Specifications

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.

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

Parameters	Specifications		
Frequency Range	2.7 to 18 GHz		
with an HP 70301A	10 MHz-18 GHz		
Frequency Accuracy	[(Freq. Readout Freq. Ref. Acc.) + % of span + 15 Hz]		
	% of span is 1% for spans "Span Breakpoint" or 2% for spans		
	"Span Breakpoint".		
	Span Breakpoint = 10 MHz N		
Frequency Tracking Range	500 Hz, 1 Hz steps		
Frequency Tracking Drift	<3 Hz/Hour after warm-up		
Frequency Offset Range	5 MHz with external 21.4 MHz source		
Maximum leveled output power	20 C to 30 C 0 C to 50 C		
	0 dBm $2 dBm$		
Amplitude Control Range	+14.5 to 66 dBm		
Vernier Range	+14.5 to $11 dBm (0.1 dB resolution)$		
Amplitude Accuracy (20-30 C):			
Absolute Accuracy at 2.7 GHz	0.5 dB (output power set to 2 dBm)		
Amplitude Flatness rel. to 2.7 GHz	1.0 dB		
Vernier Accuracy	0.15 dB/dB, 0.8 dB total		
Total Abs. Accuracy (0 dB attn.)	2.3 dB (absolute accuracy + flatness + vernier)		
Amplitude Drift	< 0.05 dB/ C at $2 dBm$ output power		
Tracking Generator Feedthrough	Less than -130 dBm or standard system displayed average noise level		
(System Performance)	(without HP 70301A), whichever is greater, disregarding the exceptions listed below.		
	Note: Systems with preamplifiers will not meet this specification.		
Exceptions:	1700c. Systems with predictional will not meet this specification.		
HP 71200C opt 002/003			
and HP 71201A			
(Preselected Mode):	< -115 dbm 2.7 - 6.2 GHz		
	< -105 dBm 6.0 - 12.7 GHz		
	< -100 dBm 12.5 - 18.0 GHz		
HP 71200A/71200C			
(Non-Preselected Mode):	< -50 dBm (charateristic)		
,	(Tracking Generator Feedthrough is defined as the displayed average		
	noise level present with the TG set to maximum leveled output power		
	with the TG output and RF input terminated in 50Ω loads.)		

Refer to Frequency Reference Accuracy for the particular system in the HP 70900 Installation and Verification Manual.

 $^{^{\}dagger}$ Uncorrected, error is $\;$ 200 Hz with tracking adjusted to 0 Hz.

 $^{^{\}ddagger}$ N = Harmonic mixing number

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

Parameters		Specifica	ations	
Scalar Dynamic Range (20-30 C)	Compute using the following formula:			
	SDR = maximum leveled output power - TG feedthrough			
Output Attenuator:		-		
Range	55 dB in 5 dB step	S		
Repeatability	0.2 dB for any			
Accuracy	· ·	<12.8 GHz	12.8-18 GHz	
(referenced to 0 dB attn.)	Attn. (dB)	(dB)	(dB)	
,	$\overset{\circ}{5}$	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	
Spectral Purity :				
(with -2 dBm output power)				
Phase Noise at 10 kHz offset	< -90 dBc/Hz + 20 logN			
	n 40 kHz: < -70	_		
		(n 50), (n 60), and (n 400 Hz): < 50 dBc		
	Display: < 60 dBc (approx. 24 kHz)			
	Others contributed by HP 70301A: < 80 dBc			
n 1st LO	< 65 dBc			
		∠ 7 dBc (∠ 15)	dRe typical)	
Harmonic Spurious		,	*	
C-1 1	3rd harmonic: < 11 dBc (< 15 dBc typical)			
	precluded by design			
Non-harmonic Spurious	<-60 dBc			
Residuals (RF off)	`	< 120 dBm (tracking)		
	< 65 dBm (LO er	nission)		
N = Harmonic mixing number $n = 1, 2, 3, \dots \infty$				

All input/output ports are 50 Ω 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 Ω Impedance 564 μ 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 Ω 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	Operation	Storage
	0 C to +50 C	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 Weight	6.9 kg (15.2 lb)	
HP 70301A Dimensions	3/8-width module	
height	127 mm (5.0 in)	
width	144 mm (5.7 in)	
length	467 mm (18.4 in)	