

# Specifications

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## Introduction

This chapter contains characteristics and measurement-related specifications. The system specification tables list specifications and characteristics that are modified when the HP 70301A Tracking Generator operates in a HP 71000 MMS Microwave Spectrum Analyzer system.

Refer to the system data sheet for any system characteristics or electrical specifications not found in this chapter.

Tables in this chapter list specifications and characteristics together, in the same format. Table items in *italics* identify a characteristic. You should understand the distinction among terms.

- Specifications** describe warranted performance over the temperature range of 0 C to +50 C after one hour of continuous operation, unless otherwise noted. Specifications apply after the system temperatures have stabilized and self-calibration routines have run. (The standard Hewlett-Packard operating temperature range is 0 C to +55 C; the HP 70301A is an exception.)
- Unless otherwise noted, corrected limits are given when a specification range is improved with error-correction routines. All specifications qualified by an output power setting refer to the indicated setting.
- Typical performance**, where listed is *not warranted*, but indicates performance that most units will meet.
- Characteristics** provide useful but non-warranted functional and performance information in the form of nominal values.
- Nominal values** indicate the expected but non-warranted value of the denoted parameter.

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## **System Specifications and Characteristics**

The tables in this section list characteristics and measurement-related specifications for HP 71000 MMS Microwave Spectrum Analyzers with an HP 70301A Tracking Generator module. For more information on different system configurations please refer to the *HP 71000 MMS Spectrum Analyzer HP 70900 Installation and Verification Manual*.



**Table 3-1. System Specifications and Characteristics (continued)**

Parameters	Specifications																																							
<i>Scalar Dynamic Range</i> (20-30 C)	Compute using the following formula: $SDR = \text{maximum leveled output power} - \text{TG feedthrough}$																																							
Output Attenuator:  <b>Range</b> <b>Repeatability</b> <i>Accuracy</i> (referenced to 0 dB attn.)	55 dB in 5 dB steps 0.2 dB for any setting <table border="1" data-bbox="568 451 1153 934"> <thead> <tr> <th></th> <th style="text-align: center;"><b>&lt;12.8 GHz</b></th> <th style="text-align: center;"><b>12.8-18 GHz</b></th> </tr> <tr> <th style="text-align: center;">Attn. (dB)</th> <th style="text-align: center;">( dB)</th> <th style="text-align: center;">( dB)</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">5</td><td style="text-align: center;">0.40</td><td style="text-align: center;">0.50</td></tr> <tr><td style="text-align: center;">10</td><td style="text-align: center;">0.60</td><td style="text-align: center;">0.70</td></tr> <tr><td style="text-align: center;">15</td><td style="text-align: center;">0.85</td><td style="text-align: center;">1.00</td></tr> <tr><td style="text-align: center;">20</td><td style="text-align: center;">0.70</td><td style="text-align: center;">0.90</td></tr> <tr><td style="text-align: center;">25</td><td style="text-align: center;">0.95</td><td style="text-align: center;">1.15</td></tr> <tr><td style="text-align: center;">30</td><td style="text-align: center;">0.90</td><td style="text-align: center;">1.20</td></tr> <tr><td style="text-align: center;">35</td><td style="text-align: center;">1.25</td><td style="text-align: center;">1.60</td></tr> <tr><td style="text-align: center;">40</td><td style="text-align: center;">1.80</td><td style="text-align: center;">2.00</td></tr> <tr><td style="text-align: center;">45</td><td style="text-align: center;">2.00</td><td style="text-align: center;">2.20</td></tr> <tr><td style="text-align: center;">50</td><td style="text-align: center;">2.00</td><td style="text-align: center;">2.30</td></tr> <tr><td style="text-align: center;">55</td><td style="text-align: center;">2.20</td><td style="text-align: center;">2.50</td></tr> </tbody> </table>		<b>&lt;12.8 GHz</b>	<b>12.8-18 GHz</b>	Attn. (dB)	( dB)	( dB)	5	0.40	0.50	10	0.60	0.70	15	0.85	1.00	20	0.70	0.90	25	0.95	1.15	30	0.90	1.20	35	1.25	1.60	40	1.80	2.00	45	2.00	2.20	50	2.00	2.30	55	2.20	2.50
	<b>&lt;12.8 GHz</b>	<b>12.8-18 GHz</b>																																						
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<b>Spectral Purity :</b> (with -2 dBm output power) <i>Phase Noise at 10 kHz offset</i> <i>Sidebands</i>  <b>n 1st LO</b> <b>Harmonic Spurious</b>  <b>Sub-harmonic Spurious</b> <b>Non-harmonic Spurious</b>	$< -90 \text{ dBc/Hz} + 20\log N$ $n = 40 \text{ kHz}: < -70 \text{ dBc/Hz} + 20\log N$ $(n = 50), (n = 60), \text{ and } (n = 400 \text{ Hz}): < 50 \text{ dBc}$ Display: $< 60 \text{ dBc}$ (approx. 24 kHz) Others contributed by HP 70301A: $< 80 \text{ dBc}$ $< 65 \text{ dBc}$ 2nd harmonic: $< 7 \text{ dBc}$ ( $< 15 \text{ dBc}$ typical) 3rd harmonic: $< 11 \text{ dBc}$ ( $< 15 \text{ dBc}$ typical) precluded by design $< -60 \text{ dBc}$																																							
<b>Residuals (RF off)</b>	$< 120 \text{ dBm}$ (tracking) $< 65 \text{ dBm}$ (LO emission)																																							
N = Harmonic mixing number † n = 1, 2, 3, ... ∞																																								

All input/output ports are 50  $\Omega$  impedance with 1.5:1 VSWR and with, unless otherwise noted, a maximum safe input/reverse level of +20 dBm ac and 20 V dc.

**Table 3-2. HP 70301A Input and Output Characteristics, Front Panel**

Connectors	HP 70301A Characteristics
RF OUTPUT	Type N female Max. Safe Reverse Lvl: +20 dBm (0.1 W), 0 V dc Output VSWR, 5 dB attn: 2.7-12.8 GHz 1.5:1 12.8-18 GHz 1.7:1 Output VSWR, 0 dB attn: 2:1
EXT ALC INPUT	BNC female, 1 M $\Omega$ Impedance 564 $\mu$ V ( 65 dBV) to 200 mV ( 14 dBV) Max. Safe Input Level: 15 V dc
LOW BAND INPUT	SMA female 10 MHz to 2.9 GHz Insertion Loss: <4.0 dB

**Table 3-3. HP 70301A Input and Output Characteristics, Rear Panel**

Connectors	HP 70301A Characteristics
LO IN	SMA female, 2:1 VSWR 3-6.6 GHz, 0.5 to 18.0 dBm required Maximum Safe Input Level: +20dBm, 5 V dc
LO OUT	SMA female, 3:1 VSWR 3-6.6 GHz, +3.0 to +15.0 dBm Maximum Safe Reverse Level: +20 dBm, 5 V dc
300 MHz IN	SMB male 300 0.03 MHz, +2 to 2 dBm
300 MHz OUT	SMB male 0 1 dBm <25 dBc Harmonics
21.4 MHz IN	SMB male 21.4 5 MHz offset allowed Minimum Required Input Level: +3 dBm 1 dB Maximum Safe Input Level: +15 dBm, 40 V dc
21.4 MHz OUT	SMB male 21.4 MHz 200 Hz w/ tracking adjusted to 0 Hz. Amplitude: >0 dBm Maximum Safe Reverse Level: +20 dBm, 5 V dc
TUNE SPAN IN	SMB male, 1 M $\Omega$ Impedance 4.5-10.2 V (1.5 V/GHz) Max. Safe Input Level; 15 V dc

**Table 3-4. General Specifications and Characteristics**

Parameters	Specifications	
Temperature	<b>Operation</b> 0 C to +50 C	<b>Storage</b> 40 C to +75 C
EMI (applies to systems only)	Conducted and radiated interference is in compliance with CISPR publication 11 (1975) and FTZ 1046. Radiated interference is in compliance with MIL-STD 461B, Part 7, RE02.	
HP 70301A <i>Weight</i>	6.9 kg (15.2 lb)	
HP 70301A <i>Dimensions</i> height width length	3/8-width module 127 mm (5.0 in) 144 mm (5.7 in) 467 mm (18.4 in)	