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Specifications for the HP 8591A

Table 1-1. HP 8591A Specifications (1 of 5)

GENERAL SPECIFICATIONS	
All specifications apply over 0°C to +55°C. The analyzer will meet its specifications after 2 hours of storage at a constant temperature, within the operating temperature range, 30 minutes after the analyzer is turned on and after CAL FREQ, and CAL AMPTD have been run.	
Temperature Range Operating Storage	 0°C to +55°C −40°C to +75°C
EMI Compatibility	Conducted and radiated interference CISPR Pub. 11 and Messempfaenger Postverfuegung 526/527/79
Audible Noise	<37.5 dBA pressure and <5.0 Bels power (ISODP7779)
Power Requirements ON (LINE 1) Standby (LINE 0)	 86 to 127, or 195 to 250 V rms, 47 to 66 Hz 103 to 126 V rms, 400 Hz ±10% Power consumption <300 VA Power consumption <7 watts
FREQUENCY SPECIFICATIONS	
Frequency Range 50Ω 75Ω *(Option 001)*	 9 kHz to 1.8 GHz 1 MHz to 1.8 GHz
Frequency Reference Aging Settability Temperature Stability	 $\pm 1 \times 10^{-7}$/day $\pm 2 \times 10^{-6}$/year $\pm 0.5 \times 10^{-6}$ $\pm 5 \times 10^{-6}$
Precision Freq. Reference *(Option 004)* Aging Settability Temperature Stability	 $\pm 1 \times 10^{-7}$/year $\pm 1 \times 10^{-8}$ $\pm 1 \times 10^{-8}$

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Table 1-1. HP 8591A Specifications (2 of 5)

FREQUENCY SPECIFICATIONS (Continued)	
Frequency Accuracy	
Readout Accuracy (Start, Stop, Center, Marker)	±(frequency readout × frequency reference error* + 3% of span + 20% of RBW + 1.5 kHz)
Marker Count Accuracy	(Signal-to-Noise ratio ≥25 dB, RBW/span ≥ 0.01)
Frequency Span ≤ 10 MHz	±(marker frequency × frequency reference error* + counter resolution + 100 Hz)
Frequency Span > 10 MHz	±(marker frequency × frequency reference error* + counter resolution + 1 kHz)
Counter Resolution	Selectable from 10 Hz to 100 kHz
Frequency Span	
Range	0 Hz (zero span), 10 kHz to 1.8 GHz
Resolution	4 digits
Accuracy	±2% of span, spans ≤10 MHz ±3% of span, spans >10 MHz
Frequency Sweep Time	
Range	
Span=0 Hz	20 ms to 100 s
Span=0 Hz *(Option 101)*	20 μs to 100 s
Span > 10 kHz	20 ms to 100 s
Accuracy	
20 ms to 100 s	±3%
20 μs to <20 ms *(Option 101)*	±2%
Sweep Trigger	Free run, Single, Line, Video, External
Stability	
Noise Sidebands	≤−95 dBc/Hz at >30 kHz offset from CW signal (1 kHz RBW, 30 Hz VBW, and sample detector)
Residual FM	<250 Hz pk-pk in 100 ms (1 kHz RBW, 1 kHz VBW)
System Related Sidebands	<−65 dBc at >30 kHz offset from CW signal

AMPLITUDE SPECIFICATIONS		
Amplitude Range		
50Ω	−115 dBm to +30 dBm	
75Ω *(Option 001)*	−63 dBmV to +75 dBmV	
Maximum Safe Input Level	(Input Atten ≥10 dB)	
	50Ω	**75Ω *(Option 001)***
Average Continuous Power	+30 dBm (1 watt)	+75 dBmV (0.4 watts)
Peak Pulse Power	+30 dBm (1 watt)	+75 dBmV (0.4 watts)
dc	25 V dc	100 V dc

* Frequency Reference Error = (aging rate × period of time since adjustment + initial achievable accuracy + temperature stability) See Table 1-2.

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Table 1-1. HP 8591A Specifications (3 of 5)

AMPLITUDE SPECIFICATIONS (continued)	
Gain Compression	
>10 MHz	≤0.5 dB (total power at input mixer* = −10 dBm)
Displayed Average Noise Level	(Input terminated, 0 dB attenuation, 1 kHz RBW, 30 Hz VBW, sample detector)
	50Ω **75Ω *(Option 001)***
400 kHz to 1 MHz	≤−115 dBm N/A
1 MHz to 1.5 GHz	≤−115 dBm ≤−63 dBmV
1.5 GHz to 1.8 GHz	≤−113 dBm ≤−61 dBmV
Spurious Responses	
Second Harmonic Distortion	
5 MHz to 1.8 GHz	<−70 dBc for −45 dBm tone power at input mixer*
Third Order Intermodulation Distortion	
5 MHz to 1.8 GHz	<−70 dBc for two −30 dBm tones at input mixer* and >50 kHz separation
Other Input Related Spurious	<−65 dBc for ≥30 kHz offset from CW signal
Residual Responses	(Input terminated and 0 dB attenuation)
	50Ω **75Ω *(Option 001)***
150 kHz to 1 MHz	<−90 dBm N/A
1 MHz to 1.8 GHz	<−90 dBm <−38 dBmV
Display Range	
Log Scale	0 to −70 dB from reference level is calibrated; 1 to 20 dB/division in 1 dB steps; 8 divisions displayed
Linear Scale	8 divisions
Scale Units	dBm, dBmV, dBμV, volts and watts
Marker Readout Resolution	0.05 dB for log scale 0.05% of reference level for linear scale
Fast Sweep Times for Zero Span	
20 μs to 20 ms *(Option 101)*	0.7% of reference level for linear scale

* Mixer Power Level (dBm) = Input Power (dBm) − Input Attenuator (dB).

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Table 1-1. HP 8591A Specifications (4 of 5)

AMPLITUDE SPECIFICATIONS (Continued)	
Reference Level	
Range	
50Ω	−115 dBm to +30 dBm
75Ω *(Option 001)*	−63 dBmV to +75 dBmV
Resolution	0.01 dB for log scale 0.12% of reference level for linear scale
Accuracy	(Referred to −20 dBm Reference Level)
0 dBm to −59.9 dBm	±(0.5 dB + Input Attenuator Accuracy at 50 MHz)
−60 dBm to −115 dBm	±(1.25 dB + Input Attenuator Accuracy at 50 MHz)
Frequency Response	(10 dB input attenuation)
Absolute	±1.5 dB, referred to 300 MHz CAL OUT
Relative Flatness	±1.0 dB, referred to midpoint between highest and lowest frequency response deviations
Calibrator Output	
Frequency	300 MHz ± (300 MHz × frequency reference error)*
Amplitude	
50Ω	−20 dBm ±0.4 dB
75Ω *(Option 001)*	+28.75 dBmV ±0.4 dB
Input Attenuator	
Range	0 to 60 dB, in 10 dB steps
Accuracy	
20 to 50 dB	±0.5 dB at 50 MHz, referred to 10 dB attenuation
60 dB	±0.75 dB at 50 MHz, referred to 10 dB attenuation
Resolution Bandwidth Switching Uncertainty	(Referred to 3 kHz RBW)
3 kHz to 3 MHz RBW	±0.4 dB
1 kHz	±0.5 dB
Log to Linear Switching	±0.25 dB at reference level
Display Scale Fidelity	
Log Incremental Accuracy	±0.2 dB/2 dB, 0 to −70 dB from reference level
Log Maximum Cumulative	±0.75 dB, 0 to −60 dB from reference level ±1.0 dB, 0 to −70 dB from reference level
Linear Accuracy	±3% of reference level
* Frequency Reference Error = (aging rate × period of time since adjustment + initial achievable accuracy + temperature stability) See Table 1-2.	

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Table 1-1. HP 8591A Specifications (5 of 5)

TRACKING GENERATOR SPECIFICATIONS	
All specifications apply over 0°C to +55°C. The spectrum-analyzer/tracking-generator combination will meet its specifications after 2 hours of storage at a constant temperature within the operating temperature range, 30 minutes after the spectrum-analyzer/tracking-generator is turned on and after CAL FREQ, CAL AMPTD, and CAL TRK GEN have been run.	
Warm-up	30 minutes
Output Frequency	
Range, 50Ω, Option 010	100 kHz to 1.8 GHz
75Ω, Option 011	1 MHz to 1.8 GHz
Output Power Level	
Range, 50Ω, Option 010	0 to −70 dBm
75Ω, Option 011	+42.8 to −27.2 dBmV
Resolution	0.1 dB
Absolute Accuracy	±1.0 dB (at 300 MHz, −20 dBm, and coupled source attenuator) (Option 011: use +28.8 dBmV instead of −20 dBm)
Vernier	
Range	10 dB*
Accuracy	±0.75 dB over 10 dB range (referred to −20 dBm for coupled source attenuator setting)* (Option 011: referred to +28.8 dBmV instead of −20 dBm)
Output Attenuator	
Range	0 to 60 dB in 10 dB steps
Switching Accuracy (at 30 MHz)	±0.8 dB or 2.5% of attenuator setting, whichever is greatest, for maximum of 1.5 dB (referred to 10 dB source attenuator setting)*
Output Power Sweep	
Range, 50Ω, Option 010	(−15 dBm to 0 dBm) − (Source Attenuator setting)
Range, 75Ω, Option 011	(+27.8 to 42.8 dBmV) − (Source Attenuator setting)
Resolution	0.1 dB
Accuracy (zero span)	<1.5 dB peak-to-peak
Output Flatness	±1.75 dB (referred to 300 MHz, 10 dB attenuator)
Spurious Outputs	
50Ω, Option 010	(0 dBm output, 100 kHz to 1.8 GHz)
75Ω, Option 011	(+42.8 dBmV output, 1 MHz to 1.8 GHz)
Harmonic Spurs	<−25 dBc
Non-Harmonic Spurs	<−30 dBc
Dynamic Range	
Tracking Generator Feedthrough, 50Ω, Option 010	<−106 dBm
Tracking Generator Feedthrough, 75Ω, Option 011	<−57.24 dBmV
* See Table 1-2, "Tracking Generator Output Accuracy."	

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Characteristics for the HP 8591A

Table 1-2. HP 8591A Characteristics (1 of 8)

Note: These are not specifications. Characteristics provide useful, but nonwarranted, information about instrument performance.	
FREQUENCY CHARACTERISTICS	
Frequency Reference Initial Achievable Accuracy	$\pm 0.5 \times 10^{-6}$
Precision Frequency Reference *(Option 004)* Aging Warm-up Initial Achievable Accuracy	5×10^{-10}/day, 7 day average after being powered on for 7 days. 1×10^{-8} after 30 minutes on. $\pm 2.2 \times 10^{-8}$, after being powered on for 24 hours.
Resolution Bandwidth (−3 dB) Range Shape	1 kHz to 3 MHz, selectable in 1, 3 and 10 increments, accuracy ±20% and 5 MHz. Resolution bandwidths may be selected manually, or coupled to frequency span. Synchronously tuned 4 poles. Approximately Gaussian shape.
Video Bandwidth (−3 dB) Range Shape	30 Hz to 1 MHz, selectable in 1, 3, 10 increments, accuracy ±30% and 3 MHz. Video bandwidths may be selected manually, or coupled to resolution bandwidth and frequency span. Post detection, single pole low-pass filter used to average displayed noise.

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Table 1-2. HP 8591A Characteristics (2 of 8)

AMPLITUDE CHARACTERISTICS	
Absolute Amplitude Calibration Uncertainty*	±0.25 dB
Log Scale Switching Uncertainty	Negligible error.
FM Demod/TV Sync Trigger *(Option 102)*	
Demod Tune Listen	Internal speaker, rear panel earphone jack and front panel volume control. Adjustable squelch control mutes the audio signal to the speaker/earphone jack based on the level of the demodulated signal above 22 kHz. An uncalibrated demodulated signal is available on the AUX VIDEO OUT connector at the rear panel.
TV Trigger *(Options 101 and 102)*	Triggers sweep of the analyzer after the sync pulse of a selected line of a TV video field.
Carrier Level for Trigger	Top 60% of Linear Display.
Compatible Formats	NTSC, PAL, SECAM.
Field Selection	Even, Odd, Non-interlaced.
Trigger Polarity	Positive, Negative.
Line Selection	10 to 1021.
Input Attenuation Uncertainty†	
Attenuator Setting	
0 dB	±0.5 dB
10 dB	Ref
20 dB	±0.5 dB
30 dB	±0.6 dB
40 dB	±0.8 dB
50 dB	±1.0 dB
60 dB	±1.2 dB
Input Attenuator Repeatability	
300 MHz	±0.03 dB
1.8 GHz	±1.0 dB
RF Input SWR	(Attenuator Setting 10 to 60 dB)
9 kHz to 1.8 GHz	1.35:1

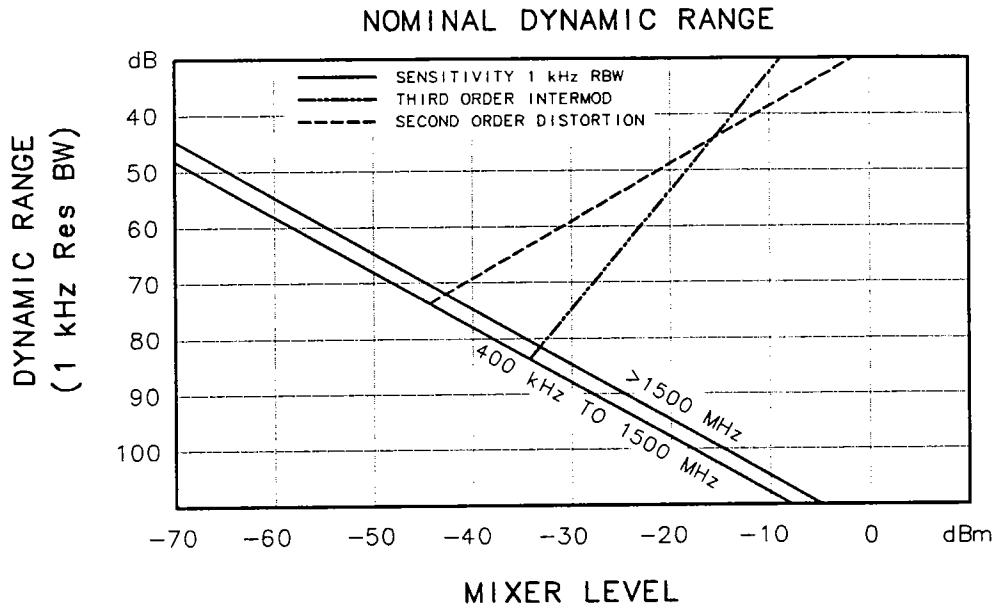
* Error in the CAL AMPTD routine. Absolute amplitude reference settings: 300 MHz Center Frequency; 10 dB Input Attenuator; −20 dBm Reference Level; 3 kHz Resolution Bandwidth; Linear Scale.

† Referred to 10 dB input attenuator setting from 9 kHz to 1.8 GHz; See Table 1-1, Frequency Response Specification.

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Table 1-2. HP 8591A Characteristics (3 of 8)

DYNAMIC RANGE



HP 8591A Dynamic Range

FRONT PANEL INPUT / OUTPUT	
INPUT 50Ω	
Connector	Type N female
Impedance	50Ω nominal
INPUT 75Ω *(Option 001)*	
Connector	BNC female
Impedance	75Ω nominal
PROBE POWER*	
Voltage/Current	+15 V dc, ±7% at 150 mA max. −12.6 V dc ±10% at 150 mA max.

* Total current drawn from the +15 V dc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.6 V dc on the PROBE POWER and the −15 V dc on the AUX INTERFACE cannot exceed 150 mA.

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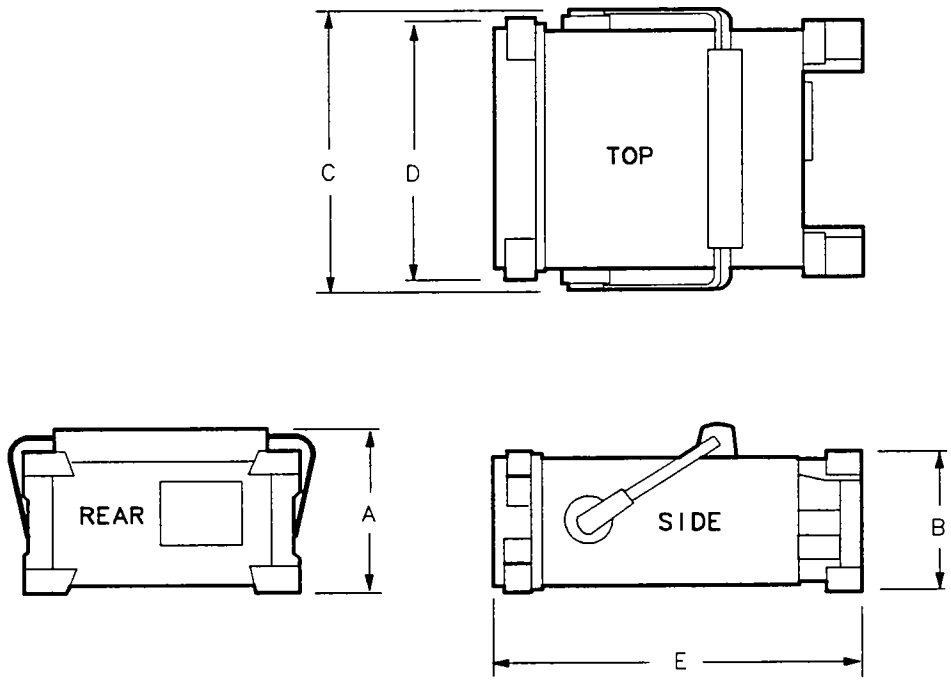
Table 1-2. HP 8591A Characteristics (4 of 8)

REAR-PANEL INPUTS / OUTPUTS	
10 MHz REF OUTPUT	
Connector	BNC female
Impedance	50Ω
Output Amplitude	>0 dBm
EXT REF IN	
Connector	BNC female Note: Analyzer noise sideband and spurious response performance may be affected by the quality of the external reference used.
Input Amplitude Range	−2 to +10 dBm
Frequency	10 MHz
AUX IF OUTPUT	
Frequency	21.4 MHz
Amplitude Range	−10 to −60 dBm
Impedance	50Ω nominal
AUX VIDEO OUTPUT	
Connector	BNC female
Amplitude Range	0 to 1 volt (uncorrected)
EARPHONE *(Option 102)*	
Connector	1/8 inch monaural jack.
EXT KEYBOARD *(Option 021/023)*	Interface compatible with HP part number C1405 Option ABA and most IBM/AT non-auto switching keyboards.
EXT TRIG INPUT	
Connector	BNC female.
Trigger Level	Positive edge initiates sweep in EXT TRIG mode (TTL).
HI-SWEEP IN/OUT	
Connector	BNC female.
Output	TTL high=sweep, low=retrace.
Input	Open collector, low stops sweep.
MONITOR OUTPUT	
Connector	BNC female.
Format	NTSC Video, 19.2 kHz horizontal rate.
REMOTE INTERFACE	
Option 021, HPIB HPIB Codes	SH1, AH1, T6, SR1, RL1, PP0, DC1, C1, C2, C3 and C28.
Option 023, RS-232	
SWEEP OUTPUT	
Connector	BNC female.
Amplitude	0 to +10 volt ramp.
TV TRIG OUT *(Options 101 and 102)*	
Connector	BNC female.
Amplitude	Negative edge corresponds to start of the selected TV line after sync pulse (TTL).

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Table 1-2. HP 8591A Characteristics (5 of 8)

WEIGHT	
Net HP 8591A	14.5 kg (32 lb)
Shipping HP 8591A	17.3 kg (38 lb)
DIMENSIONS	
A = 8 in (200 mm) B = 7.25 in (184 mm) C = 14.69 in (373 mm) D = 13.25 in (337 mm) E = 18.12 in (460.5 mm)	



HP 8591A Dimensions

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Table 1-2. HP 8591A Characteristics (6 of 8)

AUX INTERFACE

Connector Type : 9 Pin Subminiature "D"

Connector Pinout

Pin #	Function	Current	"Logic" Mode	"Serial Bit" Mode
1	Control A	—	TTL Output Hi/Lo	TTL Output Hi/Lo
2	Control B	—	TTL Output Hi/Lo	TTL Output Hi/Lo
3	Control C	—	TTL Output Hi/Lo	Strobe
4	Control D	—	TTL Output Hi/Lo	Serial Data
5	Control I	—	TTL Input Hi/Lo	TTL Input Hi/Lo
6	Gnd	—	Gnd	Gnd
7†	−15 V dc ±7%	150 mA	—	—
8*	+5 V dc ±5%	150 mA	—	—
9†	+15 V dc ±5%	150 mA	—	—

TRACKING GENERATOR INPUTS AND OUTPUTS

RF Output	
Impedance Connector	
Option 010	50Ω, Type N female
Option 011	75Ω, BNC female
Maximum Reverse Level	
Option 010	+20 dBm (0.1 W), 25 V
Option 011	+69 dBmV (0.1 W), 100 V
External ALC Input	
Impedance	1 Megohm
Polarity	Positive or Negative
Range	−66 dBV to +6 dBV
Connector	BNC

* Exceeding the +5 V current limits may result in loss of factory correction constants.

† Total current drawn from the +15 V dc on the PROBE POWER and the AUX INTERFACE cannot exceed 150 mA. Total current drawn from the −12.6 V dc on the PROBE POWER and the −15 V dc on the AUX INTERFACE cannot exceed 150 mA.

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Table 1-2. HP 8591A Characteristics (7 of 8)

TRACKING GENERATOR CHARACTERISTICS	
Output Tracking Drift (usable in 10 kHz bandwidth after 30 minute warmup)	1 kHz/5 minutes
Spurious Outputs Option 010: 0 dBm output, >1.8 GHz to 4.0 GHz Option 011: +42.8 dBmV 75Ω, >1.8 GHz to 4.0 GHz Harmonic Non-Harmonic 2121.4 MHz Feedthrough	 <−20 dBc <−40 dBc for 0 dBm TG Output Option 010: <−45 dBc; Option 011: +42.8 dBmV Output
RF Power-Off Residuals Option 010: 100 kHz to 1.8 GHz Option 011: 1 MHz to 1.8 GHz	 <−115 dBm <−66.2 dBmV
Output Attenuator Repeatability	 ±0.2 dB
Output VSWR 0 dB Attenuator 10 dB Attenuator	 <2.5:1 <1.6:1
Dynamic Range (difference between maximum power out and tracking generator feedthrough) Option 010, 100 kHz to 1.8 GHz Option 011, 1 MHz to 1.8 GHz	 >106 dB >100 dB

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Table 1-2. HP 8591A Characteristics (8 of 8)

TRACKING GENERATOR OUTPUT ACCURACY, Option 010 (after CAL TRK GEN in auto-coupled mode)					
TG Output Power Level	**Attenuator Setting**	**Relative Accuracy (at 300 MHz referred to −20 dBm)**	**Absolute Accuracy (at 300 MHz)**	**Relative Accuracy (referred to −20 dBm) (+0.2 dB/GHz)***	**Absolute Accuracy (+0.2 dB/GHz)***
0 to −10.9 dBm	0 dB	±1.25 dB	±2.25 dB	±2.75 dB	±3.75 dB
−11 to −20.9 dBm	10 dB	±0.75 dB	±1.75 dB	±2.25 dB	±3.25 dB
−20 dBm	10 dB	0 dB Reference	±1.0 dB	±1.50 dB	±2.50 dB
−21 to −30.9 dBm	20 dB	±1.25 dB	±2.25 dB	±2.75 dB	±3.75 dB
−31 to −40.9 dBm	30 dB	±1.35 dB	±2.35 dB	±2.85 dB	±3.85 dB
−41 to −50.9 dBm	40 dB	±1.55 dB	±2.55 dB	±3.05 dB	±4.05 dB
−51 to −60.9 dBm	50 dB	±1.75 dB	±2.75 dB	±3.25 dB	±4.25 dB
−61 to −70 dBm	60 dB	±1.95 dB	±2.95 dB	±3.45 dB	±4.45 dB
TRACKING GENERATOR OUTPUT ACCURACY, Option 011 (after CAL TRK GEN in auto-coupled mode)					
TG Output Power Level	**Attenuator Setting**	**Relative Accuracy (at 300 MHz referred to +28.8 dBmV)**	**Absolute Accuracy (at 300 MHz)**	**Relative Accuracy (referred to +28.8 dBmV) (+0.2 dB/GHz)***	**Absolute Accuracy (+0.2 dB/GHz)***
+42.76 to +31.77 dBmV	0 dB	±1.25 dB	±2.25 dB	±2.75 dB	±3.75 dB
+31.76 to +21.77 dBmV	10 dB	±0.75 dB	±1.75 dB	±2.25 dB	±3.25 dB
−28.76 dBmV	10 dB	0 dB Reference	±1.0 dB	±1.50 dB	±2.50 dB
+21.76 to +11.77 dBmV	20 dB	±1.25 dB	±2.25 dB	±2.75 dB	±3.75 dB
+11.76 to +1.77 dBmV	30 dB	±1.35 dB	±2.35 dB	±2.85 dB	±3.85 dB
+1.76 to −8.23 dBmV	40 dB	±1.55 dB	±2.55 dB	±3.05 dB	±4.05 dB
−8.24 to −18.23 dBmV	50 dB	±1.75 dB	±2.75 dB	±3.25 dB	±4.25 dB
−18.24 to −27.23 dBmV	60 dB	±1.95 dB	±2.95 dB	±3.45 dB	±4.45 dB
* Add 0.2 dB/GHz of tuned frequency to the value in this column for complete accuracy specification relative to frequency.					

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