
TG Output 2 GHz to 3 GHz	≤ –23 dBc	
LO Feedthrough		
LO Frequency 3.921409 GHz to 6.9214 GHz	≤ –16 dBm	

	Specifications	Supplemental Information
Dynamic Range	Maximum Output Power Level – Displayed Average Noise Level	

	Specifications	Supplemental Information
Output Tracking		
Drift		1.5 kHz/5 minute, characteristic
Swept Tracking Error		Usable in 1 kHz RBW after 5 minutes of warm-up

	Specifications	Supplemental Information
RF Power-Off Residuals		
9 kHz to 3 GHz		< –120 dBm, characteristic

	Specifications	Supplemental Information
Output Attenuator Repeatability		
9 kHz to 300 MHz		±0.1 dB, characteristic
300 MHz to 2 GHz		±0.2 dB, characteristic
2 GHz to 3 GHz		±0.3 dB, characteristic

	Specifications	Supplemental Information
Output VSWR		
0 dB attenuation		<2.0:1, characteristic
≥ 8 dB attenuation		<1.5:1, characteristic

	Specifications	Supplemental Information
Output Attenuator Accuracy		
0 dB		±0.5 dB, characteristic
8 dB		±0.5 dB, characteristic
16 dB	Reference	
24 dB		±0.5 dB, characteristic
32 dB		±0.6 dB, characteristic
40 dB		±0.8 dB, characteristic
48 dB		±1.0 dB, characteristic
56 dB		±1.1 dB, characteristic

Tracking Generator Output Accuracy
Relative Accuracy (Referred to –20 dBm) = Output Attenuator Accuracy + Vernier Accuracy + Output Flatness
Absolute Accuracy = Relative Accuracy (Referred to –20 dBm) + Absolute Accuracy at 50 MHz

General

	Specifications	Supplemental Information
Temperature Range		
Operating	0 to 55 °C	Floppy disk 10 to 40 °C
Storage	–40 to 75 °C	

	Specifications	Supplemental Information
Audible Noise (ISO 7779)		
Sound Pressure at 25 °C		<40 dBa, (<4.6 Bels power)

	Specifications	Supplemental Information
Military Specification	Has been type tested to the environmental specifications of MIL-PRF-28800F class 3.	

	Specifications	Supplemental Information
EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class B[a].	

a. Meets Class A performance during dc operation or serial number US41110000 or lower.

	Specifications	Supplemental Information
Immunity Testing		
Radiated Immunity		Testing was done at 3 V/m according to IEC 801-3/1984. When the analyzer tuned frequency is identical to the immunity test signal frequency, there may be signals of up to –60 dBm displayed on the screen.
Electrostatic Discharge		Air discharges of up to 8 kV were applied according to IEC 801-2/1991. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

	Specifications	Supplemental Information
Power Requirements		
ac Operation		
Voltage, frequency	90 to 132 Vrms, 47 to 440 Hz 195 to 250 Vrms, 47 to 66 Hz	
Power Consumption, On	<300 W	
Power Consumption, Standby	<5 W	
dc Operation		
Voltage	12 to 20 Vdc	
Power Consumption	<200 W	
Power Consumption, Standby	<100 mW	

	Specifications	Supplemental Information
Measurement Speed		
Local Measurement and Display Update rate[a]		
Sweep points = 101		≥ 40/s, characteristic
Sweep points = 401		≥ 28/s, characteristic
Remote Measurement and GPIB Transfer Rate[b,c]		
Sweep points = 101		≥ 40/s, characteristic
Sweep points = 401		≥ 28/s, characteristic
RF Center Frequency Tune, Measure, and GPIB Transfer Time[b,d]		
Sweep points = 101		≤ 75 ms, characteristic
Sweep points = 401		≤ 90 ms, characteristic

a. Factory preset, auto align Off, fixed center frequency, RBW = 1 MHz, spans >10 MHz and ≤600 MHz, and stop frequency ≤3 GHz.
b. Display Off (:DISPlay:ENABle OFF), and 32-bit integer data format (:FORMat:DATA INT,32), if *Option AYX* or *A4J* is installed, disable sweep ramp, (:SYSem:PORTs:IFVSweep:ENABle OFF), markers Off, single sweep, measured with IBM compatible PC with 550 MHz Pentium® III running Windows® NT 4.0, one meter GPIB cable, National Instruments PCI-GPIB card and NI-488.2 DLL.
c. Factory preset, auto align Off, fixed center frequency, RBW = 1 MHz, and span = 20 MHz, fixed center frequency, stop frequency ≤3 GHz, average of 100 measurements.
d. Factory preset, auto align Off, RBW = 1 MHz, span= 20 MHz, stop frequency ≤3 GHz, center frequency tune step size = 50 MHz.

	Specifications	Supplemental Information
Data Storage		
Internal		200 Traces or States[a]
External (10 to 40 °C) 3.5" 1.44 MB, MS-DOS® compatible floppy disk		200 Traces or States[a]

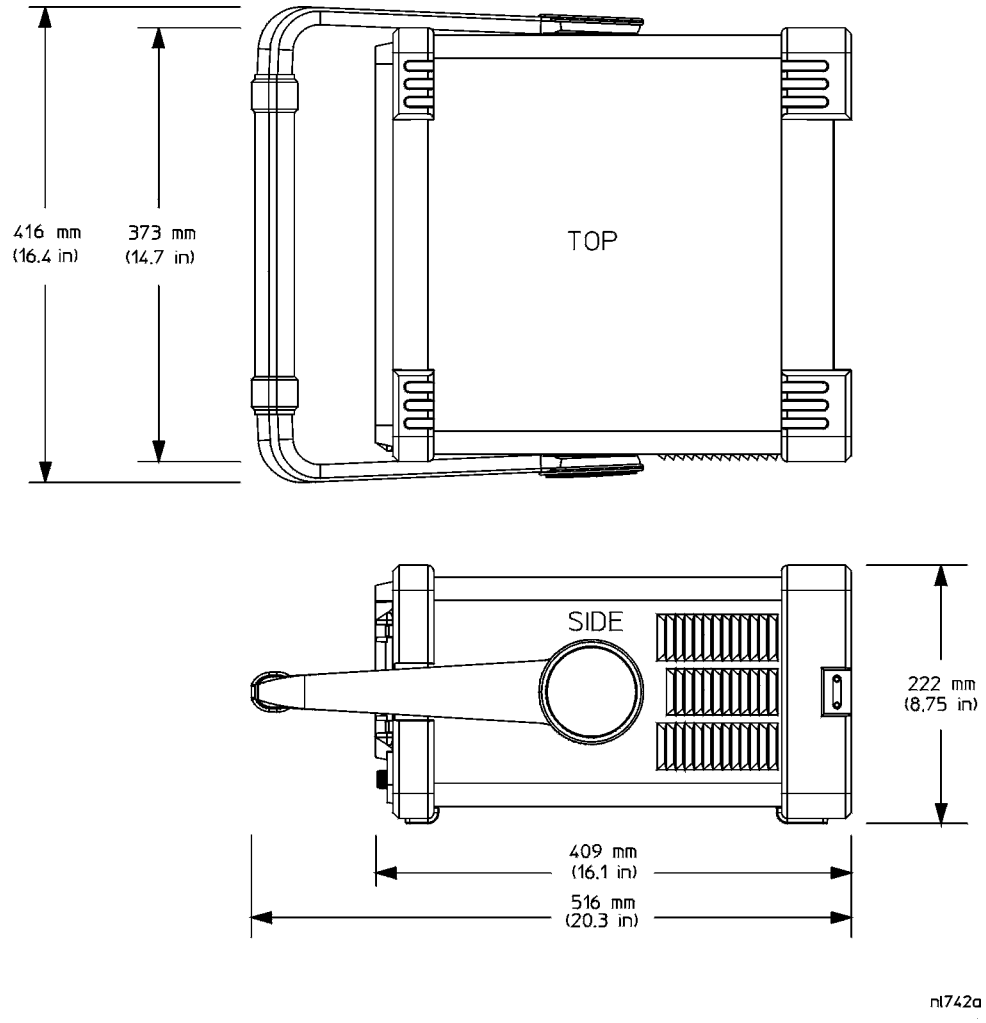
a. When storing traces set to 401 points.

	Specifications	Supplemental Information
Downloadable Program Memory		10 MB available memory

	Specifications	Supplemental Information
Demod Tune and Listen		Internal speaker, front-panel earphone jack and front-panel volume control.
Demod	AM and FM	An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

	Specifications	Supplemental Information
Weight (without options)		
Net		17.1 kg (37.7 lb), characteristic
Shipping		31.0 kg (68 lb), characteristic

Dimensions


416 mm
(16.4 in)
373 mm
(14.7 in)
TOP
SIDE
222 mm
(8.75 in)
409 mm
(16.1 in)
516 mm
(20.3 in)
nl742a

Inputs and Outputs

Front Panel

	Specifications	Supplemental Information
INPUT 50 Ω		
Connector	Type-N female	
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
RF OUT 50 Ω, *(Option 1DN)*		
Connector	Type-N female	
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
AMPTD REF OUT[a]		Amplitude Reference
Connector	BNC female	
Impedance		50 Ω, nominal
Frequency		50 MHz
Frequency Accuracy		Frequency reference error[b]
50 Ω Amplitude[c]		–20 dBm, nominal

a. Turn the amplitude reference on/off by pressing the keys: **Input/Output**, **Amptd Ref Out**.
b. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).
c. The internal amplitude reference actual power is stored internally.

	Specifications	Supplemental Information
PROBE POWER		
Voltage/Current		+15 Vdc, ±7% at 150 mA max., characteristic –12.6 Vdc ±10% at 150 mA max., characteristic

	Specifications	Supplemental Information
EXT KEYBOARD[a]		Used for entering screen titles and filenames only. Interface compatible with most IBM-compatible PC keyboards.
Connector	6-pin mini-DIN	

a. The feature is not implemented in firmware revisions prior to A.06.00.

	Specifications	Supplemental Information
Speaker		Front panel knob controls volume

	Specifications	Supplemental Information
Headphone		Front panel knob controls volume
Connector	3.5 mm (1/8 inch) miniature audio jack	
Power Output		0.2 W into 4 Ω, characteristic

Rear Panel

	Specifications	Supplemental Information
10 MHz REF OUT		
Connector	BNC female	
Impedance		50 Ω, nominal
Output Amplitude		>0 dBm, characteristic

	Specifications	Supplemental Information
10 MHz REF IN		
Connector	BNC female	Note: Analyzer noise sidebands and spurious response performance may be affected by the quality of the external reference used.
Impedance		50 Ω, nominal
Input Amplitude Range		–15 to +10 dBm, characteristic
Frequency		10 MHz, nominal

	Specifications	Supplemental Information
GATE TRIG/EXT TRIG IN		
Connector	BNC female	
External Trigger Input		
Trigger Level		Selectable positive or negative edge initiates sweep in EXT TRIG mode (5 V TTL)
Gate Trigger Input *(Option 1D6)*		
Minimum Pulse Width		>30 ns (5 V TTL)

	Specifications	Supplemental Information
GATE/HI SWP OUT		
Connector	BNC female	
High Sweep Output		
Level		High = sweep[a]; Low = retrace (5 V TTL)
Gate Output *(Option 1D6)*		
Level		High = gate on; Low = gate off (5 V TTL)

a. High sweep may be high longer than the indicated sweep times.

	Specifications	Supplemental Information
VGA OUTPUT		
Connector	VGA compatible, 15-pin mini D-SUB	
Format		VGA (31.5 kHz horizontal, 60 Hz vertical sync rates, non-interlaced) Analog RGB
Resolution	640 × 480	

	Specifications	Supplemental Information
AUX IF OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Frequency		21.4 MHz, nominal
Amplitude (for signal at reference level and for reference levels – input attenuation + preamp gain of –10 to –70 dBm)		–10 dBm (uncorrected), characteristic
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
AUX VIDEO OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Amplitude Range (into >10 kΩ)		0 to 1 V (uncorrected), characteristic

	Specifications	Supplemental Information
HI SWP IN *(Option A4J or AYX)*		
Connector	BNC female	
Input		Open collector, low resets and holds the sweep (5 V TTL)

	Specifications	Supplemental Information
HI SWP OUT *(Option A4J or AYX)*		
Connector	BNC female	
Output		High = sweep[a], Low = retrace (5 V TTL)

a. High sweep may be high longer than the indicated sweep times.

	Specifications	Supplemental Information
SWP OUT *(Option A4J or AYX)*		
Connector	BNC female	
Amplitude		0 to +10 V ramp, characteristic

	Specifications	Supplemental Information
PRESEL TUNE OUTPUT		
Connector	BNC female	
Load Impedance (dc coupled)		> 10 kΩ, nominal
Range		0 to +10 V, characteristic
Sensitivity		0.33 V/GHz of tuned frequency > 3 GHz, characteristic

	Specifications	Supplemental Information
GPIB Interface		
Connector	IEEE-488 bus connector	
GPIB Codes		SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28

	Specifications	Supplemental Information
Serial Interface *(Option 1AX)*		
Connector	9-pin D-SUB male	RS-232

	Specifications	Supplemental Information
Parallel Interface		Printer port only
Connector	25-pin D-SUB female	

Regulatory Information

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.

NOTE This product has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

The CE mark is a registered trademark of the European Community (if accompanied by a year, it is the year when the design was proven).

The CSA mark is the Canadian Standards Association safety mark.

ISM 1-A This is a symbol of an Industrial Scientific and Medical Group 1 Class A product. (CISPR 11, Clause 4)

Declaration of Conformity

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name: Agilent Technologies, Inc.

Manufacturer's Address: 1400 Fountaingrove Parkway
Santa Rosa, CA 95403-1799
USA

Declares that the products

Product Name: Spectrum Analyzer

Model Number: HP E7401A, HP E7402A, HP E7403A,
HP E7404A, HP E7405A

Product Options: This declaration covers all options of the above products.

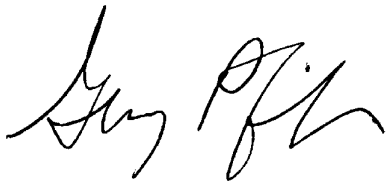
Conform to the following product specifications:

EMC: IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998

Standard	Limit
CISPR 11:1990 / EN 55011-1991	Group 1, Class A
IEC 61000-4-2:1995+A1998 / EN 61000-4-2:1995	4 kV CD, 8 kV AD
IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80 - 1000 MHz
IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5 kV sig., 1 kV power
IEC 61000-4-5:1995 / EN 61000-4-5:1996	0.5 kV L-L, 1 kV L-G
IEC 61000-4-6:1996 / EN 61000-4-6:1998	3 V, 0.15 – 80 MHz
IEC 61000-4-11:1994 / EN 61000-4-11:1998	1 cycle, 100%

Safety: IEC 61010-1:1990 + A1:1992 + A2:1995 / EN 61010-1:1993 +A2:1995
CAN/CSA-C22.2 No. 1010.1-92

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.



Santa Rosa, CA, USA 4 Feb. 2000

Greg Pfeiffer/Quality Engineering Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.

4 Agilent E7404A Specifications and Characteristics

About This Chapter

This chapter contains specifications and characteristics for the Agilent E7404A spectrum analyzer. The distinction between specifications and characteristics is described as follows.

- Specifications describe the performance of parameters covered by the product warranty. (The temperature range is 0 °C to 55 °C, unless otherwise noted.)
- Characteristics describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- Typical performance describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- Nominal values indicate the expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.

The following conditions must be met for the analyzer to meet its specifications.

- The analyzer is within the one year calibration cycle.
- If **Auto Align All** is selected:
  - After 2 hours of storage within the operating temperature range.
  - 5 minutes after the analyzer is turned on with sweep times less than 4 seconds[1].
  - After the front-panel amplitude reference is connected to the INPUT, and **Align Now RF** has been run, after the analyzer is turned on. And, once every 24 hours, or if ambient temperature changes more than 30 °C[2].

1. A Warm-up time of 25 minutes is required for a sweep time of 20 seconds.
2. 10 °C if preamp is on.

- If **Auto Align Off** is selected:
  - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
  - After the analyzer is turned on for a minimum of 90 minutes, the front panel amplitude reference has been connected to the INPUT, and **Align Now All** has been run.
  - When **Align Now All** is run:
    - Every hour
    - If the ambient temperature changes more than 3 °C
    - If the 10 MHz reference changes
  - When **Align Now RF** is run (with the front-panel amplitude reference connected to the INPUT):
    - Every 24 hours
    - If the ambient temperature changes more than 30 °C[1]
- If **Auto Align All but RF** is selected:
  - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
  - After the analyzer is turned on for a minimum of 90 minutes, the front panel amplitude reference has been connected to the INPUT, and **Align Now RF** has been run.
  - When **Align Now RF** is run (with the front-panel amplitude reference connected to the INPUT):
    - Every hour
    - If the ambient temperature changes more than 3 °C

1. 10 °C if preamp is on.

Frequency

	Specifications	Supplemental Information
Frequency Range		
dc Coupled	9 kHz to 13.2 GHz	
(Option UKB)	100 Hz to 13.2 GHz	30 Hz to 13.2 GHz, characteristic
ac Coupled	100 kHz to 13.2 GHz	
Band		Harmonic Mixing Mode (N[a])
0 (0 Hz to 3.0 GHz)		1–
1 (2.85 GHz to 6.7 GHz)		1–
2 (6.2 GHz to 13.2 GHz)		2–
Preamp On	1 MHz to 3.0 GHz	

a. N is the harmonic mixing mode. For negative mixing modes (as indicated by the "–"), the desired 1st LO harmonic is higher than the tuned frequency by the 1st IF (3.9214 for the 9 kHz to 3 GHz band, 321.4 MHz for all other bands).

	Specifications	Supplemental Information
Frequency Reference		
Aging Rate	$\pm 2 \times 10^{-6}$/year	$\pm 1.0 \times 10^{-7}$/day, characteristic
Settability	$\pm 5 \times 10^{-7}$	
Temperature Stability	$\pm 5 \times 10^{-6}$	

	Specifications	Supplemental Information
High Stability Frequency Reference *(Option 1D5)*		
Aging Rate	$\pm 1 \times 10^{-7}$/year	$\pm 5 \times 10^{-10}$/day, 7-day average after being powered on for 7 days, characteristic
Settability	$\pm 1 \times 10^{-8}$	
Temperature Stability		
20 to 30 °C	$\pm 1 \times 10^{-8}$	
0 to 55 °C	$\pm 5 \times 10^{-8}$	

	Specifications	Supplemental Information
Warm-up (Internal frequency reference selected)		
After 5 minutes		$< \pm 1 \times 10^{-7}$ of final frequency,[a] characteristic
After 15 minutes		$< \pm 1 \times 10^{-8}$ of final frequency,[a] characteristic

a. Final frequency is defined as frequency 60 minutes after power-on with analyzer set to internal frequency reference.

	Specifications	Supplemental Information
Frequency Readout Accuracy		
(Start, Stop, Center, Marker)	±((frequency indication × frequency reference error[a]) + 0.5% of span + $\frac{\text{span}}{\text{sweep points} - 1}$ + 15% of RBW + 10 Hz + 1 Hz × N[b])	

a. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).
b. N is the harmonic mixing mode.

	Specifications	Supplemental Information
Marker Frequency Counter		
Resolution	Selectable from 1 Hz to 100 kHz	
Accuracy[a]	±(marker frequency × frequency reference error[b] + counter resolution)[c]	For RBW ≥ 1 kHz

a. Marker level to displayed noise level > 25 dB, RBW/ Span ≥ 0.002, frequency offset = 0 Hz.
b. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).
c. For firmware revisions prior to A.03.00, add 1 Hz x N, where N is the harmonic mixing mode.

	Specifications	Supplemental Information
Frequency Span		
Range	0 Hz (zero span), 100 Hz to 13.2 GHz	
Resolution	2 Hz x N[a]	
Accuracy	±(0.5% of span + $2 \times \frac{\text{span}}{\text{sweep points} - 1}$)	

a. N is the harmonic mixing mode.

	Specifications	Supplemental Information
Sweep Time		
Range		
Span > 0 Hz	1 ms to 4000 s[a]	$\frac{\text{sweep points} - 1}{100\ \text{kHz}}$ to 4000 s
Span = 0 Hz	10 µs to 4000 s[a]	
Tracking Generator On *(Option 1DN)*		50 ms is the minimum sweep time
Fast Time-domain Sweep *(Option AYX)* (For Span = 0 Hz, RBW ≥ 1 kHz)	50 ns to 4000 s[b]	$\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to 4000 s
Accuracy (Span = 0 Hz)		
10 µs to 4000 s[a]	±1%	
(Option AYX) 50 ns to 4000 s[b]	±1%	
Sweep Trigger[c,d]	Free Run, Single, Line, Video[e], External, Delayed, Offset[f]	
(Option 1D6)	Add Gate	
Delayed Trigger[c,d,g]		
Range	1 µs to 400 s	
Resolution	$\frac{\text{delay in seconds}}{65000}$ rounded up to nearest µs	
Accuracy	±(500 ns + (0.01% of delay))	
Offset Trigger[f]		
Resolution	$\frac{\text{sweep time}}{\text{sweep points} - 1}$	
Range	±327 ms to ±12.3 ks	Where ST = sweep time and SP = sweep points $\frac{-32766 \times \text{ST}}{\text{SP} - 1}$ to $\frac{(32766 - \text{SP}) \times \text{ST}}{\text{SP} - 1}$

	Specifications	Supplemental Information
Fast Time-domain sweep *(Option AYX)* (For sweep times $\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$)	±1.23 ms to ±245 ms	$\frac{-32766 \times \text{ST}}{\text{SP} - 1}$ to $\frac{(32766 - \text{SP}) \times \text{ST}}{\text{SP} - 1}$

a. For firmware revisions prior to A.06.00, 5 ms to 2000 s.
b. For firmware revisions prior to A.06.00, 20 µs to 2000 s.
c. Gate cannot be used simultaneously with delayed trigger.
d. Auto align is suspended in video, external, gate, and delayed trigger modes while waiting for a trigger event to occur.
e. Unavailable when RBW ≤ 300 Hz.
f. For firmware revision A.06.00 or later.
g. Delayed trigger is available with line and external trigger.

	Specifications	Supplemental Information
Sweep (trace) Points		
Range		
Span > 0 Hz	101 to 8192[a]	
Span = 0 Hz	2 to 8192[a]	

a. For firmware revisions prior to A.06.00, 401 points.

	Specifications	Supplemental Information
Resolution Bandwidth (RBW)		
Range	10 Hz to 300 Hz (–3 dB) bandwidths in 1-3-10 sequence	Only available in spans ≤ 5 MHz, sweep times ≥ $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$, and not usable with tracking generator on. (*Option 1DN*)
	1 kHz to 3 MHz (–3 dB) bandwidths in 1-3-10 sequence	
	5 MHz (–3 dB) bandwidth	
	200 Hz (–6 dB) EMI bandwidth	Only available in spans ≤ 5 MHz, sweep times ≥ $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$, and not usable with tracking generator on. (*Option 1DN*)
	9 kHz, 120 kHz (–6 dB) EMI bandwidth	
	1 MHz (–6 dB) EMI bandwidth	

	Specifications	Supplemental Information
	1 MHz (Impulse) EMI bandwidth	
Accuracy		
10 Hz to 300 Hz (–3 dB) RBW	±10%	
1 kHz to 3 MHz (–3 dB) RBW	±15%	
5 MHz (–3 dB) RBW	±30%	
200 Hz (–6 dB) RBW	±10%	
9 kHz, 120 kHz (–6 dB) RBW	±15%	
1 MHz (–6 dB) RBW	±10%	
1 MHz (Impulse) RBW	±15%[a]	
Shape		
10 Hz to 300 Hz (–3 dB) RBW		Digital, approximately Gaussian shape
1 kHz to 5 MHz (–3 dB) RBW		Synchronously tuned four poles, approximately Gaussian shape
200 Hz (–6 dB) RBW		Digital, Kaiser Window
9 kHz, 120 kHz, 1 MHz (–6 dB) RBW		Synchronously tuned four poles, approximately Gaussian shape
1 MHz (Impulse) RBW		Synchronously tuned four poles, approximately Gaussian shape
Selectivity		
10 Hz to 300 Hz (–3 dB) RBW		< 5:1, 60 dB / 3 dB bandwidth ratio, characteristic
1 kHz to 5 MHz (–3 dB) RBW		< 15:1, 60 dB / 3 dB bandwidth ratio, characteristic
200 Hz (–6 dB) RBW		< 3:1, 40 dB / 6 dB bandwidth ratio, characteristic
9 kHz, 120 kHz, 1 MHz (–6 dB) RBW		< 10:1, 60 dB / 6 dB bandwidth ratio, characteristic
1 MHz (Impulse) RBW		< 10:1, 60 dB / 6 dB bandwidth ratio, characteristic

a. Scale Linear, VBW 3 MHz, signal 0 to –10 dB from reference level.

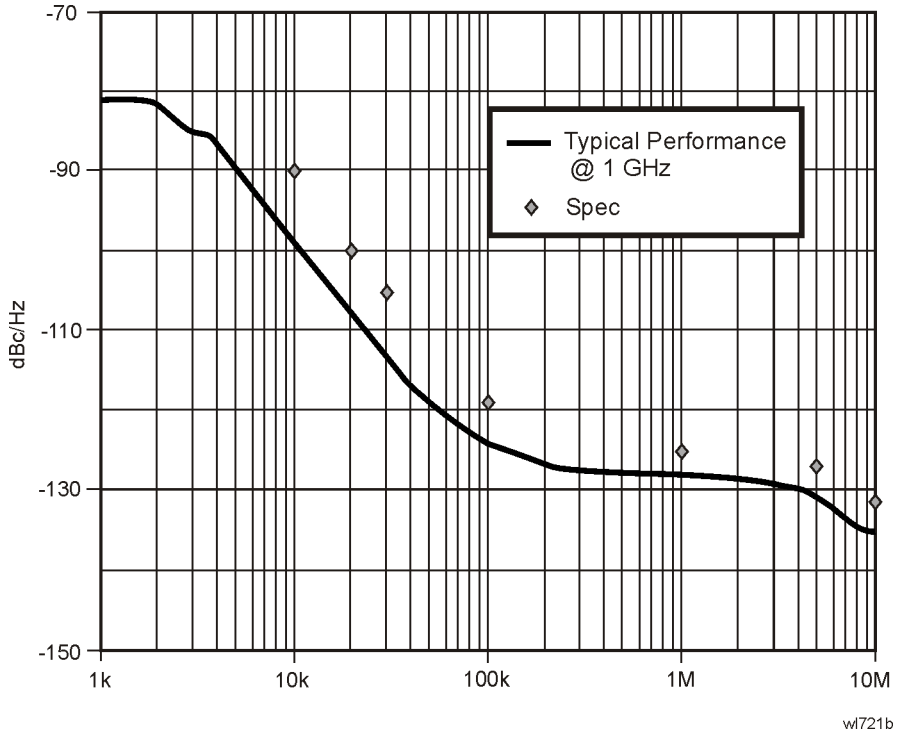
	Specifications	Supplemental Information
Video Bandwidth (VBW) (–3 dB)		
Range	30 Hz to 1 MHz in 1-3-10 sequence 1, 3, 10 Hz for RBW's <1 kHz	3 MHz, characteristic
Accuracy		±30%, characteristic
Shape		Post detection, single pole low-pass filter used to average displayed noise Video bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

	Specifications	Supplemental Information
Stability		
Noise Sidebands (Offset from CW signal with 1 kHz RBW, 30 Hz VBW and sample detector)		
≥1 kHz *(Option 1D5)*		≤ –78 dBc/Hz[a], typical
≥10 kHz	≤ –90 dBc/Hz[a]	≤ –94 dBc/Hz[a], typical
≥20 kHz	≤ –100 dBc/Hz[a]	≤ –105 dBc/Hz[a], typical
≥30 kHz	≤ –106 dBc/Hz[a]	≤ –112 dBc/Hz[a], typical
≥100 kHz	≤ –119 dBc/Hz[a]	≤ –122 dBc/Hz[a], typical
≥1 MHz	≤ –125 dBc/Hz[a]	≤ –127 dBc/Hz[a], typical
≥5 MHz	≤ –127 dBc/Hz[a]	≤ –129 dBc/Hz[a], typical
≥10 MHz	≤ –131 dBc/Hz[a]	≤ –136 dBc/Hz[a], typical
Residual FM		
1 kHz RBW, 1 kHz VBW	≤150 Hz × N p–p in 100 ms	
(Option 1D5)	≤100 Hz × N p–p in 100 ms	
10 Hz RBW, 10 Hz VBW *(Option 1D5)*	≤2 Hz × N p–p in 20 ms	
10 Hz RBW, 10 Hz VBW		≤10 Hz × N p–p in 20 ms, characteristic

	Specifications	Supplemental Information
System-Related Sidebands, offset from CW signal		
≥30 kHz	≤ –65 dBc[a]	
Line-Related Sidebands, offset from CW signal		
<300 Hz		≤ –50 dBc[a], characteristic
>300 Hz to 30 kHz		≤ –55 dBc[a], characteristic

a. Add 20 Log(N) for frequencies > 6.7 GHz.

Noise Sidebands Normalized to 1 Hz Versus Offset from Carrier



Amplitude

Amplitude specifications do not apply for the negative peak detector mode.

	Specifications	Supplemental Information
Measurement Range	Displayed Average Noise Level to Maximum Safe Input Level	
Input Attenuator Range	0 to 65 dB, in 5 dB steps	0 to 75 dB, in 5 dB steps, characteristic

	Specifications	Supplemental Information
Maximum Safe Input Level		
Average Continuous Power	+30 dBm (1 W)	
(Input attenuator setting ≥5 dB)		
Peak Pulse Power (for <10 µsec pulse width, <1% duty cycle, and input attenuation ≥30 dB)	+50 dBm (100 W)	
dc		
dc Coupled	0 Vdc	
ac Coupled	50 Vdc	

	Specifications	Supplemental Information
1 dB Gain Compression		
Total power at input mixer [a,b]		
50 MHz to 3.0 GHz	0 dBm	
3.0 GHz to 6.7 GHz	0 dBm	
6.7 GHz to 13.2 GHz	–3 dBm	
Preamp On		
Total power at the preamp[c]		–20 dBm, characteristic

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).
b. For resolution bandwidths 1 kHz to 30 kHz, the maximum input signal amplitude must be ≤ reference level +10 dB.
c. Total power at the preamp (dBm) = total power at the input (dBm) – input attenuation (dB).

	Specifications		Supplemental Information	
Displayed Average Noise Level				
(Input terminated, 0 dB attenuation, sample detector, Reference Level = –70 dBm)				
	1 kHz RBW 30 Hz VBW	10 Hz RBW 1 Hz VBW	1 kHz RBW 30 Hz VBW (typical)	10 Hz RBW 1 Hz VBW (typical)
30 Hz to 9 kHz *(Option UKB*)				≤ –93 dBm
9 kHz to 100 kHz				≤ –109 dBm
100 kHz to 1 MHz				≤ –135 dBm
1 MHz to 10 MHz			≤ –117 dBm	≤ –137 dBm
10 MHz to 1.0 GHz	≤ –116 dBm	≤ –135 dBm	≤ –119 dBm	≤ –139 dBm
1.0 GHz to 2.0 GHz	≤ –116 dBm	≤ –135 dBm	≤ –120 dBm	≤ –140 dBm
2.0 GHz to 3.0 GHz	≤ –112 dBm	≤ –131 dBm	≤ –118 dBm	≤ –138 dBm
3.0 GHz to 6.0 GHz	≤ –112 dBm	≤ –131 dBm	≤ –118 dBm	≤ –138 dBm
6.0 GHz to 12 GHz	≤ –111 dBm	≤ –130 dBm	≤ –117 dBm	≤ –137 dBm
12 GHz to 13.2 GHz	≤ –107 dBm	≤ –126 dBm	≤ –114 dBm	≤ –134 dBm
Preamp On	1 kHz RBW 30 Hz VBW	10 Hz RBW 1 Hz VBW	1 kHz RBW 30 Hz VBW (typical)	10 kHz RBW1 Hz VBW (typical)
0 to 55 °C				
10 MHz to 1.0 GHz	≤ –131 dBm	≤ –150 dBm		
1.0 GHz to 2.0 GHz	≤ –131 dBm	≤ –150 dBm		
2.0 GHz to 3.0 GHz	≤ –127 dBm	≤ –146 dBm		
20 to 30 °C				
1 MHz to 10 MHz			≤ –135 dBm	≤ –155 dBm
10 MHz to 1.0 GHz	≤ –132 dBm	≤ –151 dBm	≤ –137 dBm	≤ –157 dBm
1.0 GHz to 2.0 GHz	≤ –132 dBm	≤ –151 dBm	≤ –135 dBm	≤ –155 dBm
2.0 GHz to 3.0 GHz	≤ –130 dBm	≤ –149 dBm	≤ –132 dBm	≤ –152 dBm

	Specifications	Supplemental Information
Display Range		
Log Scale	Ten divisions displayed; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps	
RBW ≥ 1 kHz	Calibrated 0 to –85 dB from Reference Level	
RBW ≤ 300 Hz	Calibrated 0 to –120 dB[a] from Reference Level	
Linear Scale	Ten divisions	
Scale Units	dBm, dBmV, dBµV, dBµA, A, V, W, and Hz	

a. 0 to –70 dB range when span = 0 Hz, or when IF Gain fixed: (:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF).

	Specifications	Supplemental Information
Marker Readout Resolution		
Log scale		
RBW ≥ 1 kHz		
0 to –85 dB from ref level	0.04 dB	
RBW ≤ 300 Hz		
0 to –120 dB from ref level	0.04 dB	
Linear scale	0.01% of Reference Level	
Fast Sweep Times for Zero Span		
(Option AYX)[a] For sweep times $\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$		
Log 0 to –85 dB from ref level	0.3 dB	
Linear	0.3% of Reference Level for linear scale	

a. For firmware revisions prior to A.06.00, 20 µs to <5 ms.

	Specifications	Supplemental Information
Frequency Response		
50 Ω, Absolute[a]/Relative		
10 dB attenuation (dc coupled)		
9 kHz to 3.0 GHz		
20 to 30 °C	±0.46 dB	±0.14 dB, typical
0 to 55 °C	±0.76 dB	
(ac coupled)		
100 kHz to 3.0 GHz		
20 to 30 °C	±0.50 dB	
0 to 55 °C	±1.0 dB	
(Option UKB)		
100 Hz to 3.0 GHz (dc coupled)		
20 to 30 °C	±0.50 dB	
0 to 55 °C	±1.00 dB	
30 Hz to 3.0 GHz (dc coupled)		
20 to 30 °C		±0.5 dB, characteristic
0 to 55 °C		±1.0 dB, characteristic
Preamp On		
0 dB attenuation		
1 MHz to 3.0 GHz		
20 to 30 °C	±1.5 dB	
0 to 55 °C	±2.0 dB	

	Specifications	Supplemental Information
Preselector centered for frequency >3.0 GHz		
10 dB attenuation		
3.0 GHz to 6.7 GHz (ac or dc coupled)		
Absolute[a]		
20 to 30 °C	±1.5 dB	
0 to 55 °C	±2.5 dB	
Relative		
20 to 30 °C	±1.3 dB	
0 to 55 °C	±1.5 dB	
6.7 GHz to 13.2 GHz (ac or dc coupled)		
Absolute[a]		
20 to 30 °C	±2.0 dB	
0 to 55 °C	±3.0 dB	
Relative		
20 to 30 °C	±1.8 dB	
0 to 55 °C	±2.0 dB	

a. Absolute frequency response values are referenced to the amplitude at 50 MHz.

	Specifications	Supplemental Information
Input Attenuation Switching Uncertainty at 50 MHz		
Attenuator Setting		
0 dB to 5 dB	±0.3 dB	
10 dB	Reference	
15 dB	±0.3 dB	
20 to 65 dB attenuation	±(0.1 dB + 0.01 × Attenuator Setting)	

Attenuation Accuracy Relative to the 10 dB Attenuator Setting, Characteristic		
	Frequency Range	
Attenuation	**dc–3.0 GHz**	**3.0–13.2 GHz**
0 dB	±0.3 dB	±0.5 dB
5 dB	±0.3 dB	±0.5
10 dB	Reference	Reference
15 dB	±0.4 dB	±0.5 dB
20 dB	±0.4 dB	±0.5 dB
25 dB	±0.5 dB	±0.6 dB
30 dB	±0.5 dB	±0.6 dB
35 dB	±0.6 dB	±0.7 dB
40 dB	±0.6 dB	±0.7 dB
45 dB	±0.7 dB	±1.0 dB
50 dB	±0.7 dB	±1.0 dB
55 dB	±0.9 dB	±1.1 dB
60 dB	±0.9 dB	±1.1 dB
65 dB	±1.0 dB	±1.6 dB

	Specifications	Supplemental Information
Preamp		Refer also to Displayed Average Noise Level specification
Gain		+20 dB, nominal[a]
Noise figure		5 dB, characteristic

a. Amplifier is between the input attenuator and the input mixer.

	Specifications	Supplemental Information
Absolute Amplitude Accuracy		
At reference settings[a]	±0.34 dB	±0.13 dB, typical
Preamp On[b]	±0.37 dB	±0.14 dB, typical
Overall Amplitude Accuracy[c]		
20 to 30 °C	± (0.54 dB + Absolute Frequency Response)	

a. Settings are: reference level –20 dBm; input attenuation 10 dB; dc coupled; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled, sample detector, signal at reference level.
b. Settings are: reference level –30 dBm; input attenuation 0 dB; dc coupled; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled, signal at reference level.
c. For reference level 0 to –50 dBm; input attenuation 10 dB; dc coupled; RBW 1 kHz; VBW 1 kHz; scale log, log range 0 to –50 dB from reference level; sweep time coupled; signal input 0 to –50 dBm; span ≤20 kHz.

	Specifications	Supplemental Information	
RF Input VSWR (at tuned frequency)		characteristic	characteristic
Attenuator setting 0 dB		(dc coupled)	(ac coupled)
9 kHz to 100 kHz		≤3.0:1	
100 kHz to 13.2 GHz		≤3.0:1	≤3.0:1
100 Hz to 100 kHz *(Option UKB)*		≤1.1:1	
Attenuator setting 5 dB		(dc coupled)	(ac coupled)
9 kHz to 100 kHz		≤2.0:1	
100 kHz to 300 kHz		≤1.4:1	≤2.3:1
300 kHz to 1.0 MHz		≤1.4:1	≤1.6:1
1.0 MHz to 3.0 GHz		≤1.4:1	≤1.4:1
3.0 GHz to 6.7 GHz		≤1.4:1	≤1.7:1
6.7 GHz to 13.2 GHz		≤1.7:1	≤1.9:1
100 Hz to 100 kHz *(Option UKB)*		≤1.1:1	

	Specifications	Supplemental Information	
Attenuator setting 10 to 65 dB		(dc coupled)	(ac coupled)
9 kHz to 100 kHz		≤2.0:1	
100 kHz to 300 kHz		≤1.3:1	≤2.1:1
300 kHz to 1.0 MHz		≤1.3:1	≤1.5:1
1.0 MHz to 3.0 GHz		≤1.3:1	≤1.3:1
3.0 GHz to 6.7 GHz		≤1.3:1	≤1.5:1
6.7 GHz to 13.2 GHz		≤1.5:1	≤1.7:1
100 Hz to 100 kHz *(Option UKB)*		≤1.1:1	

	Specifications	Supplemental Information
Auto Alignment[a]		
Sweep-to-sweep variation		±0.1 dB, characteristic

a. Set **Auto Align** to **Off** and use **Align Now, All** to eliminate this variation.

	Specifications	Supplemental Information
Resolution Bandwidth Switching Uncertainty (at Reference Level)		
1 kHz RBW	Reference	
3 kHz to 3 MHz RBW	±0.3 dB	
5 MHz RBW	±0.6 dB	
10 Hz to 300 Hz RBW	±0.3 dB	

	Specifications	Supplemental Information
Reference Level		
Range	–149.9 dBm to maximum mixer level + attenuator setting	
Resolution		
Log Scale	±0.1 dB	
Linear Scale	±0.12% of Reference Level	

	Specifications	Supplemental Information
Accuracy (at a fixed frequency, a fixed attenuator, and referenced to –30 dBm(–10 dBm, Preamp On))		
Reference Level (dBm) – input attenuator setting (dB) + preamp gain (dB)		
–10 dBm to > –60 dBm	±0.3 dB	
–60 dBm to > –85 dBm	±0.5 dB	
–85 dBm to –90 dBm	±0.7 dB	

	Specifications	Supplemental Information
Display Scale Switching Uncertainty		
Switching between Linear and Log	±0.15 dB at reference level	
Log Scale Switching	No error	

	Specifications	Supplemental Information
Display Scale Fidelity		
Log Maximum Cumulative		
RBW ≥ 1 kHz		
dB Below Reference Level		
0 dB Reference	0 dB	
> 0 to 10 dB	±0.22 dB	±0.08 dB, typical
> 10 to 20 dB	±0.24 dB	±0.09 dB, typical
> 20 to 30 dB	±0.26 dB	±0.10 dB, typical
> 30 to 40 dB	±0.40 dB	±0.23 dB, typical
> 40 to 50 dB	±0.57 dB	±0.35 dB, typical
> 50 to 60 dB	±0.57 dB	±0.35 dB, typical
> 60 to 70 dB	±0.66 dB	±0.39 dB, typical
>70 to 80 dB	±0.66 dB	±0.46 dB, typical
>80 to 85 dB	±1.15 dB	±0.79 dB, typical

	Specifications	Supplemental Information
RBW = 200 Hz		
0 to 30 dB below reference level	±(0.3 dB + 0.01 × dB from reference level)	
RBW = 10 Hz, 30 Hz, 100 Hz, or 300 Hz		
Span > 0 Hz		
Auto range On		
0 to 98 dB below reference level	±(0.3 dB + 0.01 × dB from reference level)	
> 98 to 120 dB below reference level		±2.0 dB, characteristic
Auto range Off		
0 to 60 dB below reference level	±(0.3 dB + 0.015 × dB from reference level)	
> 60 to 70 dB below reference level	±1.5 dB	
Span = 0 Hz[a]		
0 to 60 dB below reference level	±(0.3 dB + 0.015 × dB from reference level)	
> 60 to 70 dB below reference level	±1.5 dB	
Log Incremental Accuracy		
0 to 80 dB[b] below reference level	±0.4 dB/4 dB	
Linear Accuracy	±2% of Reference Level	

a. The SCPI command for auto range off is:
(:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF)

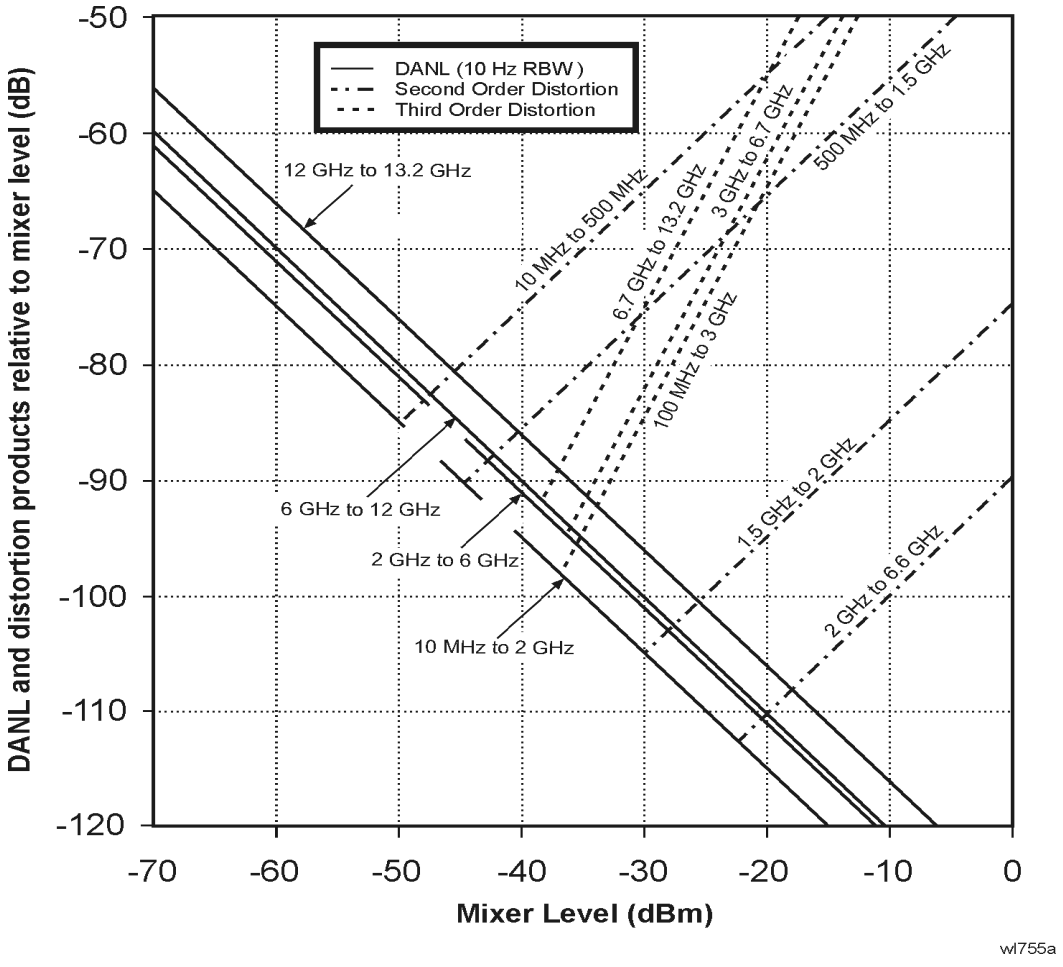
b. 0 to –50 dB for RBWs ≤ 300 Hz and span = 0 Hz, or when auto ranging is off.

	Specifications	Supplemental Information
Spurious Responses		
Second Harmonic Distortion		
Input Signal		
10 MHz to 500 MHz	< –65 dBc for –30 dBm signal at input mixer[a]	+35 dBm SHI (second harmonic intercept)
500 MHz to 1.5 GHz	< –75 dBc for –30 dBm signal at input mixer[a]	+45 dBm SHI
1.5 GHz to 2.0 GHz	< –85 dBc for –10 dBm signal at input mixer[a]	+75 dBm SHI
2.0 GHz to 3.35 GHz	< –100 dBc[b] for –10 dBm signal at input mixer[a]	+90 dBm SHI
3.35 GHz to 6.6 GHz	< –100 dBc[b] for –10 dBm signal at input mixer[a]	+90 dBm SHI
Preamp On 10 MHz to 1.5 GHz		–5 dBm SHI, characteristic
Third Order Intermodulation Distortion		
10 MHz to 100 MHz		+7 dBm TOI (third order intercept), characteristic
100 MHz to 3 GHz	< –85 dBc for two –30 dBm signals at input mixer[a] and >50 kHz separation	+12.5 dBm TOI +16 dBm TOI, typical
3.0 GHz to 6.7 GHz	< –82 dBc for two –30 dBm signals at input mixer[a] and >50 kHz separation	+11 dBm TOI +18 dBm TOI, typical
6.7 GHz to 13.2 GHz	< –75 dBc for two –30 dBm signals at input mixer[a] and >50 kHz separation	+7.5 dBm TOI +12 dBm TOI, typical
Preamp On 10 MHz to 3 GHz		–16 dBm TOI, characteristic

	Specifications	Supplemental Information
Other Input Related Spurious		
Inband Responses		
>30 kHz offset	< –65 dBc for –20 dBm signal at input mixer[a]	
Out-of-band Responses	< –80 dBc for –10 dBm signal at input mixer[a]	

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).
b. or signal below displayed average noise level.

Specified Dynamic Range



	Specifications	Supplemental Information
Residual Responses (Input terminated and 0 dB attenuation) 150 kHz to 6.7 GHz	< –90 dBm	

	Specifications	Supplemental Information
Quasi-Peak Detector	The quasi-peak detector provides the quasi-peak amplitude of pulsed radio frequency (RF) or continuous wave (CW) signals. The amplitude response conforms to Publication 16 of CISPR Section 1, Clause 2, except as indicated in the Relative Quasi-Peak Response Table.	

Relative Quasi-Peak Response to a CISPR Pulse (dB)			
Frequency Band			
Pulse Repetition Frequency	**120 kHz EMI BW 0.03 to 1 GHz**	**9 kHz EMI BW 0.15 to 30 MHz**	**200 Hz EMI BW 9 to 150 kHz**
1000 Hz	+8.0 ± 1.0	+4.5 ± 1.0	N/A
100 Hz	0 dB reference[a]	0 dB reference[a]	+4.0 ± 1.0
60 Hz	N/A	N/A	+3.0 ± 1.0
25 Hz	N/A	N/A	0 dB reference[a]
20 Hz	–9.0 ± 1.0	–6.5 ± 1.0	N/A
10 Hz	–14.0 ± 1.5	–10.0 ± 1.5	–4.0 ± 1.0
5 Hz	N/A	N/A	–7.5 ± 1.5
2 Hz	–26.0 ± 2.0	–20.5 ± 2.0	–13.0 ± 2.0
1 Hz		–22.5 ± 2.0	–17.0 ± 2.0
Isolated Pulse		–23.5 ± 2.0	–19.0 ± 2.0

a. Reference pulse amplitude accuracy relative to a 66 dBµV CW signal is <1.5 dB as specified in CISPR Publication 16. CISPR reference pulse: 0.044 µVs for 30 MHz to 1.0 GHz, 0.316 µVs for 15 kHz to 30 MHz, and 13.5 µVs for 9 to 150 kHz.

	Specifications	Supplemental Information
FM Demodulation		
Input level		(–60 dBm + attenuator setting), characteristic
Signal level		0 to –30 dB below reference level, characteristic

Options

Time Gated Spectrum Analysis (Option 1D6)

	Specifications	Supplemental Information
Gate Delay		
Range	1 µs to 400 s	
Accuracy	±(500 ns + (0.01% × (maximum of gate delay or length)))	From gate trigger input to positive edge of gate output
Gate Length		
Range	1 µs to 400 s	
Accuracy	±(500 ns + (0.01% × (maximum of gate delay or length)))	From positive edge to negative edge of gate output
Resolution	((maximum of gate delay or length in seconds)/65000) rounded up to nearest µs	Dependent on the greater of gate delay or gate length
Additional Amplitude Error[a]		
Log Scale	±0.2 dB	
Linear Scale	±0.1% of reference level	

a. While in gate mode.

Tracking Generator (Option 1DN)

The spectrum analyzer/tracking generator combination will meet its specification after a cable (8120-5148) and adapter are connected between RF OUT and INPUT and **Align Now**, **TG** has been run.

	Specifications	Supplemental Information
Warm-up	5 minutes	

	Specifications	Supplemental Information
Output Frequency Range	9 kHz to 3.0 GHz	

	Specifications	Supplemental Information
Minimum Resolution BW	1 kHz	Not usable with resolution bandwidths ≤300 Hz

	Specifications	Supplemental Information
Output Power Level		
Range	–2 to –66 dBm	
Resolution	0.1 dB	
Absolute Accuracy (at 50 MHz with coupled source attenuator, referenced to –20 dBm)	± 0.75 dB	
Vernier		
Range	8 dB	
Accuracy (with coupled source attenuator, 50 MHz, –20 dBm)		
Incremental	±0.2 dB/dB	
Cumulative	±0.5 dB, total	
Output Attenuator Range	0 to 56 dB in 8 dB steps	

	Specifications	Supplemental Information
Maximum Safe Reverse Level		+30 dBm (1 W), 50 Vdc, characteristic

	Specifications	Supplemental Information
Output Power Sweep		
Range	(–10 to –2 dBm) – (Source Attenuator Setting)	
Resolution	0.1 dB	
Accuracy (zero span)	<1 dB peak-to-peak	

	Specifications	Supplemental Information
Output Flatness		
Referenced to 50 MHz, –20 dBm		
9 kHz to 10 MHz	±3 dB	
10 MHz to 3 GHz	±2 dB	

	Specifications	Supplemental Information
Spurious Outputs		
(–2 dBm output)		
Harmonic Spurs		
TG Output 9 kHz to 20 kHz	≤ –15 dBc	
TG Output 20 kHz to 3 GHz	≤ –25 dBc	
Non-harmonic Spurs		
TG Output 9 kHz to 2 GHz	≤ –27 dBc	
TG Output 2 GHz to 3 GHz	≤ –23 dBc	
LO Feedthrough		
LO Frequency 3.921409 GHz to 6.9214 GHz	≤ –16 dBm	

	Specifications	Supplemental Information
Dynamic Range	Maximum Output Power Level – Displayed Average Noise Level	

	Specifications	Supplemental Information
Output Tracking		
Drift		1.5 kHz/5 minute, characteristic
Swept Tracking Error		Usable in 1 kHz RBW after 5 minutes of warm-up

	Specifications	Supplemental Information
RF Power-Off Residuals		
9 kHz to 3 GHz		< –120 dBm, characteristic

	Specifications	Supplemental Information
Output Attenuator Repeatability		
9 kHz to 300 MHz		±0.1 dB, characteristic
300 MHz to 2 GHz		±0.2 dB, characteristic
2 GHz to 3 GHz		±0.3 dB, characteristic

	Specifications	Supplemental Information
Output VSWR		
0 dB attenuation		<2.0:1, characteristic
≥ 8 dB attenuation		<1.5:1, characteristic

	Specifications	Supplemental Information
Output Attenuator Accuracy		
0 dB		±0.5 dB, characteristic
8 dB		±0.5 dB, characteristic
16 dB	Reference	
24 dB		±0.5 dB, characteristic
32 dB		±0.6 dB, characteristic
40 dB		±0.8 dB, characteristic
48 dB		±1.0 dB, characteristic
56 dB		±1.1 dB, characteristic

Tracking Generator Output Accuracy
Relative Accuracy (Referred to –20 dBm) = Output Attenuator Accuracy + Vernier Accuracy + Output Flatness
Absolute Accuracy = Relative Accuracy (Referred to –20 dBm) + Absolute Accuracy at 50 MHz

General

	Specifications	Supplemental Information
Temperature Range		
Operating	0 to 55 °C	Floppy disk 10 to 40 °C
Storage	–40 to 75 °C	

	Specifications	Supplemental Information
Audible Noise (ISO 7779)		
Sound Pressure at 25 °C		<40 dBa, (<4.6 Bels power)

	Specifications	Supplemental Information
Military Specification	Has been type tested to the environmental specifications of MIL-PRF-28800F class 3.	

	Specifications	Supplemental Information
EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class B[a].	

a. Meets Class A performance during dc operation or serial number US41110000 or lower.

	Specifications	Supplemental Information
Immunity Testing		
Radiated Immunity		Testing was done at 3 V/m according to IEC 801-3/1984. When the analyzer tuned frequency is identical to the immunity test signal frequency, there may be signals of up to –60 dBm displayed on the screen.
Electrostatic Discharge		Air discharges of up to 8 kV were applied according to IEC 801-2/1991. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

	Specifications	Supplemental Information
Power Requirements		
ac Operation		
Voltage, frequency	90 to 132 Vrms, 47 to 440 Hz 195 to 250 Vrms, 47 to 66 Hz	
Power Consumption, On	<300 W	
Power Consumption, Standby	<5 W	
dc Operation		
Voltage	12 to 20 Vdc	
Power Consumption	<200 W	
Power Consumption, Standby	<100 mW	

	Specifications	Supplemental Information
Measurement Speed		
Local Measurement and Display Update rate[a]		
Sweep points = 101		≥ 40/s, characteristic
Sweep points = 401		≥ 28/s, characteristic
Remote Measurement and GPIB Transfer Rate[b,c]		
Sweep points = 101		≥ 40/s, characteristic
Sweep points = 401		≥ 28/s, characteristic
RF Center Frequency Tune, Measure, and GPIB Transfer Time[b,d]		
Sweep points = 101		≤ 75 ms, characteristic
Sweep points = 401		≤ 90 ms, characteristic

a. Factory preset, auto align Off, fixed center frequency, RBW = 1 MHz, spans >10 MHz and ≤600 MHz, and stop frequency ≤3 GHz.
b. Display Off (:DISPlay:ENABle OFF), and 32-bit integer data format (:FORMat:DATA INT,32), if *Option AYX* or *A4J* is installed, disable sweep ramp, (:SYSem:PORTs:IFVSweep:ENABle OFF), markers Off, single sweep, measured with IBM compatible PC with 550 MHz Pentium® III running Windows® NT 4.0, one meter GPIB cable, National Instruments PCI-GPIB card and NI-488.2 DLL.
c. Factory preset, auto align Off, fixed center frequency, RBW = 1 MHz, and span = 20 MHz, fixed center frequency, stop frequency ≤3 GHz, average of 100 measurements.
d. Factory preset, auto align Off, RBW = 1 MHz, span= 20 MHz, stop frequency ≤3 GHz, center frequency tune step size = 50 MHz.

	Specifications	Supplemental Information
Data Storage		
Internal		200 Traces or States[a]
External (10 to 40 °C) 3.5" 1.44 MB, MS-DOS® compatible floppy disk		200 Traces or States[a]

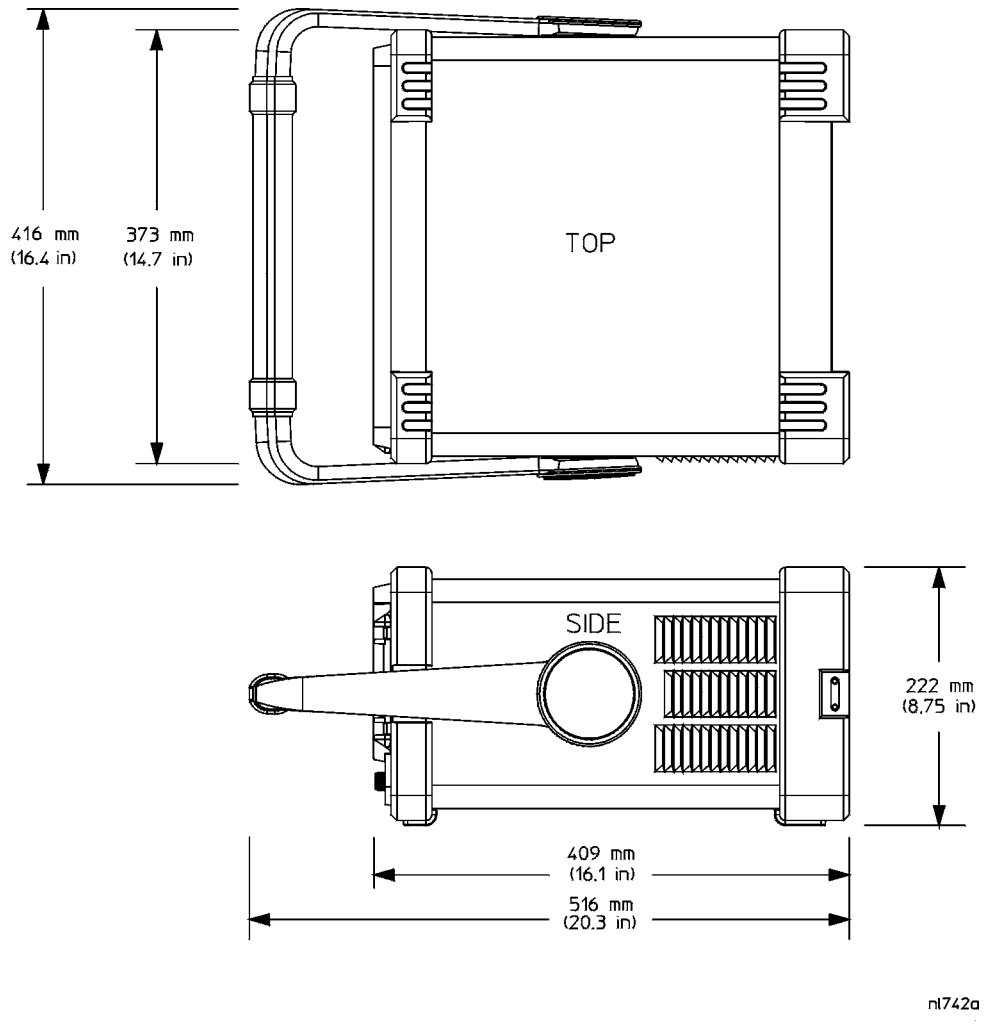
a. When storing traces set to 401 points.

	Specifications	Supplemental Information
Downloadable Program Memory		10 MB available memory

	Specifications	Supplemental Information
Demod Tune and Listen		Internal speaker, front-panel earphone jack and front-panel volume control.
Demod	AM and FM	An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

	Specifications	Supplemental Information
Weight (without options)		
Net		17.1 kg (37.7 lb), characteristic
Shipping		31.0 kg (68 lb), characteristic

Dimensions


416 mm
(16.4 in)
373 mm
(14.7 in)
TOP
SIDE
222 mm
(8.75 in)
409 mm
(16.1 in)
516 mm
(20.3 in)
nl742a

Inputs and Outputs

Front Panel

	Specifications	Supplemental Information
INPUT 50 Ω		
Connector	Type-N female	
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
RF OUT 50 Ω, *(Option 1DN)*		
Connector	Type-N female	
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
AMPTD REF OUT[a]		Amplitude Reference
Connector	BNC female	
Impedance		50 Ω, nominal
Frequency		50 MHz
Frequency Accuracy		Frequency reference error[b]
50 Ω Amplitude[c]		–20 dBm, nominal

a. Turn the amplitude reference on/off by pressing the keys: **Input/Output**, **Amptd Ref Out**.
b. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).
c. The internal amplitude reference actual power is stored internally.

	Specifications	Supplemental Information
PROBE POWER		
Voltage/Current		+15 Vdc, ±7% at 150 mA max., characteristic –12.6 Vdc ±10% at 150 mA max., characteristic

	Specifications	Supplemental Information
EXT KEYBOARD[a]		Used for entering screen titles and filenames only. Interface compatible with most IBM-compatible PC keyboards.
Connector	6-pin mini-DIN	

a. The feature is not implemented in firmware revisions prior to A.06.00.

	Specifications	Supplemental Information
Speaker		Front panel knob controls volume

	Specifications	Supplemental Information
Headphone		Front panel knob controls volume
Connector	3.5 mm (1/8 inch) miniature audio jack	
Power Output		0.2 W into 4 Ω, characteristic

Rear Panel

	Specifications	Supplemental Information
10 MHz REF OUT		
Connector	BNC female	
Impedance		50 Ω, nominal
Output Amplitude		>0 dBm, characteristic

	Specifications	Supplemental Information
10 MHz REF IN		
Connector	BNC female	Note: Analyzer noise sidebands and spurious response performance may be affected by the quality of the external reference used.
Impedance		50 Ω, nominal
Input Amplitude Range		–15 to +10 dBm, characteristic
Frequency		10 MHz, nominal

	Specifications	Supplemental Information
GATE TRIG/EXT TRIG IN		
Connector	BNC female	
External Trigger Input		
Trigger Level		Selectable positive or negative edge initiates sweep in EXT TRIG mode (5 V TTL)
Gate Trigger Input *(Option 1D6)*		
Minimum Pulse Width		>30 ns (5 V TTL)

	Specifications	Supplemental Information
GATE/HI SWP OUT		
Connector	BNC female	
High Sweep Output		
Level		High = sweep[a]; Low = retrace (5 V TTL)
Gate Output *(Option 1D6)*		
Level		High = gate on; Low = gate off (5 V TTL)

a. High sweep may be high longer than the indicated sweep times.

	Specifications	Supplemental Information
VGA OUTPUT		
Connector	VGA compatible, 15-pin mini D-SUB	
Format		VGA (31.5 kHz horizontal, 60 Hz vertical sync rates, non-interlaced) Analog RGB
Resolution	640 × 480	

	Specifications	Supplemental Information
AUX IF OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Frequency		21.4 MHz, nominal

	Specifications	Supplemental Information
Amplitude (for signal at reference level and for reference levels – input attenuation + preamp gain of –10 to –70 dBm)		–10 dBm (uncorrected), characteristic
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
AUX VIDEO OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Amplitude Range (into >10 kΩ)		0 to 1 V (uncorrected), characteristic

	Specifications	Supplemental Information
HI SWP IN *(Option A4J or AYX)*		
Connector	BNC female	
Input		Open collector, low resets and holds the sweep (5 V TTL)

	Specifications	Supplemental Information
HI SWP OUT *(Option A4J or AYX)*		
Connector	BNC female	
Output		High = sweep[a], Low = retrace (5 V TTL)

a. High sweep may be high longer than the indicated sweep times.

	Specifications	Supplemental Information
SWP OUT *(Option A4J or AYX)*		
Connector	BNC female	
Amplitude		0 to +10 V ramp, characteristic

	Specifications	Supplemental Information
PRESEL TUNE OUTPUT		
Connector	BNC female	
Load Impedance (dc coupled)		> 10 kΩ, nominal
Range		0 to +10 V, characteristic
Sensitivity		0.33 V/GHz of tuned frequency > 3 GHz, characteristic

	Specifications	Supplemental Information
GPIB Interface		
Connector	IEEE-488 bus connector	
GPIB Codes		SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28

	Specifications	Supplemental Information
Serial Interface *(Option 1AX)*		
Connector	9-pin D-SUB male	RS-232

	Specifications	Supplemental Information
Parallel Interface		Printer port only
Connector	25-pin D-SUB female	

Regulatory Information

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.

NOTE This product has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

The CE mark is a registered trademark of the European Community (if accompanied by a year, it is the year when the design was proven).

The CSA mark is the Canadian Standards Association safety mark.

ISM 1-A This is a symbol of an Industrial Scientific and Medical Group 1 Class A product. (CISPR 11, Clause 4)

Declaration of Conformity

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name: Agilent Technologies, Inc.

Manufacturer's Address: 1400 Fountaingrove Parkway
Santa Rosa, CA 95403-1799
USA

Declares that the products

Product Name: Spectrum Analyzer

Model Number: HP E7401A, HP E7402A, HP E7403A,
HP E7404A, HP E7405A

Product Options: This declaration covers all options of the above products.

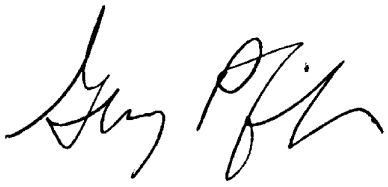
Conform to the following product specifications:

EMC: IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998

Standard	Limit
CISPR 11:1990 / EN 55011-1991	Group 1, Class A
IEC 61000-4-2:1995+A1998 / EN 61000-4-2:1995	4 kV CD, 8 kV AD
IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80 - 1000 MHz
IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5 kV sig., 1 kV power
IEC 61000-4-5:1995 / EN 61000-4-5:1996	0.5 kV L-L, 1 kV L-G
IEC 61000-4-6:1996 / EN 61000-4-6:1998	3 V, 0.15 – 80 MHz
IEC 61000-4-11:1994 / EN 61000-4-11:1998	1 cycle, 100%

Safety: IEC 61010-1:1990 + A1:1992 + A2:1995 / EN 61010-1:1993 +A2:1995
CAN/CSA-C22.2 No. 1010.1-92

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.



Santa Rosa, CA, USA 4 Feb. 2000

Greg Pfeiffer/Quality Engineering Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.

5 Agilent E7405A Specifications and Characteristics

About This Chapter

This chapter contains specifications and characteristics for the Agilent E7405A spectrum analyzer. The distinction between specifications and characteristics is described as follows.

- Specifications describe the performance of parameters covered by the product warranty. (The temperature range is 0 °C to 55 °C, unless otherwise noted.)
- Characteristics describe product performance that is useful in the application of the product, but is not covered by the product warranty.
- Typical performance describes additional product performance information that is not covered by the product warranty. It is performance beyond specification that 80% of the units exhibit with a 95% confidence level over the temperature range 20 to 30 °C. Typical performance does not include measurement uncertainty.
- Nominal values indicate the expected performance, or describe product performance that is useful in the application of the product, but is not covered by the product warranty.

The following conditions must be met for the analyzer to meet its specifications.

- The analyzer is within the one year calibration cycle.
- If **Auto Align All** is selected:
  - After 2 hours of storage within the operating temperature range.
  - 5 minutes after the analyzer is turned on with sweep times less than 4 seconds[1].
  - After the front-panel amplitude reference is connected to the INPUT, and **Align Now RF** has been run, after the analyzer is turned on. And, once every 24 hours, or if ambient temperature changes more than 30 °C[2].

1. A Warm-up time of 25 minutes is required for a sweep time of 20 seconds.
2. 10 °C if preamp is on.

- If **Auto Align Off** is selected:
  - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
  - After the analyzer is turned on for a minimum of 90 minutes, the front panel amplitude reference has been connected to the INPUT, and **Align Now All** has been run.
  - When **Align Now All** is run:
    - Every hour
    - If the ambient temperature changes more than 3 °C
    - If the 10 MHz reference changes
  - When **Align Now RF** is run (with the front-panel amplitude reference connected to the INPUT):
    - Every 24 hours
    - If the ambient temperature changes more than 30 °C[1]
- If **Auto Align All but RF** is selected:
  - When the analyzer is at a constant temperature, within the operating temperature range, for a minimum of 90 minutes.
  - After the analyzer is turned on for a minimum of 90 minutes, the front panel amplitude reference has been connected to the INPUT, and **Align Now RF** has been run.
  - When **Align Now RF** is run (with the front-panel amplitude reference connected to the INPUT):
    - Every hour
    - If the ambient temperature changes more than 3 °C

1. 10 °C if preamp is on.

Frequency

	Specifications	Supplemental Information
Frequency Range	9 kHz to 26.5 GHz	
(Option UKB)		
dc coupled	100 Hz to 26.5 GHz	30 Hz to 26.5 GHz, characteristic
ac coupled	10 MHz to 26.5 GHz	
Band		Harmonic Mixing Mode (N[a])
0 (0 Hz to 3.0 GHz)		1–
1 (2.85 GHz to 6.7 GHz)		1–
2 (6.2 GHz to 13.2 GHz)		2–
3 (12.8 GHz to 19.2 GHz)		4–
4 (18.7 GHz to 26.5 GHz)		4–
Preamp On	1 MHz to 3.0 GHz	
(Option UKB)		
dc coupled	1 MHz to 3.0 GHz	
ac coupled	10 MHz to 3.0 GHz	

a. N is the harmonic mixing mode. For negative mixing modes (as indicated by the "–"), the desired 1st LO harmonic is higher than the tuned frequency by the 1st IF (3.9214 for the 9 kHz to 3 GHz band, 321.4 MHz for all other bands).

	Specifications	Supplemental Information
Frequency Reference		
Aging Rate	$\pm 2 \times 10^{-6}$/year	$\pm 1.0 \times 10^{-7}$/day, characteristic
Settability	$\pm 5 \times 10^{-7}$	
Temperature Stability	$\pm 5 \times 10^{-6}$	

	Specifications	Supplemental Information
High Stability Frequency Reference *(Option 1D5)*		
Aging Rate	$\pm 1 \times 10^{-7}$/year	$\pm 5 \times 10^{-10}$/day, 7-day average after being powered on for 7 days, characteristic
Settability	$\pm 1 \times 10^{-8}$	
Temperature Stability		
20 to 30 °C	$\pm 1 \times 10^{-8}$	
0 to 55 °C	$\pm 5 \times 10^{-8}$	
Warm-up (Internal frequency reference selected)		
After 5 minutes		$< \pm 1 \times 10^{-7}$ of final frequency,[a] characteristic
After 15 minutes		$< \pm 1 \times 10^{-8}$ of final frequency,[a] characteristic

a. Final frequency is defined as frequency 60 minutes after power-on with analyzer set to internal frequency reference.

	Specifications	Supplemental Information
Frequency Readout Accuracy		
(Start, Stop, Center, Marker)	±((frequency indication × frequency reference error[a]) + 0.5% of span + $\frac{\text{span}}{\text{sweep points} - 1}$ + 15% of RBW + 10 Hz + 1 Hz × N[b])	

a. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).
b. N is the harmonic mixing mode.

	Specifications	Supplemental Information
Marker Frequency Counter		
Resolution	Selectable from 1 Hz to 100 kHz	
Accuracy[a]	±(marker frequency × frequency reference error[b] + counter resolution)[c]	For RBW ≥ 1 kHz

a. Marker level to displayed noise level > 25 dB, RBW/ Span ≥ 0.002, frequency offset = 0 Hz.
b. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).
c. For firmware revisions prior to A.03.00, add 1 Hz x N, where N is the harmonic mixing mode.

	Specifications	Supplemental Information
Frequency Span		
Range	0 Hz (zero span), 100 Hz to 26.5 GHz	
Resolution	2 Hz x N[a]	
Accuracy	±(0.5% of span $+ 2 \times \frac{\text{span}}{\text{sweep points} - 1}$)	

a. N is the harmonic mixing mode.

	Specifications	Supplemental Information
Sweep Time		
Range		
Span > 0 Hz	1 ms to 4000 s[a]	$\frac{\text{sweep points} - 1}{100\ \text{kHz}}$ to 4000 s
Span = 0 Hz	10 µs to 4000 s[a]	
Tracking Generator On *(Option 1DN)*		50 ms is the minimum sweep time
Fast Time-domain Sweep *(Option AYX)* (For Span = 0 Hz, RBW ≥ 1 kHz)	50 ns to 4000 s[b]	$\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to 4000 s
Accuracy (Span = 0 Hz)		
10 µs to 4000 s[a]	±1%	
(Option AYX) 50 ns to 4000 s[b]	±1%	
Sweep Trigger[c,d]	Free Run, Single, Line, Video[e], External, Delayed, Offset[f]	
(Option 1D6)	Add Gate	
Delayed Trigger[c,d,g]		
Range	1 µs to 400 s	
Resolution	$\frac{\text{delay in seconds}}{65000}$ rounded up to nearest µs	
Accuracy	±(500 ns + (0.01% of delay))	

	Specifications	Supplemental Information
Offset Trigger[f]		
Resolution	$\frac{\text{sweep time}}{\text{sweep points} - 1}$	
Range	±327 ms to ±12.3 ks	Where ST = sweep time and SP = sweep points $\frac{-32766 \times ST}{SP - 1}$ to $\frac{(32766 - SP) \times ST}{SP - 1}$
Fast Time-domain sweep *(Option AYX)* (For sweep times $\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$)	±1.23 ms to ±245 ms	$\frac{-32766 \times ST}{SP - 1}$ to $\frac{(32766 - SP) \times ST}{SP - 1}$

a. For firmware revisions prior to A.06.00, 5 ms to 2000 s.
b. For firmware revisions prior to A.06.00, 20 µs to 2000 s.
c. Gate cannot be used simultaneously with delayed trigger.
d. Auto align is suspended in video, external, gate, and delayed trigger modes while waiting for a trigger event to occur.
e. Unavailable when RBW ≤ 300 Hz.
f. For firmware revision A.06.00 or later.
g. Delayed trigger is available with line and external trigger.

	Specifications	Supplemental Information
Sweep (trace) Points		
Range		
Span > 0 Hz	101 to 8192[a]	
Span = 0 Hz	2 to 8192[a]	

a. For firmware revisions prior to A.06.00, 401 points.

	Specifications	Supplemental Information
Resolution Bandwidth (RBW)		
Range	10 Hz to 300 Hz (–3 dB) bandwidths in 1-3-10 sequence	Only available in spans ≤ 5 MHz, sweep times ≥ $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$, and not usable with tracking generator on. (*Option 1DN*)
	1 kHz to 3 MHz (–3 dB) bandwidths in 1-3-10 sequence	
	5 MHz (–3 dB) bandwidth	

	Specifications	Supplemental Information
	200 Hz (–6 dB) EMI bandwidth	Only available in spans ≤ 5 MHz, sweep times ≥ $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$, and not usable with tracking generator on. (*Option 1DN*)
	9 kHz, 120 kHz (–6 dB) EMI bandwidth	
	1 MHz (–6 dB) EMI bandwidth	
	1 MHz (Impulse) EMI bandwidth	
Accuracy		
10 Hz to 300 Hz (–3 dB) RBW	±10%	
1 kHz to 3 MHz (–3 dB) RBW	±15%	
5 MHz (–3 dB) RBW	±30%	
200 Hz (–6 dB) RBW	±10%	
9 kHz, 120 kHz (–6 dB) RBW	±15%	
1 MHz (–6 dB) RBW	±10%	
1 MHz (Impulse) RBW	±15%[a]	
Shape		
10 Hz to 300 Hz (–3 dB) RBW		Digital, approximately Gaussian shape
1 kHz to 5 MHz (–3 dB) RBW		Synchronously tuned four poles, approximately Gaussian shape
200 Hz (–6 dB) RBW		Digital, Kaiser Window
9 kHz, 120 kHz, 1 MHz (–6 dB) RBW		Synchronously tuned four poles, approximately Gaussian shape
1 MHz (Impulse) RBW		Synchronously tuned four poles, approximately Gaussian shape
Selectivity		
10 Hz to 300 Hz (–3 dB) RBW		< 5:1, 60 dB / 3 dB bandwidth ratio, characteristic
1 kHz to 5 MHz (–3 dB) RBW		< 15:1, 60 dB / 3 dB bandwidth ratio, characteristic

	Specifications	Supplemental Information
200 Hz (–6 dB) RBW		< 3:1, 40 dB / 6 dB bandwidth ratio, characteristic
9 kHz, 120 kHz, 1 MHz (–6 dB) RBW		< 10:1, 60 dB / 6 dB bandwidth ratio, characteristic
1 MHz (Impulse) RBW		< 10:1, 60 dB / 6 dB bandwidth ratio, characteristic

a. Scale Linear, VBW 3 MHz, signal 0 to –10 dB from reference level.

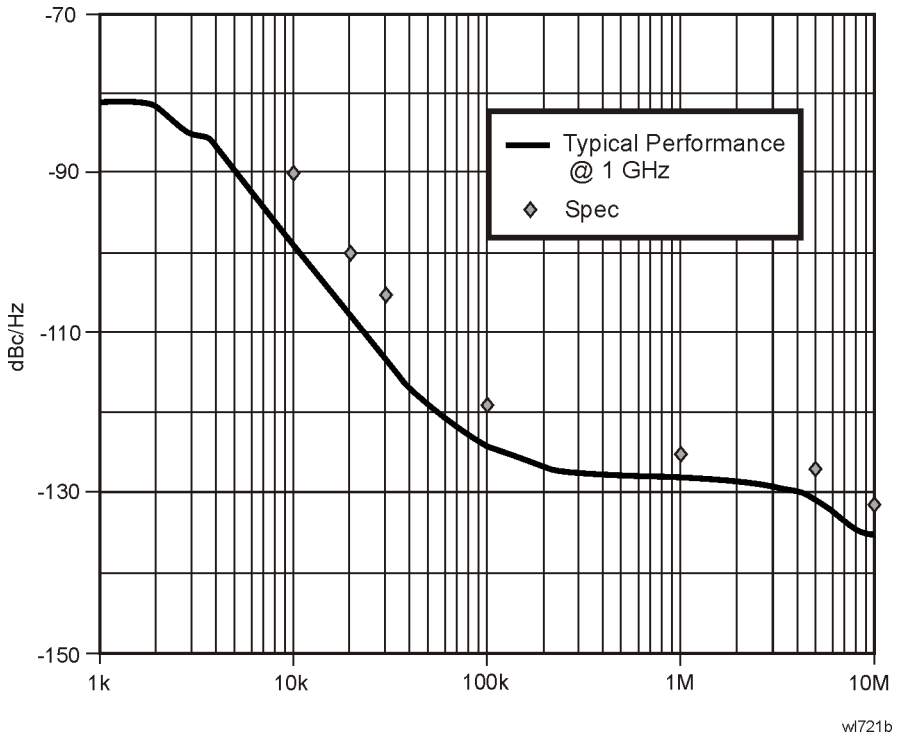
	Specifications	Supplemental Information
Video Bandwidth (VBW) (–3 dB)		
Range	30 Hz to 1 MHz in 1-3-10 sequence 1, 3, 10 Hz for RBW's <1 kHz	3 MHz, characteristic
Accuracy		±30%, characteristic
Shape		Post detection, single pole low-pass filter used to average displayed noise Video bandwidths below 30 Hz are digital bandwidths with anti-aliasing filtering.

	Specifications	Supplemental Information
Stability		
Noise Sidebands (Offset from CW signal with 1 kHz RBW, 30 Hz VBW and sample detector)		
≥1 kHz *(Option 1D5)*		≤ –78 dBc/Hz[a], typical
≥10 kHz	≤ –90 dBc/Hz[a]	≤ –94 dBc/Hz[a], typical
≥20 kHz	≤ –100 dBc/Hz[a]	≤ –105 dBc/Hz[a], typical
≥30 kHz	≤ –106 dBc/Hz[a]	≤ –112 dBc/Hz[a], typical
≥100 kHz	≤ –119 dBc/Hz[a]	≤ –122 dBc/Hz[a], typical
≥1 MHz	≤ –125 dBc/Hz[a]	≤ –127 dBc/Hz[a], typical
≥5 MHz	≤ –127 dBc/Hz[a]	≤ –129 dBc/Hz[a], typical
≥10 MHz	≤ –131 dBc/Hz[a]	≤ –136 dBc/Hz[a], typical

	Specifications	Supplemental Information
Residual FM		
1 kHz RBW, 1 kHz VBW	≤150 Hz × N p–p in 100 ms	
(Option 1D5)	≤100 Hz × N p–p in 100 ms	
10 Hz RBW, 10 Hz VBW *(Option 1D5)*	≤2 Hz × N p–p in 20 ms	
10 Hz RBW, 10 Hz VBW		≤10 Hz × N p–p in 20 ms, characteristic
System-Related Sidebands, offset from CW signal		
≥30 kHz	≤ –65 dBc[a]	
Line-Related Sidebands, offset from CW signal		
<300 Hz		≤ –50 dBc[a], characteristic
>300 Hz to 30 kHz		≤ –55 dBc[a], characteristic

a. Add 20 Log(N) for frequencies > 6.7 GHz.

Noise Sidebands Normalized to 1 Hz Versus Offset from Carrier



Amplitude

Amplitude specifications do not apply for the negative peak detector mode.

	Specifications	Supplemental Information
Measurement Range	Displayed Average Noise Level to Maximum Safe Input Level	
Input Attenuator Range	0 to 65 dB, in 5 dB steps	

	Specifications	Supplemental Information
Maximum Safe Input Level		
Average Continuous Power	+30 dBm (1 W)	
(Input attenuator setting ≥5 dB)		
Peak Pulse Power (for <10 µsec pulse width, <1% duty cycle, and input attenuation ≥30 dB)	+50 dBm (100 W)	
dc	0 Vdc	
(Option UKB)		
dc coupled	0 Vdc	
ac coupled	50 Vdc	

	Specifications	Supplemental Information
1 dB Gain Compression		
Total power at input mixer [a,b]		
50 MHz to 3.0 GHz	0 dBm	
3.0 GHz to 6.7 GHz	0 dBm	
6.7 GHz to 13.2 GHz	–3 dBm	
13.2 GHz to 26.5 GHz	–5 dBm	
Preamp On		
Total power at the preamp[c]		–20 dBm, characteristic

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).
b. For resolution bandwidths 1 kHz to 30 kHz, the maximum input signal amplitude must be ≤ reference level +10 dB.
c. Total power at the preamp (dBm) = total power at the input (dBm) – input attenuation (dB).

	Specifications		Supplemental Information	
Displayed Average Noise Level				
(Input terminated, 0 dB attenuation, sample detector, Reference Level = –70 dBm)				
	1 kHz RBW 30 Hz VBW	10 Hz RBW 1 Hz VBW	1 kHz RBW 30 Hz VBW (typical)	10 Hz RBW 1 Hz VBW (typical)
9 kHz to 100 kHz				≤ –109 dBm
100 kHz to 1 MHz				≤ –135 dBm
1 MHz to 10 MHz			≤ –117 dBm	≤ –137 dBm
10 MHz to 1.0 GHz	≤ –116 dBm	≤ –135 dBm	≤ –119 dBm	≤ –139 dBm
1.0 GHz to 2.0 GHz	≤ –116 dBm	≤ –135 dBm	≤ –120 dBm	≤ –140 dBm
2.0 GHz to 3.0 GHz	≤ –112 dBm	≤ –131 dBm	≤ –118 dBm	≤ –138 dBm
3.0 GHz to 6.0 GHz	≤ –112 dBm	≤ –131 dBm	≤ –118 dBm	≤ –138 dBm
6.0 GHz to 12 GHz	≤ –111 dBm	≤ –130 dBm	≤ –117 dBm	≤ –137 dBm
12 GHz to 22 GHz	≤ –107 dBm	≤ –126 dBm	≤ –114 dBm	≤ –134 dBm
22 GHz to 26.5 GHz	≤ –106 dBm	≤ –125 dBm	≤ –112 dBm	≤ –132 dBm
Preamp On	1 kHz RBW 30 Hz VBW	10 Hz RBW 1 Hz VBW	1 kHz RBW 30 Hz VBW (typical)	10 kHz RBW1 Hz VBW (typical)
0 to 55 °C				
10 MHz to 1.0 GHz	≤ –131 dBm	≤ –150 dBm		
1.0 GHz to 2.0 GHz	≤ –131 dBm	≤ –150 dBm		
2.0 GHz to 3.0 GHz	≤ –127 dBm	≤ –146 dBm		
20 to 30 °C				
1 MHz to 10 MHz *(Option UKB) (dc coupled)*			≤ –135 dBm	≤ –155 dBm
10 MHz to 1.0 GHz	≤ –132 dBm	≤ –151 dBm	≤ –137 dBm	≤ –157 dBm
1.0 GHz to 2.0 GHz	≤ –132 dBm	≤ –151 dBm	≤ –135 dBm	≤ –155 dBm
2.0 GHz to 3.0 GHz	≤ –130 dBm	≤ –149 dBm	≤ –132 dBm	≤ –152 dBm

	Specifications	Supplemental Information
Display Range		
Log Scale	Ten divisions displayed; 0.1, 0.2, 0.5 dB/division and 1 to 20 dB/division in 1 dB steps	
RBW ≥ 1 kHz	Calibrated 0 to –85 dB from Reference Level	
RBW ≤ 300 Hz	Calibrated 0 to –120 dB[a] from Reference Level	
Linear Scale	Ten divisions	
Scale Units	dBm, dBmV, dBµV, dBµA, A, V, W, and Hz	

a. 0 to –70 dB range when span = 0 Hz, or when IF Gain fixed: (:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF).

	Specifications	Supplemental Information
Marker Readout Resolution		
Log scale		
RBW ≥ 1 kHz		
0 to –85 dB from ref level	0.04 dB	
RBW ≤ 300 Hz		
0 to –120 dB from ref level	0.04 dB	
Linear scale	0.01% of Reference Level	
Fast Sweep Times for Zero Span		
(Option AYX)[a] For sweep times $\frac{\text{sweep points} - 1}{20\ \text{MHz}}$ to $\frac{\text{sweep points} - 1}{100\ \text{kHz}}$		
Log 0 to –85 dB from ref level	0.3 dB	
Linear	0.3% of Reference Level for linear scale	

a. For firmware revisions prior to A.06.00, 20 µs to <5 ms.

	Specifications	Supplemental Information
Frequency Response		
Absolute[a]/Relative		
10 dB attenuation		
9 kHz to 3.0 GHz		
20 to 30 °C	±0.46 dB	±0.14 dB, typical
0 to 55 °C	±0.76 dB	
(Option UKB) (dc coupled)		
100 Hz to 3.0 GHz		
20 to 30 °C	±0.5 dB	
0 to 55 °C	±1.0 dB	
30 Hz to 3.0 GHz		
20 to 30 °C		±0.5 dB, characteristic
0 to 55 °C		±1.0 dB, characteristic
(ac coupled)		
10 MHz to 3.0 GHz		
20 to 30 °C	±0.5 dB	
0 to 55 °C	±1.0 dB	
Absolute[a]/Relative Preamp On		
0 dB attenuation		
1 MHz to 3.0 GHz		
20 to 30 °C	±1.5 dB	±0.47 dB, typical
0 to 55 °C	±2.0 dB	
(Option UKB) (dc coupled)		
1 MHz to 3.0 GHz		
20 to 30 °C	±1.5 dB	±0.47 dB, typical
0 to 55 °C	±2.0 dB	

	Specifications	Supplemental Information
(ac coupled)		
10 MHz to 3.0 GHz		
20 to 30 °C	±1.5 dB	
0 to 55 °C	±2.0 dB	
Preselector centered for frequency >3.0 GHz *(Option UKB)* (ac or dc coupled)		
10 dB attenuation		
3.0 GHz to 6.7 GHz		
Absolute[a]		
20 to 30 °C	±1.5 dB	±0.38 dB, typical
0 to 55 °C	±2.5 dB	
Relative		
20 to 30 °C	±1.3 dB	
0 to 55 °C	±1.5 dB	
6.7 GHz to 13.2 GHz		
Absolute[a]		
20 to 30 °C	±2.0 dB	±0.68 dB, typical
0 to 55 °C	±3.0 dB	
Relative		
20 to 30 °C	±1.8 dB	
0 to 55 °C	±2.0 dB	
13.2 GHz to 26.5 GHz		
Absolute[a]		
20 to 30 °C	±2.0 dB	±0.86 dB, typical
0 to 55 °C	±3.0 dB	
Relative		
20 to 30 °C	±1.8 dB	
0 to 55 °C	±2.0 dB	

a. Absolute frequency response values are referenced to the amplitude at 50 MHz.

	Specifications	Supplemental Information
Input Attenuation Switching Uncertainty at 50 MHz		
Attenuator Setting		
0 dB to 5 dB	±0.3 dB	
10 dB	Reference	
15 dB	±0.3 dB	
20 to 65 dB attenuation	±(0.1 dB + 0.01 × Attenuator Setting)	

Attenuation Accuracy Relative to the 10 dB Attenuator Setting, Characteristic					
	Frequency Range				
Attenuation	**dc–3 GHz**	**3.0–13.2 GHz**	**13.2–19 GHz**	**19–22 GHz**	**22–26.5 GHz**
0 dB	±0.3 dB	±0.5 dB	±0.8 dB	±0.9 dB	±1.0 dB
5 dB	±0.3 dB	±0.5 dB	±0.8 dB	±0.9 dB	±1.0 dB
10 dB	Reference	Reference	Reference	Reference	Reference
15 dB	±0.4 dB	±0.5 dB	±0.8 dB	±1.0 dB	±1.5 dB
20 dB	±0.4 dB	±0.5 dB	±0.8 dB	±1.0 dB	±1.5 dB
25 dB	±0.5 dB	±0.6 dB	±0.8 dB	±1.2 dB	±2.0 dB
30 dB	±0.5 dB	±0.6 dB	±0.8 dB	±1.2 dB	±2.0 dB
35 dB	±0.6 dB	±0.7 dB	±1.0 dB	±1.8 dB	±3.0 dB
40 dB	±0.6 dB	±0.7 dB	±1.0 dB	±1.8 dB	±3.0 dB
45 dB	±0.7 dB	±1.0 dB	±1.3 dB	±2.2 dB	±3.4 dB
50 dB	±0.7 dB	±1.0 dB	±1.3 dB	±2.2 dB	±3.4 dB
55 dB	±0.9 dB	±1.1 dB	±1.6 dB	±2.7 dB	±3.5 dB
60 dB	±0.9 dB	±1.1 dB	±1.6 dB	±2.7 dB	±3.5 dB
65 dB	±1.0 dB	±1.6 dB	±2.0 dB	±3.2 dB	±3.8 dB

	Specifications	Supplemental Information
Preamp		Refer also to Displayed Average Noise Level specification
Gain		+20 dB, nominal[a]
Noise figure		5 dB, characteristic

a. Amplifier is between the input attenuator and the input mixer.

	Specifications	Supplemental Information
Absolute Amplitude Accuracy		
At reference settings[a]	±0.34 dB	±0.13 dB, typical
Preamp On[b]	±0.37 dB	±0.14 dB, typical
Overall Amplitude Accuracy[c]		
20 to 30 °C	± (0.54 dB + Absolute Frequency Response)	

a. Settings are: reference level –20 dBm; input attenuation 10 dB; dc coupled *(Option UKB)*; center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled, sample detector, signal at reference level.
b. Settings are: reference level –30 dBm; input attenuation 0 dB; dc coupled *(Option UKB);* center frequency 50 MHz; RBW 1 kHz; VBW 1 kHz; scale linear or log; span 2 kHz; sweep time coupled, signal at reference level.
c. For reference level 0 to –50 dBm; input attenuation 10 dB; dc coupled *(Option UKB)*; RBW 1 kHz; VBW 1 kHz; scale log, log range 0 to –50 dB from reference level; sweep time coupled; signal input 0 to –50 dBm; span ≤20 kHz.

	Specifications	Supplemental Information	
RF Input VSWR (at tuned frequency)			
Attenuator setting 0 dB			
9 kHz to 26.5 GHz		≤3.0:1, characteristic	
Attenuator setting 5 dB			
9 kHz to 100 kHz		≤2.0:1, characteristic	
100 kHz to 6.7 GHz		≤1.4:1, characteristic	
6.7 GHz to 13.2 GHz		≤1.7:1, characteristic	
13.2 GHz to 22.0 GHz		≤2.3:1, characteristic	

	Specifications	Supplemental Information	
22.0 GHz to 26.5 GHz		≤2.6:1, characteristic	
Attenuator setting 10 to 65 dB			
9 kHz to 6.7 GHz		≤1.3:1, characteristic	
6.7 GHz to 13.2 GHz		≤1.5:1, characteristic	
13.2 GHz to 22.0 GHz		≤2.0:1, characteristic	
22.0 GHz to 26.5 GHz		≤2.2:1, characteristic	
(Option UKB)		characteristic	characteristic
Attenuator setting 0 dB		(dc coupled)	(ac coupled)
100 Hz to 100 kHz		≤1.1:1	
100 kHz to 3 GHz		≤3.0:1	≤3.0:1
100 kHz to 6.7 GHz		≤1.4:1, characteristic	
6.7 GHz to 13.2 GHz		≤1.7:1, characteristic	
13.2 GHz to 22.0 GHz		≤2.3:1, characteristic	
22.0 GHz to 26.5 GHz		≤2.6:1, characteristic	
Attenuator setting 5 dB		(dc coupled)	(ac coupled)
100 Hz to 100 kHz		≤1.1:1	
100 kHz to 300 kHz		≤1.1:1	≤2.3:1
300 kHz to 1.0 MHz		≤1.1:1	≤1.6:1
1.0 MHz to 3.0 GHz		≤1.4:1	≤1.4:1
100 kHz to 6.7 GHz		≤1.4:1, characteristic	
6.7 GHz to 13.2 GHz		≤1.7:1, characteristic	
13.2 GHz to 22.0 GHz		≤2.3:1, characteristic	
22.0 GHz to 26.5 GHz		≤2.6:1, characteristic	

	Specifications	Supplemental Information	
Attenuator setting 10 to 65 dB		(dc coupled)	(ac coupled)
100 Hz to 100 kHz		≤1.1:1	
100 kHz to 300 kHz		≤1.1:1	≤2.1:1
300 kHz to 1.0 MHz		≤1.1:1	≤1.5:1
1.0 MHz to 3.0 GHz		≤1.2:1	≤1.2:1
100 kHz to 6.7 GHz		≤1.4:1, characteristic	
6.7 GHz to 13.2 GHz		≤1.7:1, characteristic	
13.2 GHz to 22.0 GHz		≤2.3:1, characteristic	
22.0 GHz to 26.5 GHz		≤2.6:1, characteristic	

	Specifications	Supplemental Information
Auto Alignment[a]		
Sweep-to-sweep variation		±0.1 dB, characteristic

a. Set **Auto Align** to **Off** and use **Align Now, All** to eliminate this variation.

	Specifications	Supplemental Information
Resolution Bandwidth Switching Uncertainty (at Reference Level)		
1 kHz RBW	Reference	
3 kHz to 3 MHz RBW	±0.3 dB	
5 MHz RBW	±0.6 dB	
10 Hz to 300 Hz RBW	±0.3 dB	

	Specifications	Supplemental Information
Reference Level		
Range	–149.9 dBm to maximum mixer level + attenuator setting	
Resolution		
Log Scale	±0.1 dB	
Linear Scale	±0.12% of Reference Level	
Accuracy (at a fixed frequency, a fixed attenuator, and referenced to –30 dBm(–10 dBm, Preamp On))		
Reference Level (dBm) – input attenuator setting (dB) + preamp gain (dB)		
–10 dBm to > –60 dBm	±0.3 dB	
–60 dBm to > –85 dBm	±0.5 dB	
–85 dBm to –90 dBm	±0.7 dB	

	Specifications	Supplemental Information
Display Scale Switching Uncertainty		
Switching between Linear and Log	±0.15 dB at reference level	
Log Scale Switching	No error	

	Specifications	Supplemental Information
Display Scale Fidelity		
Log Maximum Cumulative		
RBW ≥ 1 kHz		
dB Below Reference Level		
0 dB Reference	0 dB	
> 0 to 10 dB	±0.22 dB	±0.08 dB, typical
> 10 to 20 dB	±0.24 dB	±0.09 dB, typical
> 20 to 30 dB	±0.26 dB	±0.10 dB, typical
> 30 to 40 dB	±0.40 dB	±0.23 dB, typical

	Specifications	Supplemental Information
> 40 to 50 dB	±0.57 dB	±0.35 dB, typical
> 50 to 60 dB	±0.57 dB	±0.35 dB, typical
> 60 to 70 dB	±0.66 dB	±0.39 dB, typical
>70 to 80 dB	±0.66 dB	±0.46 dB, typical
>80 to 85 dB	±1.15 dB	±0.79 dB, typical
RBW = 200 Hz		
0 to 30 dB below reference level	±(0.3 dB + 0.01 × dB from reference level)	
RBW = 10 Hz, 30 Hz, 100 Hz, or 300 Hz		
Span > 0 Hz		
Auto range On		
0 to 98 dB below reference level	±(0.3 dB + 0.01 × dB from reference level)	
> 98 to 120 dB below reference level		±2.0 dB, characteristic
Auto range Off		
0 to 60 dB below reference level	±(0.3 dB + 0.015 × dB from reference level)	
> 60 to 70 dB below reference level	±1.5 dB	
Span = 0 Hz[a]		
0 to 60 dB below reference level	±(0.3 dB + 0.015 × dB from reference level)	
> 60 to 70 dB below reference level	±1.5 dB	
Log Incremental Accuracy		
0 to 80 dB[b] below reference level	±0.4 dB/4 dB	
Linear Accuracy	±2% of Reference Level	

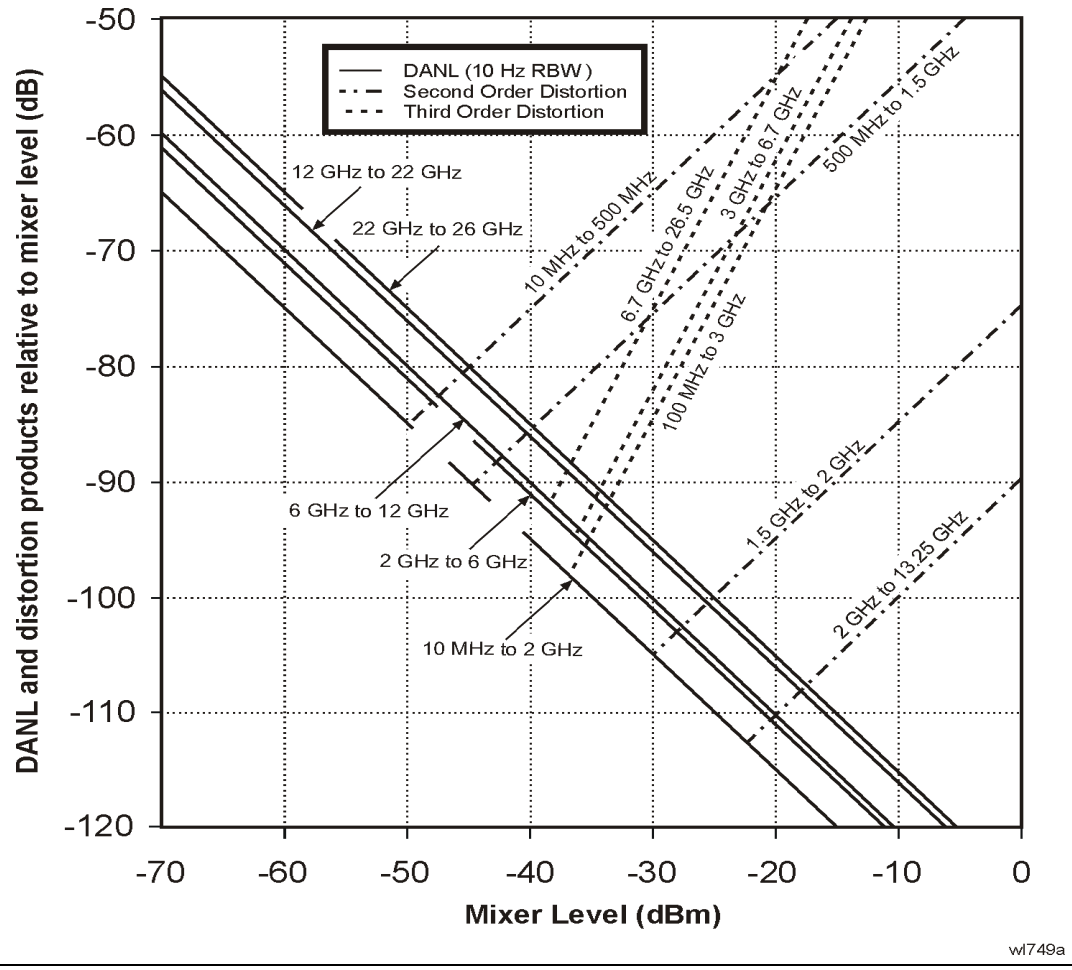
a. The SCPI command for auto range off is: (:DISPlay:WINDow:TRACe:Y[:SCALe]:LOG:RANGe:AUTO OFF)
b. 0 to –50 dB for RBWs ≤ 300 Hz and span = 0 Hz, or when auto ranging is off.

	Specifications	Supplemental Information
Spurious Responses		
Second Harmonic Distortion		
Input Signal		
10 MHz to 500 MHz	< –65 dBc for –30 dBm signal at input mixer[a]	+35 dBm SHI (second harmonic intercept)
500 MHz to 1.5 GHz	< –75 dBc for –30 dBm signal at input mixer[a]	+45 dBm SHI
1.5 GHz to 2.0 GHz	< –85 dBc for –10 dBm signal at input mixer[a]	+75 dBm SHI
2.0 GHz to 3.35 GHz	< –100 dBc[b] for –10 dBm signal at input mixer[a]	+90 dBm SHI
3.35 GHz to 6.6 GHz	< –100 dBc[b] for –10 dBm signal at input mixer[a]	+90 dBm SHI
6.6 GHz to 13.25 GHz	< –100 dBc[b] for –10 dBm signal at input mixer[a]	+90 dBm SHI
Preamp On 10 MHz to 1.5 GHz		–5 dBm SHI, characteristic
Third Order Intermodulation Distortion		
10 MHz to 100 MHz		+7 dBm TOI (third order intercept), characteristic
100 MHz to 3 GHz	< –85 dBc for two –30 dBm signals at input mixer[a] and >50 kHz separation	+12.5 dBm TOI +16 dBm TOI, typical
3.0 GHz to 6.7 GHz	< –82 dBc for two –30 dBm signals at input mixer[a] and >50 kHz separation	+11 dBm TOI +18 dBm TOI, typical
6.7 GHz to 13.2 GHz	< –75 dBc for two –30 dBm signals at input mixer[a] and >50 kHz separation	+7.5 dBm TOI +12 dBm TOI, typical
13.2 GHz to 26.5 GHz	< –75 dBc for two –30 dBm signals at input mixer[a] and >50 kHz separation	+7.5 dBm TOI +11 dBm TOI, typical
Preamp On 10 MHz to 3 GHz		–16 dBm TOI, characteristic

	Specifications	Supplemental Information
Other Input Related Spurious		
Inband Responses		
>30 kHz offset	< –65 dBc for –20 dBm signal at input mixer[a]	
Out-of-band Responses	< –80 dBc for –10 dBm signal at input mixer[a]	

a. Mixer power level (dBm) = input power (dBm) – input attenuation (dB).
b. or signal below displayed average noise level.

Specified Dynamic Range



	Specifications	Supplemental Information
Residual Responses (Input terminated and 0 dB attenuation) 150 kHz to 6.7 GHz	< –90 dBm	

	Specifications	Supplemental Information
Quasi-Peak Detector	The quasi-peak detector provides the quasi-peak amplitude of pulsed radio frequency (RF) or continuous wave (CW) signals. The amplitude response conforms to Publication 16 of CISPR Section 1, Clause 2, except as indicated in the Relative Quasi-Peak Response Table.	

Relative Quasi-Peak Response to a CISPR Pulse (dB)			
Frequency Band			
Pulse Repetition Frequency	**120 kHz EMI BW 0.03 to 1 GHz**	**9 kHz EMI BW 0.15 to 30 MHz**	**200 Hz EMI BW 9 to 150 kHz**
1000 Hz	+8.0 ± 1.0	+4.5 ± 1.0	N/A
100 Hz	0 dB reference[a]	0 dB reference[a]	+4.0 ± 1.0
60 Hz	N/A	N/A	+3.0 ± 1.0
25 Hz	N/A	N/A	0 dB reference[a]
20 Hz	–9.0 ± 1.0	–6.5 ± 1.0	N/A
10 Hz	–14.0 ± 1.5	–10.0 ± 1.5	–4.0 ± 1.0
5 Hz	N/A	N/A	–7.5 ± 1.5
2 Hz	–26.0 ± 2.0	–20.5 ± 2.0	–13.0 ± 2.0
1 Hz		–22.5 ± 2.0	–17.0 ± 2.0
Isolated Pulse		–23.5 ± 2.0	–19.0 ± 2.0

a. Reference pulse amplitude accuracy relative to a 66 dBµV CW signal is <1.5 dB as specified in CISPR Publication 16. CISPR reference pulse: 0.044 µVs for 30 MHz to 1.0 GHz, 0.316 µVs for 15 kHz to 30 MHz, and 13.5 µVs for 9 to 150 kHz.

	Specifications	Supplemental Information
FM Demodulation		
Input level		(–60 dBm + attenuator setting), characteristic
Signal level		0 to –30 dB below reference level, characteristic

Options

Time Gated Spectrum Analysis (Option 1D6)

	Specifications	Supplemental Information
Gate Delay		
Range	1 µs to 400 s	
Accuracy	±(500 ns + (0.01% × (maximum of gate delay or length)))	From gate trigger input to positive edge of gate output
Gate Length		
Range	1 µs to 400 s	
Accuracy	±(500 ns + (0.01% × (maximum of gate delay or length)))	From positive edge to negative edge of gate output
Resolution	((maximum of gate delay or length in seconds)/65000) rounded up to nearest µs	Dependent on the greater of gate delay or gate length
Additional Amplitude Error[a]		
Log Scale	±0.2 dB	
Linear Scale	±0.1% of reference level	

a. While in gate mode.

Tracking Generator (Option 1DN)

The spectrum analyzer/tracking generator combination will meet its specification after a cable (8120-5148) and adapter are connected between RF OUT and INPUT and **Align Now**, **TG** has been run.

	Specifications	Supplemental Information
Warm-up	5 minutes	

	Specifications	Supplemental Information
Output Frequency Range	9 kHz to 3.0 GHz	

	Specifications	Supplemental Information
Minimum Resolution BW	1 kHz	Not usable with resolution bandwidths ≤300 Hz

	Specifications	Supplemental Information
Output Power Level		
Range	–2 to –66 dBm	
Resolution	0.1 dB	
Absolute Accuracy (at 50 MHz with coupled source attenuator, referenced to –20 dBm)	± 0.75 dB	
Vernier		
Range	8 dB	
Accuracy (with coupled source attenuator, 50 MHz, –20 dBm)		
Incremental	±0.2 dB/dB	
Cumulative	±0.5 dB, total	
Output Attenuator Range	0 to 56 dB in 8 dB steps	

	Specifications	Supplemental Information
Maximum Safe Reverse Level		+30 dBm (1 W), 50 Vdc, characteristic

	Specifications	Supplemental Information
Output Power Sweep		
Range	(–10 to –2 dBm) – (Source Attenuator Setting)	
Resolution	0.1 dB	
Accuracy (zero span)	<1 dB peak-to-peak	

	Specifications	Supplemental Information
Output Flatness		
Referenced to 50 MHz, –20 dBm		
9 kHz to 10 MHz	±3 dB	
10 MHz to 3 GHz	±2 dB	

	Specifications	Supplemental Information
Spurious Outputs		
(–2 dBm output)		
Harmonic Spurs		
TG Output 9 kHz to 20 kHz	≤ –15 dBc	
TG Output 20 kHz to 3 GHz	≤ –25 dBc	
Non-harmonic Spurs		
TG Output 9 kHz to 2 GHz	≤ –27 dBc	
TG Output 2 GHz to 3 GHz	≤ –23 dBc	
LO Feedthrough		
LO Frequency 3.921409 GHz to 6.9214 GHz	≤ –16 dBm	

	Specifications	Supplemental Information
Dynamic Range	Maximum Output Power Level – Displayed Average Noise Level	

	Specifications	Supplemental Information
Output Tracking		
Drift		1.5 kHz/5 minute, characteristic
Swept Tracking Error		Usable in 1 kHz RBW after 5 minutes of warm-up

	Specifications	Supplemental Information
RF Power-Off Residuals		
9 kHz to 3 GHz		< –120 dBm, characteristic

	Specifications	Supplemental Information
Output Attenuator Repeatability		
9 kHz to 300 MHz		±0.1 dB, characteristic
300 MHz to 2 GHz		±0.2 dB, characteristic
2 GHz to 3 GHz		±0.3 dB, characteristic

	Specifications	Supplemental Information
Output VSWR		
0 dB attenuation		<2.0:1, characteristic
≥ 8 dB attenuation		<1.5:1, characteristic

	Specifications	Supplemental Information
Output Attenuator Accuracy		
0 dB		±0.5 dB, characteristic
8 dB		±0.5 dB, characteristic
16 dB	Reference	
24 dB		±0.5 dB, characteristic
32 dB		±0.6 dB, characteristic
40 dB		±0.8 dB, characteristic
48 dB		±1.0 dB, characteristic
56 dB		±1.1 dB, characteristic

Tracking Generator Output Accuracy
Relative Accuracy (Referred to –20 dBm) = Output Attenuator Accuracy + Vernier Accuracy + Output Flatness
Absolute Accuracy = Relative Accuracy (Referred to –20 dBm) + Absolute Accuracy at 50 MHz

General

	Specifications	Supplemental Information
Temperature Range		
Operating	0 to 55 °C	Floppy disk 10 to 40 °C
Storage	–40 to 75 °C	

	Specifications	Supplemental Information
Audible Noise (ISO 7779)		
Sound Pressure at 25 °C		<40 dBa, (<4.6 Bels power)

	Specifications	Supplemental Information
Military Specification	Has been type tested to the environmental specifications of MIL-PRF-28800F class 3.	

	Specifications	Supplemental Information
EMI Compatibility	Conducted and radiated emission is in compliance with CISPR Pub. 11/1990 Group 1 Class B[a].	

a. Meets Class A performance during dc operation or serial number US41110000 or lower.

	Specifications	Supplemental Information
Immunity Testing		
Radiated Immunity		Testing was done at 3 V/m according to IEC 801-3/1984. When the analyzer tuned frequency is identical to the immunity test signal frequency, there may be signals of up to –60 dBm displayed on the screen.
Electrostatic Discharge		Air discharges of up to 8 kV were applied according to IEC 801-2/1991. Discharges to center pins of any of the connectors may cause damage to the associated circuitry.

	Specifications	Supplemental Information
Power Requirements		
ac Operation		
Voltage, frequency	90 to 132 Vrms, 47 to 440 Hz 195 to 250 Vrms, 47 to 66 Hz	
Power Consumption, On	<300 W	
Power Consumption, Standby	<5 W	
dc Operation		
Voltage	12 to 20 Vdc	
Power Consumption	<200 W	
Power Consumption, Standby	<100 mW	

	Specifications	Supplemental Information
Measurement Speed		
Local Measurement and Display Update rate[a]		
Sweep points = 101		≥ 40/s, characteristic
Sweep points = 401		≥ 28/s, characteristic
Remote Measurement and GPIB Transfer Rate[b,c]		
Sweep points = 101		≥ 40/s, characteristic
Sweep points = 401		≥ 28/s, characteristic
RF Center Frequency Tune, Measure, and GPIB Transfer Time[b,d]		
Sweep points = 101		≤ 75 ms, characteristic
Sweep points = 401		≤ 90 ms, characteristic

a. Factory preset, auto align Off, fixed center frequency, RBW = 1 MHz, spans >10 MHz and ≤600 MHz, and stop frequency ≤3 GHz.
b. Display Off (:DISPlay:ENABle OFF), and 32-bit integer data format (:FORMat:DATA INT,32), if *Option AYX* or *A4J* is installed, disable sweep ramp, (:SYSem:PORTs:IFVSweep:ENABle OFF), markers Off, single sweep, measured with IBM compatible PC with 550 MHz Pentium® III running Windows® NT 4.0, one meter GPIB cable, National Instruments PCI-GPIB card and NI-488.2 DLL.
c. Factory preset, auto align Off, fixed center frequency, RBW = 1 MHz, and span = 20 MHz, fixed center frequency, stop frequency ≤3 GHz, average of 100 measurements.
d. Factory preset, auto align Off, RBW = 1 MHz, span= 20 MHz, stop frequency ≤3 GHz, center frequency tune step size = 50 MHz.

	Specifications	Supplemental Information
Data Storage		
Internal		200 Traces or States[a]
External (10 to 40 °C) 3.5" 1.44 MB, MS-DOS® compatible floppy disk		200 Traces or States[a]

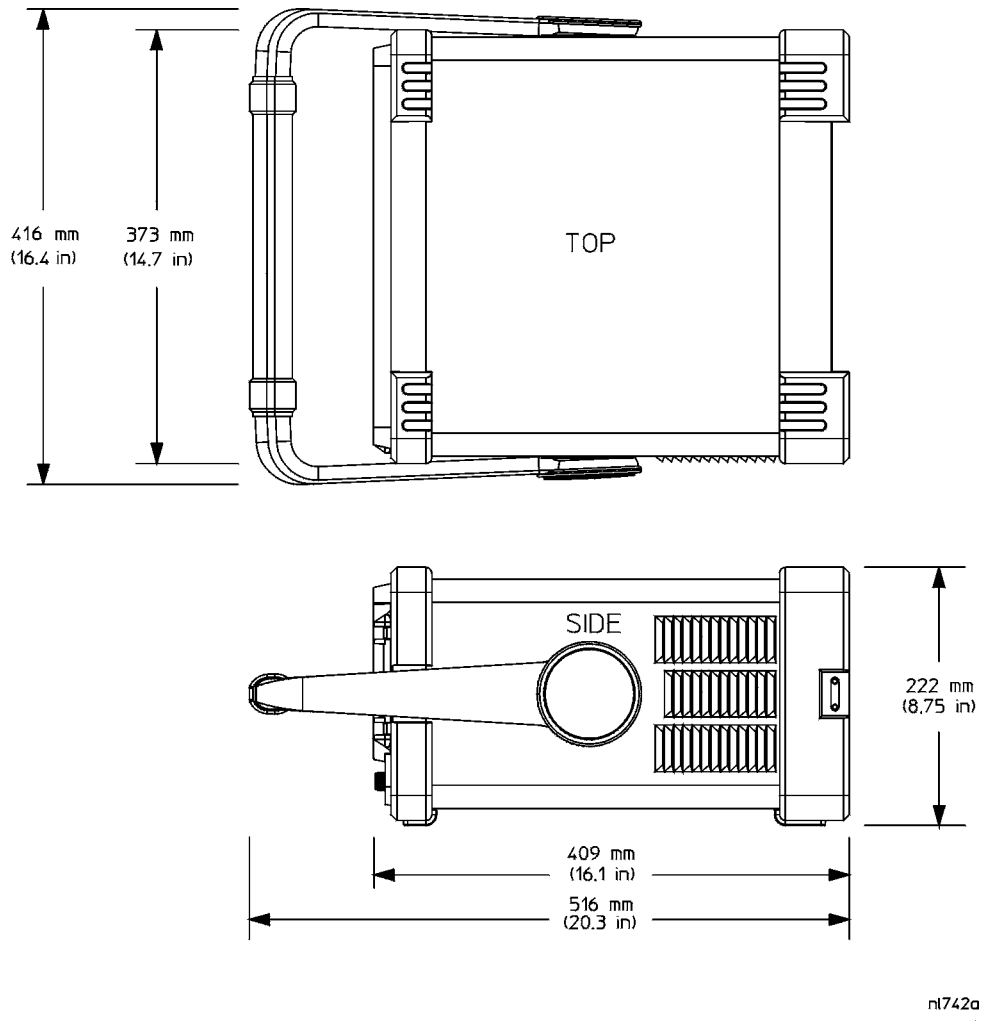
a. When storing traces set to 401 points.

	Specifications	Supplemental Information
Downloadable Program Memory		10 MB available memory

	Specifications	Supplemental Information
Demod Tune and Listen		Internal speaker, front-panel earphone jack and front-panel volume control.
Demod	AM and FM	An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.

	Specifications	Supplemental Information
Weight (without options)		
Net		17.1 kg (37.7 lb), characteristic
Shipping		31.0 kg (68 lb), characteristic

Dimensions


416 mm
(16.4 in)
373 mm
(14.7 in)
TOP
SIDE
222 mm
(8.75 in)
409 mm
(16.1 in)
516 mm
(20.3 in)
nl742a

Inputs and Outputs

Front Panel

	Specifications	Supplemental Information
INPUT 50 Ω		
Connector	Type-N female	
(Option BAB)	APC 3.5 male	
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
RF OUT 50 Ω, *(Option 1DN)*		
Connector	Type-N female	
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
AMPTD REF OUT[a]		Amplitude Reference
Connector	BNC female	
Impedance		50 Ω, nominal
Frequency		50 MHz
Frequency Accuracy		Frequency reference error[b]
50 Ω Amplitude[c]		–20 dBm, nominal

a. Turn the amplitude reference on/off by pressing the keys: **Input/Output**, **Amptd Ref Out**.
b. Frequency reference error = (aging rate × period of time since adjustment + settability + temperature stability).
c. The internal amplitude reference actual power is stored internally.

	Specifications	Supplemental Information
PROBE POWER		
Voltage/Current		+15 Vdc, ±7% at 150 mA max., characteristic –12.6 Vdc ±10% at 150 mA max., characteristic

	Specifications	Supplemental Information
EXT KEYBOARD[a]		Used for entering screen titles and filenames only. Interface compatible with most IBM-compatible PC keyboards.
Connector	6-pin mini-DIN	

a. The feature is not implemented in firmware revisions prior to A.06.00.

	Specifications	Supplemental Information
Speaker		Front panel knob controls volume

	Specifications	Supplemental Information
Headphone		Front panel knob controls volume
Connector	3.5 mm (1/8 inch) miniature audio jack	
Power Output		0.2 W into 4 Ω, characteristic

Rear Panel

	Specifications	Supplemental Information
10 MHz REF OUT		
Connector	BNC female	
Impedance		50 Ω, nominal
Output Amplitude		>0 dBm, characteristic

	Specifications	Supplemental Information
10 MHz REF IN		
Connector	BNC female	Note: Analyzer noise sidebands and spurious response performance may be affected by the quality of the external reference used.
Impedance		50 Ω, nominal
Input Amplitude Range		–15 to +10 dBm, characteristic
Frequency		10 MHz, nominal

	Specifications	Supplemental Information
GATE TRIG/EXT TRIG IN		
Connector	BNC female	
External Trigger Input		
Trigger Level		Selectable positive or negative edge initiates sweep in EXT TRIG mode (5 V TTL)
Gate Trigger Input *(Option 1D6)*		
Minimum Pulse Width		>30 ns (5 V TTL)

	Specifications	Supplemental Information
GATE/HI SWP OUT		
Connector	BNC female	
High Sweep Output		
Level		High = sweep[a]; Low = retrace (5 V TTL)
Gate Output *(Option 1D6)*		
Level		High = gate on; Low = gate off (5 V TTL)

a. High sweep may be high longer than the indicated sweep times.

	Specifications	Supplemental Information
VGA OUTPUT		
Connector	VGA compatible, 15-pin mini D-SUB	
Format		VGA (31.5 kHz horizontal, 60 Hz vertical sync rates, non-interlaced) Analog RGB
Resolution	640 × 480	

	Specifications	Supplemental Information
AUX IF OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Frequency		21.4 MHz, nominal
Amplitude (for signal at reference level and for reference levels – input attenuation + preamp gain of –10 to –70 dBm)		–10 dBm (uncorrected), characteristic
Impedance		50 Ω, nominal

	Specifications	Supplemental Information
AUX VIDEO OUT *(Option A4J or AYX)*		RBW ≥ 1 kHz
Connector	BNC female	
Amplitude Range (into >10 kΩ)		0 to 1 V (uncorrected), characteristic

	Specifications	Supplemental Information
HI SWP IN *(Option A4J or AYX)*		
Connector	BNC female	
Input		Open collector, low resets and holds the sweep (5 V TTL)

	Specifications	Supplemental Information
HI SWP OUT *(Option A4J or AYX)*		
Connector	BNC female	
Output		High = sweep[a], Low = retrace (5 V TTL)

a. High sweep may be high longer than the indicated sweep times.

	Specifications	Supplemental Information
SWP OUT *(Option A4J or AYX)*		
Connector	BNC female	
Amplitude		0 to +10 V ramp, characteristic

	Specifications	Supplemental Information
PRESEL TUNE OUTPUT		
Connector	BNC female	
Load Impedance (dc coupled)		> 10 kΩ, nominal
Range		0 to +10 V, characteristic
Sensitivity		0.33 V/GHz of tuned frequency > 3 GHz, characteristic

	Specifications	Supplemental Information
GPIB Interface		
Connector	IEEE-488 bus connector	
GPIB Codes		SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28

	Specifications	Supplemental Information
Serial Interface *(Option 1AX)*		
Connector	9-pin D-SUB male	RS-232

	Specifications	Supplemental Information
Parallel Interface		Printer port only
Connector	25-pin D-SUB female	

Regulatory Information

CAUTION This product is designed for use in Installation Category II and Pollution Degree 2 per IEC 1010 and 664 respectively.

NOTE This product has been designed and tested in accordance with IEC Publication 1010, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The instruction documentation contains information and warnings which must be followed by the user to ensure safe operation and to maintain the product in a safe condition.

The CE mark is a registered trademark of the European Community (if accompanied by a year, it is the year when the design was proven).

The CSA mark is the Canadian Standards Association safety mark.

ISM 1-A This is a symbol of an Industrial Scientific and Medical Group 1 Class A product. (CISPR 11, Clause 4)

Declaration of Conformity

DECLARATION OF CONFORMITY

According to ISO/IEC Guide 22 and CEN/CENELEC EN 45014

Manufacturer's Name: Agilent Technologies, Inc.

Manufacturer's Address: 1400 Fountaingrove Parkway
Santa Rosa, CA 95403-1799
USA

Declares that the products

Product Name: Spectrum Analyzer

Model Number: HP E7401A, HP E7402A, HP E7403A,
HP E7404A, HP E7405A

Product Options: This declaration covers all options of the above products.

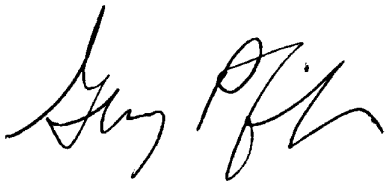
Conform to the following product specifications:

EMC: IEC 61326-1:1997+A1:1998 / EN 61326-1:1997+A1:1998

Standard	Limit
CISPR 11:1990 / EN 55011-1991	Group 1, Class A
IEC 61000-4-2:1995+A1998 / EN 61000-4-2:1995	4 kV CD, 8 kV AD
IEC 61000-4-3:1995 / EN 61000-4-3:1995	3 V/m, 80 - 1000 MHz
IEC 61000-4-4:1995 / EN 61000-4-4:1995	0.5 kV sig., 1 kV power
IEC 61000-4-5:1995 / EN 61000-4-5:1996	0.5 kV L-L, 1 kV L-G
IEC 61000-4-6:1996 / EN 61000-4-6:1998	3 V, 0.15 – 80 MHz
IEC 61000-4-11:1994 / EN 61000-4-11:1998	1 cycle, 100%

Safety: IEC 61010-1:1990 + A1:1992 + A2:1995 / EN 61010-1:1993 +A2:1995
CAN/CSA-C22.2 No. 1010.1-92

Supplementary Information:
The products herewith comply with the requirements of the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC and carry the CE-marking accordingly.



Santa Rosa, CA, USA 4 Feb. 2000

Greg Pfeiffer/Quality Engineering Manager

For further information, please contact your local Agilent Technologies sales office, agent or distributor.