


# DATASHEET APPH50G and APPH64G Specification v1.00

Signal Source Analyzer from 5 MHz to 50 and 64 GHz



## DEFINITIONS

 The specifications in the following pages describe the warranted performance of the instrument for  $23 \pm 5$  °C after a 30-minute warm-up period (unless otherwise stated).

**Min/Max:** Parameter range that is guaranteed by product design, and/or production tested. Warranted performance specifications include guard-bands to account for the expected statistical performance distribution, measurement uncertainties, and changes in performance due to environmental conditions.

**Typical:** Expected mean values, not warranted performance.

## INTRODUCTION

 **Fully integrated cross-correlation signal source analyser for 5 MHz to 50 and 64 GHz**

The APPH50G and APPH64G is an integrated solution that offers an indispensable set of measurement functions for evaluating signal sources ranging from VHF to microwave frequencies such as crystal oscillators, PLL synthesizers, clocks, phase-locked or free-running VCOs, DROs, SAW or YIG oscillators, and others.

The flexible instrument comprises a two-channel cross-correlation system with two internal tunable reference sources and allows measurements with externally fed references.

The APPH supports many other functions including

- Absolute and residual phase noise measurements
- Amplitude noise measurements
- Pulsed absolute and residual phase noise measurements
- Two-channel 100 MHz FFT analysis
- Transient measurements (frequency, phase, amplitude vs. time)
- Spectrum analysis
- Frequency counter function / power meter

Additionally, the unit offers

- Two programmable low noise DC supplies up to 15 V and 600 mA current capability
- Three low noise tuning voltages for -5 to +22 V voltage range

It is a compact and powerful instrument available with LAN (VXI-11), USBTMC, or with GPIB (optionally) interfaces. Platform independent intuitive graphical user interface (GUI), API library, and powerful SCPI command language set is available.

Operated with an external 24 V DC supply, it consumes less than 70 W.

# SPECIFICATIONS

## ◆ Absolute Phase Noise Measurement 5 MHz to 64 GHz (continuous waveform)

Measurement parameters:

SSB Phase Noise [dBc/Hz]

Spurious Noise [dBc]

Integrated RMS Phase Noise Deviation [deg, rad]

Time Jitter [s]

Residual FM/PM [Hz RMS]

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>RF Frequency Range</b>	<i>FMIN</i> 5 MHz 5 MHz		<i>FMAX</i> 50 GHz 64 GHz	Using internal references APPH50G APPH64G
<b>RF Frequency Range</b>	5 MHz		22 GHz	Using external references
<b>Input Power Range</b> <18 GHz 18 GHz to 40 GHz > 40 GHz	-20 dBm -20 dBm -15 dBm		+20 dBm +23 dBm +23 dBm	Damage level +26 dBm  <i>See RF sensitivity plots</i>
<b>Input Impedance</b> VSWR		50 Ω 2		AC coupled, 10 V DC max
<b>Offset Analysis Range</b>	0.01 Hz 0.01 Hz		100 MHz > 25% of $f_c$	$f_c > 150$ MHz $f_c < 150$ MHz
<b>Resolution (PPD)</b>	200	200	1600	RBW adjustable (x1/x2/x4/x8), PPD (points per decade) can be lower for lowest decade of measurement
<b>Measurement Accuracy</b>		±4 dB ±3 dB ±2 dB		Offset < 10 Hz Offset 10 Hz to 1 kHz Offset 1 kHz to 100 MHz
<b>Phase Noise Sensitivity</b>				<i>See plot &amp; sensitivity tables</i>
<b>Spurious Levels</b> Internal References External References		-90 dBc -85 dBc		
<b>Measurement Time</b>				<i>See table "Measurement Time"</i>
<b>Trigger</b>				Single, continuous, manual, bus
<b>Internal References</b>				Cross-correlation
Frequency Range	<i>FMIN</i>		<i>FMAX</i>	
Phase Noise Sensitivity				<i>See plots "Sensitivity"</i>
RF Tracking Range		±1 ppm ±4 ppm ±1000 ppm		Option LN Standard High drift mode
<b>External References</b>				Single channel / cross-corr.
Frequency Range	10 MHz		22 GHz	
RF Input Power Range	0 dBm		+23 dBm	Damage level +26 dBm

Phase Noise Sensitivity				See plot & sensitivity tables
Reference Input Level Range				
< 4 GHz	+10 dBm	+13 dBm	+18 dBm	Lower input ports
> 4 GHz	+13 dBm	+15 dBm	+18 dBm	Upper input ports
Tuning Voltage Range	-5 V		+20 V	User adjustable
Tuning Output Current			20 mA	

### Absolute Phase Noise Measurement – Pulsed (Option PULSE / NPS)

PARAMETER	MIN	TYPICAL	MAX	NOTE
RF Frequency Range	30 MHz		50 GHz	APPH50G
	30 MHz		64 GHz	APPH64G
RF Input Power Range	+5 dBm		+20 dBm	No power measurement
Input Parameters				
Pulse Rate (PRF)	500 Hz		2 MHz	
Pulse Width	1 us		2 ms	Option PULSE
	30 ns		2 ms	Option NPS
Duty Cycle	2%		60%	Option PULSE
	0.1%		60%	Option NPS
Offset Analysis Range	0.01 Hz		PRF	
Measurement Accuracy		±4 dB		Offset < 10 Hz
		±3 dB		Offset 10 Hz to 1 kHz
		±2 dB		Offset 1 kHz to 100 MHz
Measurement Time				See table “Meas. Time”

### Residual (Additive) Phase Noise Measurement – CW (Option APN) and Pulsed (Option APN + PULSE)

Measurement parameters:

SSB Phase Noise [dBc/Hz]

Spurious Noise [dBc]

Integrated RMS Phase Noise Deviation [deg, rad]

Time Jitter [s]

Residual FM/PM [Hz RMS]

PARAMETER	MIN	TYPICAL	MAX	NOTE
RF Frequency Range	10 MHz		22 GHz	
RF Input Power Range				
RF Port	+3 dBm		+23 dBm	
REF Ports	+13 dBm		+20 dBm	
LO Output Power Range	+17 dBm		+23 dBm	Option LO
Offset Analysis Range	0.01 Hz		100 MHz	
Measurement Accuracy		±3 dB		Offset < 1 kHz
		±2 dB		Offset > 1 kHz
Additive Phase Noise Sensitivity				See sensitivity table

### Transient Analysis (Option TRAN)

Measurement parameters:

Wideband Mode (WB): Frequency [Hz]

Narrowband Mode (NB): Frequency [Hz], RF Power [dB], Phase [deg]

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>RF Frequency Bands (WB)</b>	5 MHz 20 MHz 80 MHz 320 MHz 2 GHz 16 GHz tbd		100 MHz 400 MHz 1.6 GHz 3 GHz 20 GHz 32 GHz 48 GHz	Band 1 Band 2 Band 3 Band 4 Band 5 Band 6 Band 7
<b>Measurement Spans</b>				Bands 1-6
Wideband Mode (WB)				
Narrowband Mode (NB)	200 kHz		80 MHz	200 kHz, 1.25 MHz, 80 MHz
<b>Frequency Resolution</b>				See table
<b>Time Span</b>	10 $\mu$ s		1 min	
<b>Time Resolution</b>	16 ns		50 ms	
<b>Trigger Mode</b>				Single, Continuous, Internal (WB video or NB video), external

### Burst Mode Phase Noise Measurement (Option PULSE + Option BURST)

Measurement parameters:  
SSB Phase Noise [dBc/Hz]

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>RF Frequency Range</b>	5 MHz		FMAX	
<b>Offset Analysis Range</b>	1 / T		30 MHz	
<b>Time Span (T)</b>	10 $\mu$ s		1 min	
<b>Phase Noise Sensitivity</b>				Single Channel, f = 1 GHz
1 kHz		-120 dBc/Hz		
10 kHz		-128 dBc/Hz		
100 kHz		-131 dBc/Hz		
1 MHz		-131 dBc/Hz		
10 MHz		-147 dBc/Hz		

### Absolute Amplitude Noise Measurement (Option AM)

Measurement parameters:  
SSB Amplitude Noise [dBc/Hz]

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>RF Frequency Range</b>	<i>FMIN</i>		<i>FMAX</i>	
<b>RF Input Power Range</b>				
5 MHz to 10 GHz	-20 dBm		+20 dBm	
>10 GHz	-10 dBm		+20 dBm	
<b>Offset Analysis Range</b>	0.1 Hz		40 MHz	
<b>Measurement Uncertainty</b>		$\pm 2$ dB		
<b>AM Noise Sensitivity (1 corr.)</b>				1 GHz, P <sub>in</sub> = -10 dBm to +20 dBm
1 Hz		-100 dBc/Hz		
10 Hz		-115 dBc/Hz		
100 Hz		-135 dBc/Hz		

1 kHz		-145 dBc/Hz		
10 kHz		-155 dBc/Hz		
> 100 kHz		-160 dBc/Hz		

## Baseband Noise Analysis

Input Connectors:

2 BNC female (rear panel), AC coupled

Measurement parameters:

Noise Spectrum [dBV/Hz, dBm/Hz, nV/ $\sqrt{\text{Hz}}$ ]

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Frequency Input Range</b>	1 Hz		100 MHz	
<b>DC Voltage Input Range</b> Input Impedance	-12 V	1 k $\Omega$	+12 V	DC
<b>AC Voltage Range</b>			+10 dBm	
<b>Input Noise Density (1 correlation)</b> 10 kHz		< 1 nV/ $\sqrt{\text{Hz}}$		
<b>Trigger</b>				Single, Continuous, Manual, Bus

## Time Stability Measurement (Option TSTAB)

Measurement parameters:

ADEV (no dead time)

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Measurement Time</b>	1 s		10 days	
<b>ADEV Sensitivity</b> $\tau = 1$ s $\tau = 100$ s		5e-13 1e-13		With RBW 100 Hz

## Spectrum Monitoring (Option SPEC)

Measurement parameters:

Spectral Noise Density [dBm, dBm/Hz, dBv/Hz]

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>RF Frequency Range</b>	5 MHz		FMAX	
<b>RBW</b>	5.8 Hz		58 kHz	
<b>Measurement Uncertainty</b>				
Absolute		±3 dB		
Relative		±1 dB		
<b>Noise Floor</b>				
10 MHz to 4 GHz		-95 dBm/Hz		
4 GHz to 18 GHz		-90 dBm/Hz		
18 GHz to 40 GHz		-80 dBm/Hz		
40 to FMAX		tbd		
<b>Spurious (SFDR)</b>				Spurious Free Dynamic Range
10 MHz to 4 GHz		-70 dBc		
4 GHz to 18 GHz		-60 dBc		
18 GHz to 40 GHz		-55 dBc		
<b>Spurious (absolute)</b>				
10 MHz to 4 GHz		dBm		
4 GHz to 18 GHz		tbd		
18 GHz to 40 GHz		tbd		
<b>Trigger</b>				Continuous

## VCO Characterization (Option VCO)

Measurement parameters:

Frequency [Hz]

$K_{VCO}$  (Tuning Sensitivity) ( $\Delta f/\Delta V_c$ ) [Hz/V]

Frequency Pushing [Hz/V]

RF Power Level [dBm]

DC Supply Current [mA]

SSB Phase Noise [dBc/Hz]

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Sweep Parameters</b>				
DC Supply Voltage	0 V		15 V	Adjustable
DC Supply Current			550 mA	
Tuning Voltage	-5 V		20 V	Adjustable
Tuning Current			20 mA	
<b>RF Frequency Range</b>	10 MHz		tbd	
Uncertainty				
<b>RF Input Power Range</b>	-5 dBm		+20 dBm	
Uncertainty		0.5 dB	2 dB	
<b>DC Supply Current</b>	0 mA		550 mA	
Uncertainty		1%		
<b>Output Settling Time</b>		20 ms		
<b>Measurement Speed</b>		70 ms / point		Frequency, $K_{VCO}$ , Pushing, Supply Current, and Power

## Frequency Counter

Measurement parameters:  
Frequency [Hz]

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>RF Frequency Range</b>	1 MHz		<i>FMAX</i>	
<b>Absolute Accuracy</b>		300 ppb		Or accuracy of external reference
<b>Sensitivity</b>				See plot "Typical RF Sensitivity Plot"

## Power Detector

Measurement parameters:  
RF Power Level [mW, dBm]

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>RF Frequency Range</b>	5 MHz		<i>FMAX</i>	
<b>Absolute Accuracy</b>		±1 dB	±2.5 dB	
<b>Power Range</b>	-10 dBm		+13 dBm	

## Tuning Voltage & Dual Power Supply

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>DUT Tuning</b>				BNC Front Panel Output
DC Voltage Range	-5 V		+22 V	
Setting Resolution		1 mV		
Setting Uncertainty		±2 mV		
Noise Level		< 2 nV <sub>rms</sub> /√Hz		> 2 kHz
DC Current Range	0 mA		20 mA	
<b>DC Power Supplies</b>				BNC Rear Panel Output (Channel 1 & 2)
DC Voltage Range	0 V		15 V	
Setting Resolution		10 mV		
Setting Accuracy		±10 mV		
Noise Level		< 10 nV <sub>rms</sub> /√Hz		> 20 kHz
Output Resistance		< 0.5 Ω		
DC Current Measurement Range	0 mA		550 mA	Per Channel
Resolution		100 μA		

## LO Output (Option LO)

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Use: Additive Phase Noise</b>				
Frequency Range	0.1 GHz		20 GHz	
Frequency Resolution		1 Hz		
Power Level	15 dBm	17.5 dBm	20 dBm	
<b>Use: LO for Downconversion</b>				



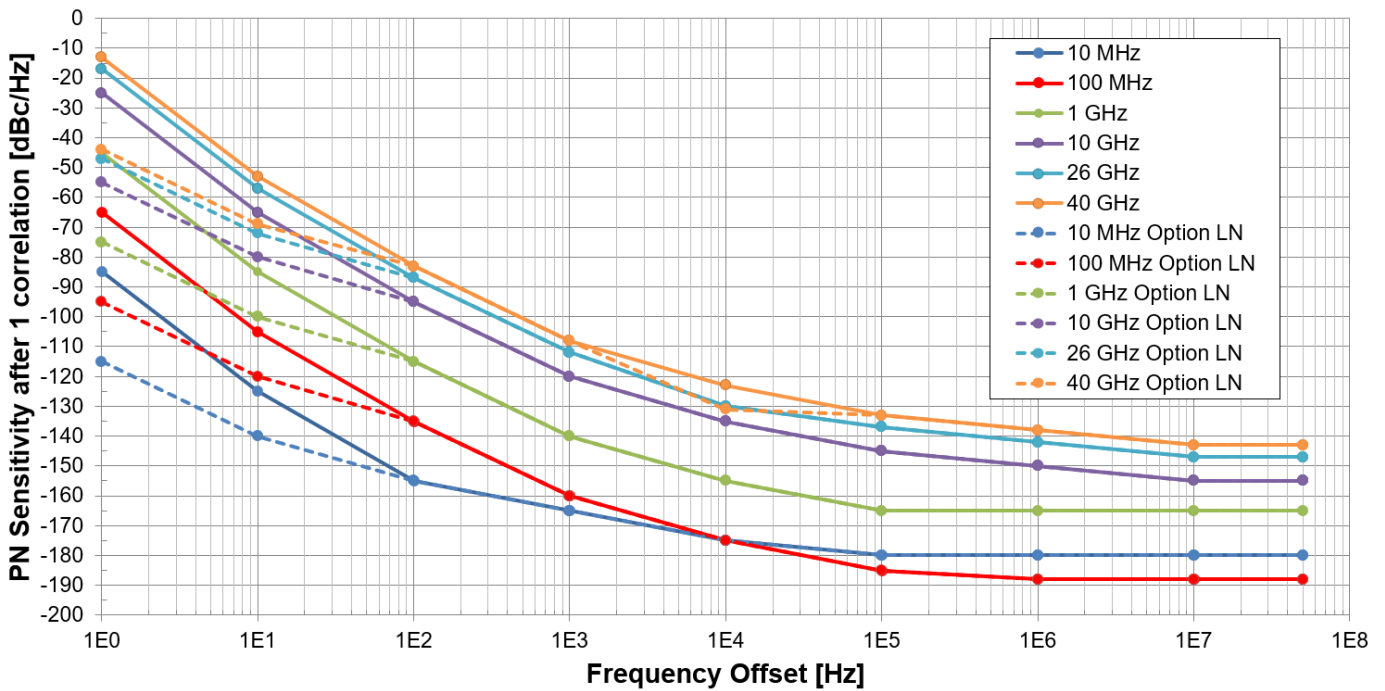
Frequency Range	2 GHz		20 GHz	
Frequency Resolution		0.5 GHz		
Power Level	15 dBm	17.5 dBm	21 dBm	

# PERFORMANCE CURVES

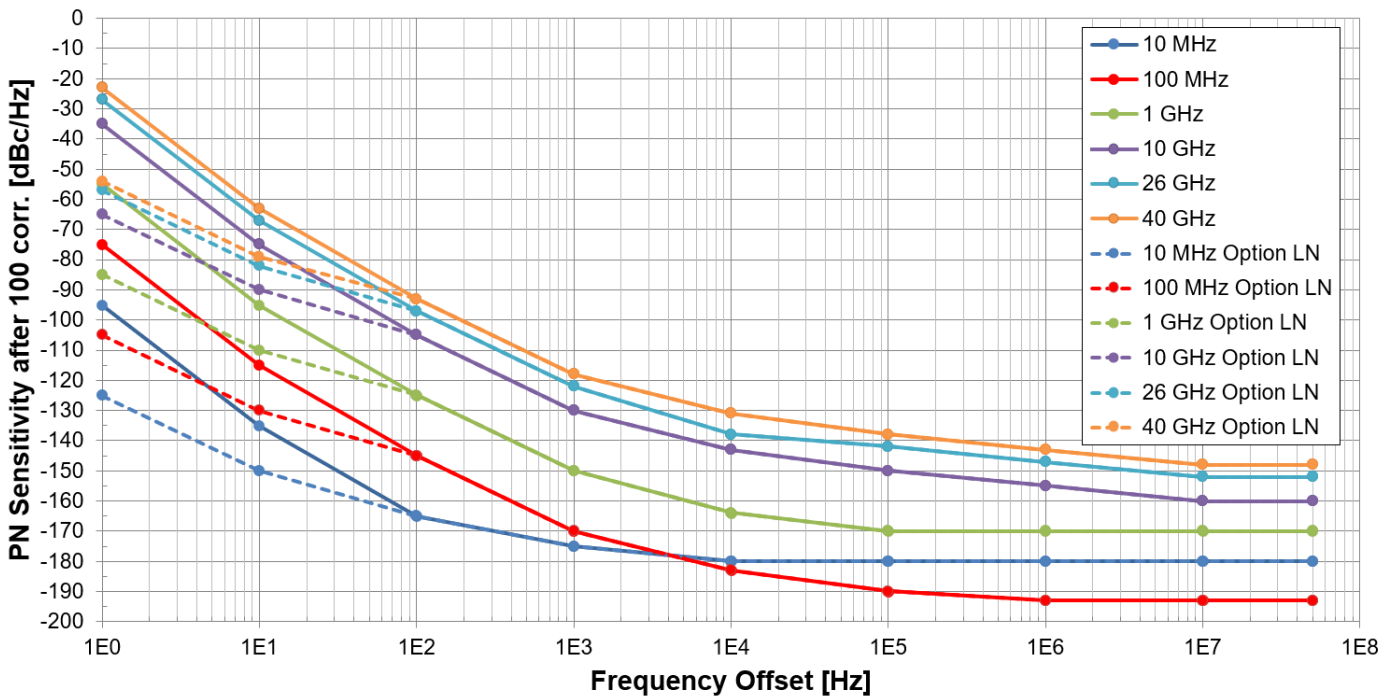
## Phase Noise Sensitivity - Standard and Low Noise (Option LN) Internal References

Measurement Time ~10 seconds, after first cross-correlation; further correlations will improve sensitivity by 5 dB for 10, 10 dB for 100, and 15 dB for 1000 correlations performed. The plots show typical performance.

### After 1 Correlation

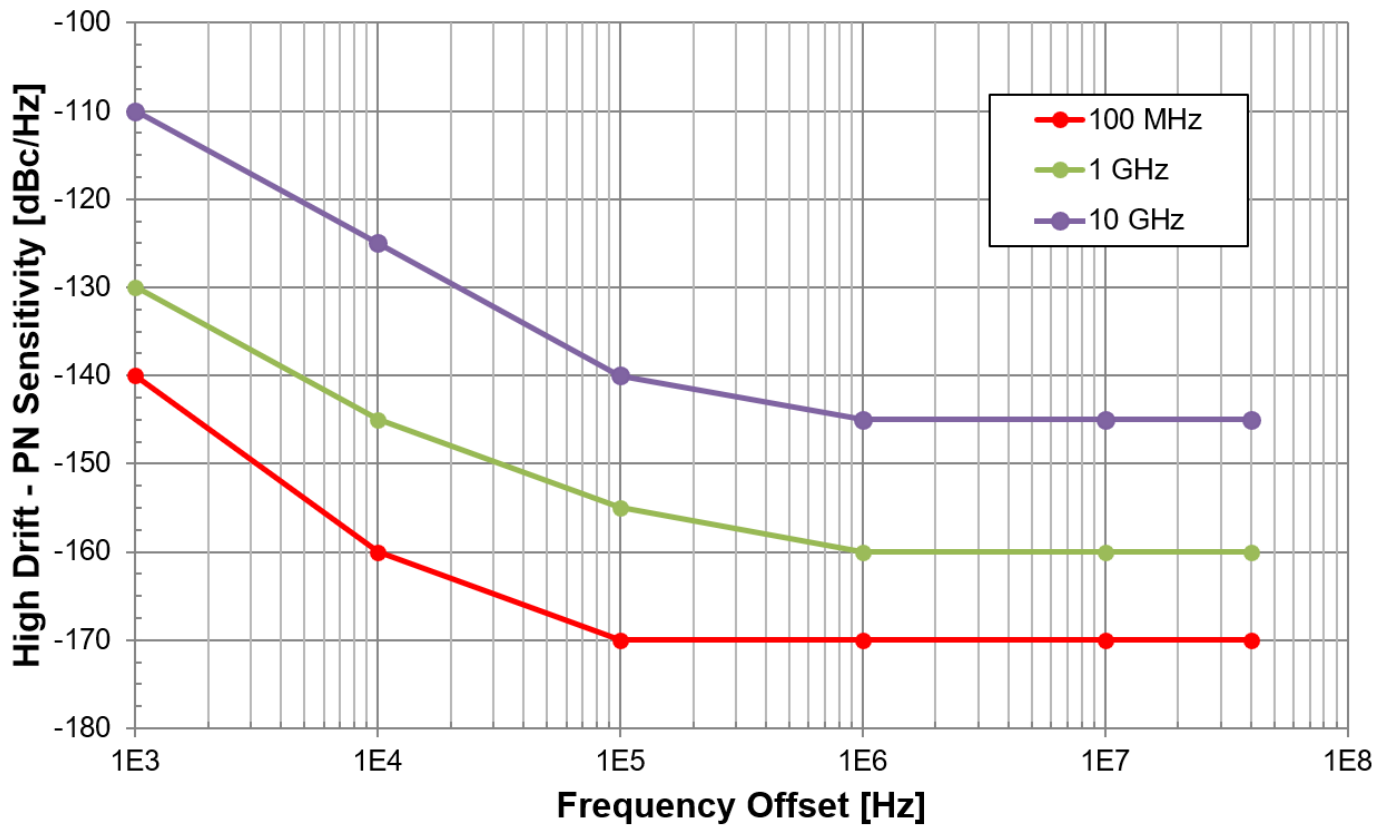


### After 100 Correlations



 **Typical Noisefloor Example (after >1k correlations at 100MHz, 1GHz, 10GHz)**

## Phase Noise Sensitivity - High Drift



## Typical RF Sensitivity 5 MHz FMAX

## Phase Noise Measurement Time

Total measurement time consists of setup time, transfer time plus the number of performed correlations times the time per correlation. The measurement times below are normalized to one correlation for nominal RBW settings per correlation and measurement times > 2 seconds.

	TIME PER CORRELATIONS	DEFAULT NR. OF POINTS (SETTABLE)
0.1 Hz to 100 MHz	80	250 per decade
1 Hz to 100 MHz	8	250 per decade
10 Hz to 100 MHz	0.8	250 per decade
100 Hz to 100 MHz	0.1	250 per decade
1 kHz to 100 MHz	0.01	250 per decade
10 kHz to 100 MHz	< 0.004	250 per decade

## Absolute Phase Noise Sensitivity – Internal References (Standard)

Abs. PN with internal references (Option LN)	OFFSET						
	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
10 MHz	-85	-125	-155	-165	-172	-175	-175
100 MHz	-65	-105	-135	-160	-172	-178	-178
1 GHz	-45	-85	-115	-140	-155	-160	-160
3 GHz	-35	-75	-105	-130	-145	-150	-155
10 GHz	-25	-65	-95	-120	-135	-140	-145
25 GHz	-15	-55	-85	-110	-130	-135	-140
40 GHz	-13	-53	-83	-108	-123	-133	-138
Remarks	Test conditions: carrier power $\geq$ 5 dBm; after <b>one correlation</b>						

## Absolute Phase Noise Sensitivity – Internal References (with Option LN)

Abs. PN with internal references (Option LN)	OFFSET						
	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
10 MHz	-115	-140	-155	-165	-172	-175	-175
100 MHz	-95	-120	-135	-160	-172	-178	-178
1 GHz	-75	-100	-115	-140	-155	-160	-160
3 GHz	-65	-90	-105	-130	-145	-150	-155
10 GHz	-55	-80	-95	-120	-135	-140	-145
25 GHz	-45	-70	-85	-110	-130	-135	-140
40 GHz	-44	-68	-83	-108	-123	-133	-138
Remarks	Test conditions: carrier power $\geq$ 5 dBm; after <b>one correlation</b>						

## Absolute Phase Noise Sensitivity – External References

Abs. PN with external references	OFFSET						
	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
10 MHz	-135	-150	-155	-170	-175	-175	-175
100 MHz	-120	-130	-140	-170	-178	-178	-178
1 GHz	-100	-110	-125	-155	-170	-170	-170
3 GHz	-95	-110	-125	-155	-170	-170	-170
10 GHz	-90	-110	-120	-145	-155	-155	-155
18 GHz	-85	-105	-115	-130	-140	-145	-145
Remarks	Test conditions: carrier power $\geq$ 5 dBm; after one correlation						

## Additive Phase Noise Sensitivity – Single Channel

Additive PN (1 channel)	OFFSET						
	1 Hz	10 Hz	100 Hz	1 kHz	10 kHz	100 kHz	1 MHz
$10 \text{ MHz} \leq f \leq 1 \text{ GHz}$	-130	-140	-150	-160	-170	-170	-170
$1 \text{ GHz} \leq f \leq 4 \text{ GHz}$	-130	-140	-150	-160	-170	-170	-170
$4 \text{ GHz} \leq f \leq 16 \text{ GHz}$	-115	-125	-135	-145	-150	-155	-160
Remarks	Test conditions: RF carrier power $\geq$ 10 dBm; REF $\geq$ 13 dBm Two channel cross-correlation can improve noise floor by 5 dB per 10x correlations.						

## Transient Analysis – Wideband: Frequency Resolution vs. Time Resolution (residual FM, 5% video bandwidth, typical)

Frequency Measurement uncertainty is  $\pm$  (resolution + time-base uncertainty). Tabulated resolutions are measured with the APPH and DUT locked to the same 10 MHz reference. Input level 0 dBm.

Time Resolution	16 ns	128 ns	500 ns	1 $\mu$ s	$\geq 10$ $\mu$ s
Frequency Band	Frequency Resolution [Hz]				
5 MHz to 100 MHz	3 k	100	30	15	10
20 MHz to 400 MHz	5 k	700	200	100	20
80 MHz to 1.6 GHz	10 k	1 k	200	100	50
320 MHz to 3 GHz	30 k	1.5 k	300	150	150
1.3 GHz to 26 GHz	100 k	6 k	2 k	1 k	1 k
5.2 GHz to <i>FMAX</i>	500 k	20 k	4 k	2 k	2 k

## Transient Analysis – Narrowband: Frequency Resolution vs. Time Resolution (residual FM, 80 MHz span, 5% video bandwidth, typical)

Frequency Measurement uncertainty is  $\pm$  (resolution + time-base uncertainty). Tabulated resolutions are measured with the APPH and DUT locked to the same 10 MHz reference. Input level 0 dBm.

Time Resolution	16 ns	128 ns	500 ns	1 $\mu$ s	10 $\mu$ s	$\geq 20$ $\mu$ s
Frequency Range	Frequency Resolution [Hz]					
< 200 MHz	1.5 k	50	10	4	4	4
< 800 MHz	2.5 k	150	15	10	4	4
< 2 GHz	2.5 k	500	20	10	4	4
< 20 GHz	30 k	4 k	150	70	20	7
> 20 GHz	50 k	4 k	400	150	50	15

## Transient Analysis – Narrowband: Frequency Resolution vs. Time Resolution (residual FM, 1.25 MHz span, no video bandwidth, typical)

Frequency Measurement uncertainty is  $\pm$  (resolution + time-base uncertainty). Tabulated resolutions are measured with the APPH and DUT locked to the same 10 MHz reference. Input level 0 dBm.

Time Resolution	256 ns	500 ns	1 $\mu$ s	10 $\mu$ s	$\geq 20$ $\mu$ s
Frequency Range	Frequency Resolution [Hz]				
< 200 MHz	60	30	15	1.5	0.5
< 800 MHz	70	30	15	1.5	1.5
< 2 GHz	100	40	15	3	1.5
< 20 GHz	1 k	300	150	30	15
> 20 GHz	3 k	1 k	400	60	30

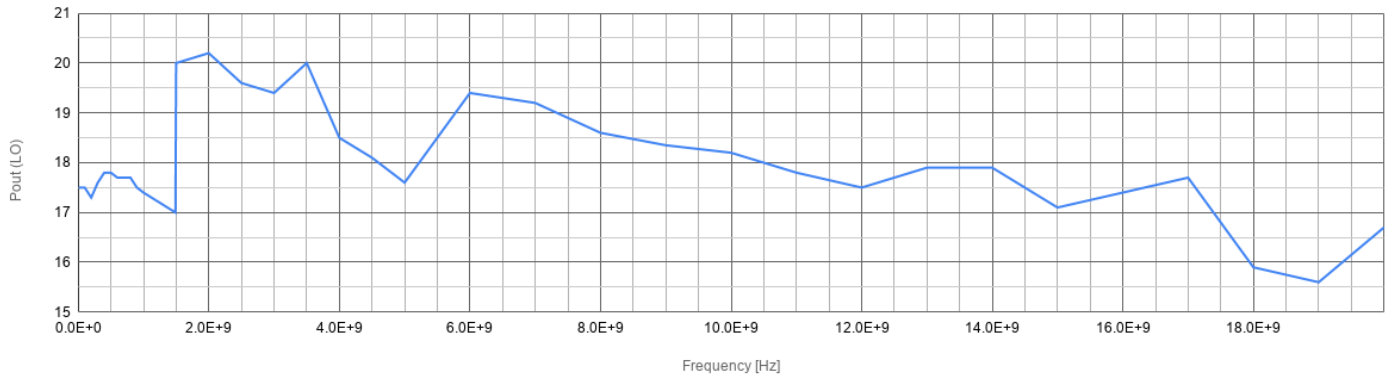
## Transient Analysis – Narrowband: Frequency Resolution vs. Time Resolution (residual FM, 200 kHz span, no video bandwidth, typical)

Frequency Measurement uncertainty is  $\pm$  (resolution + time-base uncertainty). Tabulated resolutions are measured with the APPH and DUT locked to the same 10 MHz reference. Input level 0 dBm.

Time Resolution	1 $\mu$ s	10 $\mu$ s	$\geq$ 20 $\mu$ s
Frequency Range	Frequency Resolution [Hz]		
< 200 MHz	1	0.5	0.3
< 800 MHz	1.5	0.5	0.3
< 2 GHz	3	1	0.4
< 20 GHz	20	10	3
> 20 GHz	50	20	10

## Option LO – Power Output

Option LO - Typical Power Output



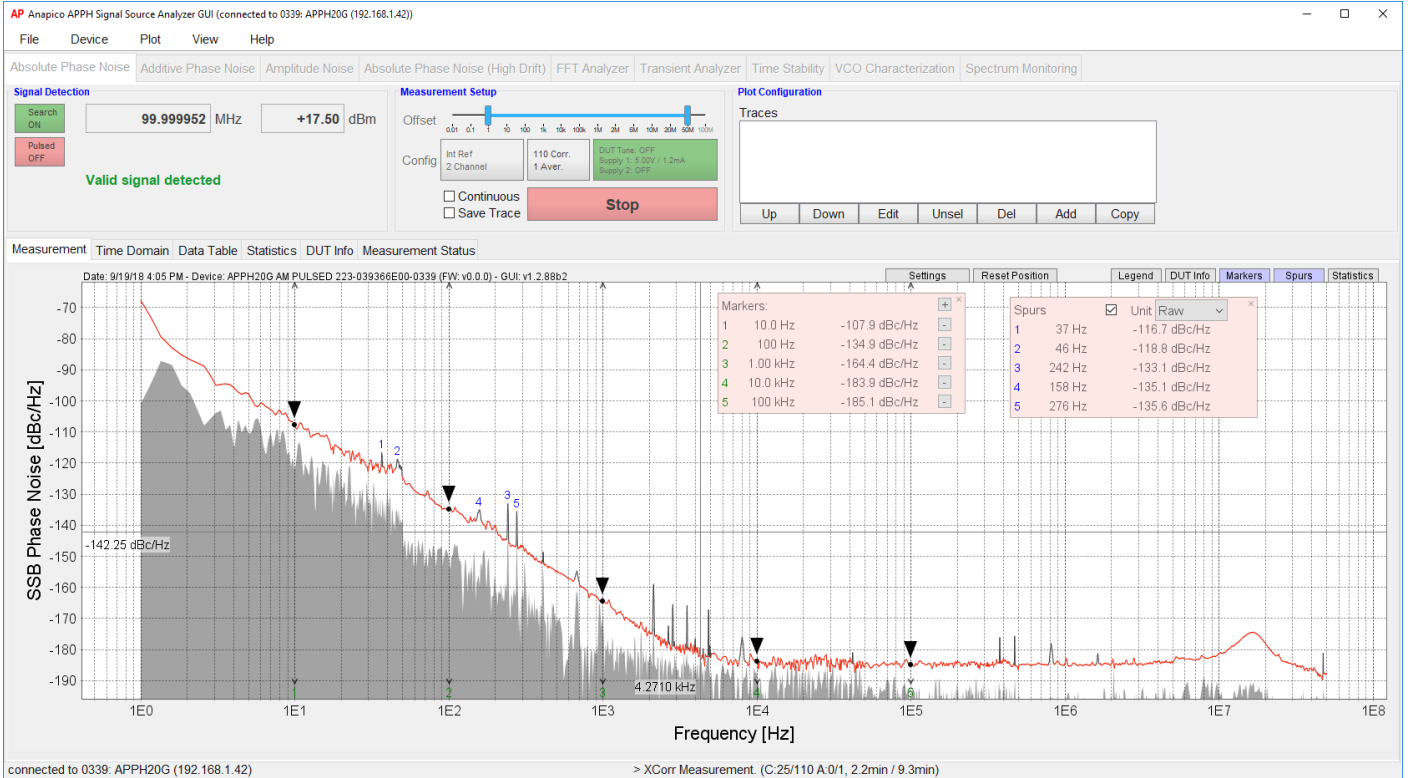


## Data Processing Capabilities

Graphical User Interface: The analyzer employs a graphical user interface based on the Windows operating system.

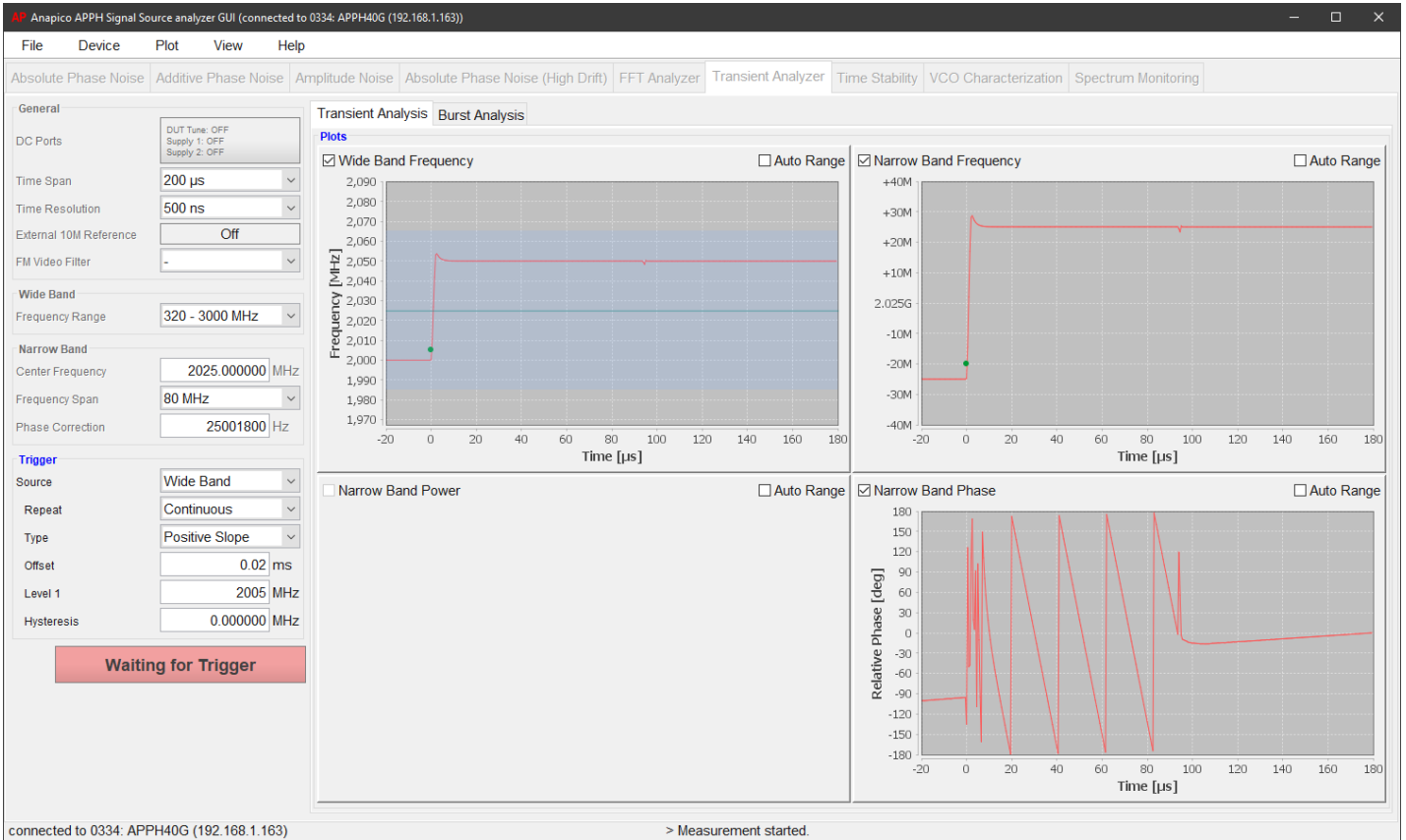
<b>Display Functions</b>	Phase Noise, Time Domain, Data Table, Residual, Statistics
<b>Trace Functions</b>	
Data Traces	Display current measurement and/or multiple memory data (up to 16 traces)
Title	Add customized title to each measurement window
Auto-Scale	Automatically selects scale resolution and reference value to vertically center the trace
Statistics	Calculates and displays mean, standard deviation, and peak-to-peak deviation of the trace
<b>Marker Functions</b>	16 independent markers

# GUI Interface (Absolute Phase Noise)

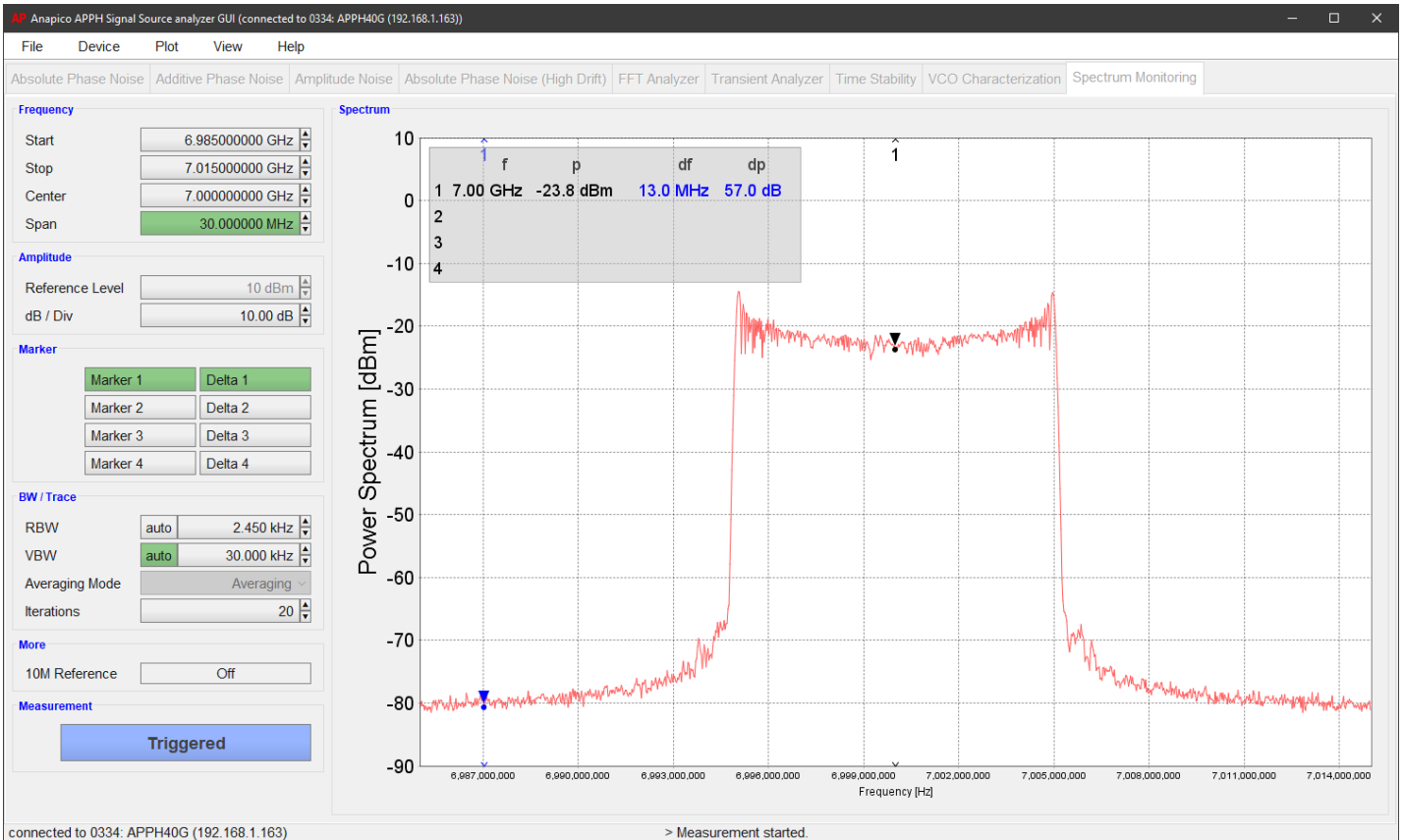


# GUI Interface (PULSED RF Absolute Phase Noise)

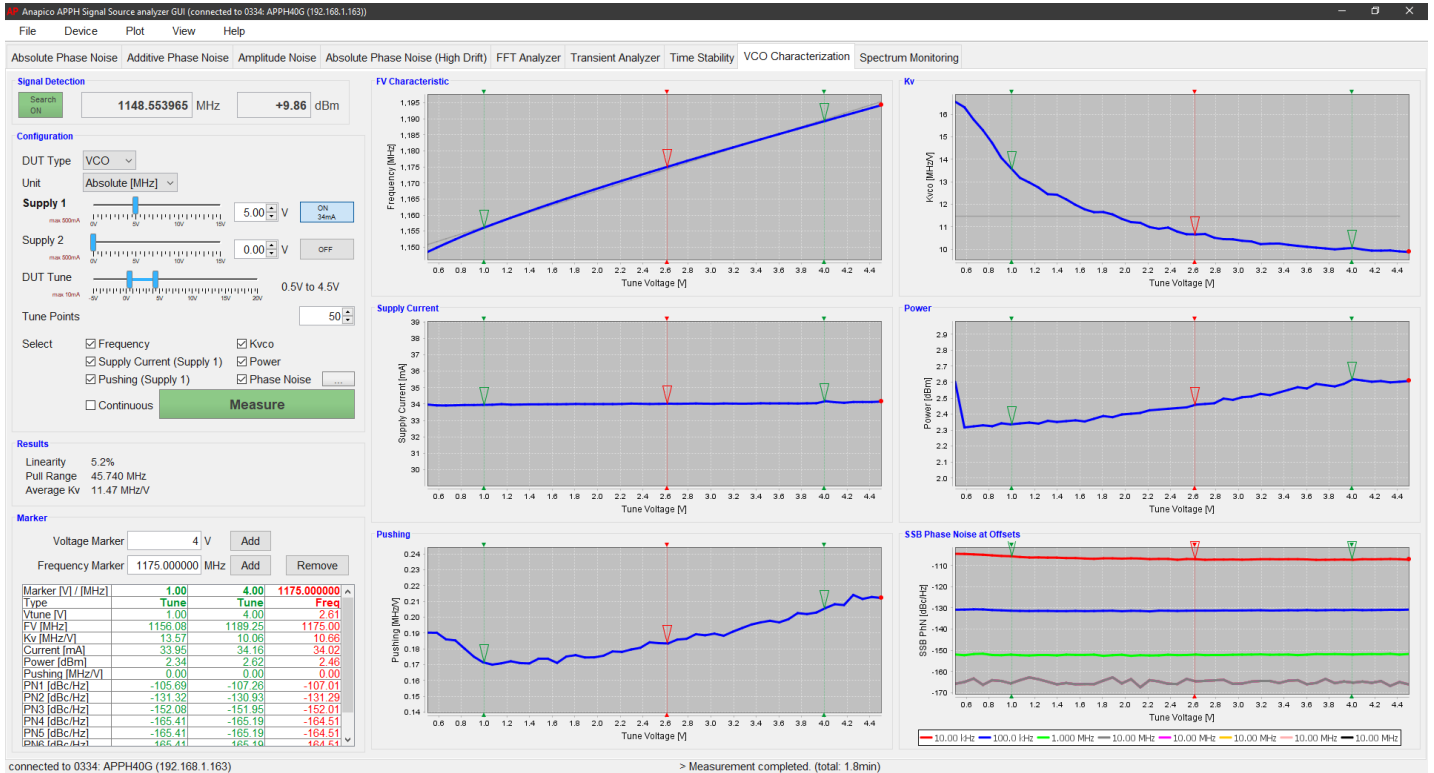
# GUI Interface (Transient Analyzer)



# GUI Interface (Spectrum Monitoring)



# GUI Interface (VCO Testing)



## Connectors (Front)

### RF Inputs

**RF IN:** 2.4 mm female (for APPH50G); 1.8 mm female (for APPH67G)

**REF1 IN HIGH/LOW, REF2 IN HIGH/LOW:** SMA female

### DC Outputs

**REF1 TUNE, REF2 TUNE:** BNC female

### Operation

**Switch I/O:** DC Power Switch

**POWER, READY, REMOTE:** Status LED

## Connectors (Rear)

### HF/VHF/AUX Inputs

**BASEBAND CH1, BASEBAND CH2:** BNC female

**REF IN 10 MHz:** BNC female

**EXT TRIG:** BNC female

### DC Outputs

**DC SUPPLY CH1, DC SUPPLY CH2:** BNC female

### Operation

**LAN:** RJ-45

**USB B:** USB 2.0 device

**DC 24V:** DC Power Plug (24V, 2A)

**GPIB (Option GPIB):** IEEE-488 GPIB Connector

## Connectors (Front – Option LO)

### Additional RF Inputs

**LO1 IN HIGH/LOW, LO2 IN HIGH/LOW:** SMA female


**RF1 IN, RF2 IN:** SMA female

### Additional RF Outputs

**LO1 OUT HIGH/LOW, LO2 OUT HIGH/LOW:** SMA female

**RF1 OUT, RF2 OUT:** SMA female

## ORDERING INFORMATION

 HOST MODEL	PRODUCT	DESCRIPTION
APPH	APPH50G	50 GHz Signal Source Analyzer
APPH	APPH64G	64 GHz Signal Source Analyzer
APPH	Option LN	Ultra-low noise internal sources
APPH	Option PULSE	Pulsed signal measurement
APPH	Option NPS	Pulsed signal measurement for narrow pulses and low duty cycles

<b>APPH</b>	<b>Option BURST</b>	Burst mode phase noise measurement
<b>APPH</b>	<b>Option AM</b>	Amplitude noise measurement
<b>APPH</b>	<b>Option APN</b>	Additive phase noise measurement
<b>APPH</b>	<b>Option LO</b>	Access to internal reference for residual phase noise measurement (requires option APN)
<b>APPH</b>	<b>Option TRAN</b>	Transient analysis
<b>APPH</b>	<b>Option TSTAB</b>	Time stability analysis
<b>APPH</b>	<b>Option VCO</b>	VCO characterization
<b>APPH</b>	<b>Option SPEC</b>	Spectrum monitoring
<b>APPH</b>	<b>Option GPIB</b>	GPIB interface

# GENERAL CHARACTERISTICS

**Remote programming interfaces:**

- Ethernet 100BaseT LAN interface
- USB 2.0 device
- GPIB (IEEE-488.2,1987) with listen and talk (Option GPIB)
- Control Language SCPI Version 1999.0

**Power requirements:** 24V ± 3.0 VDC; 70 W maximum

**Mains adapter supplied:** 100-240 VAC in/ 24 V 4.0 A DC out

**Environmental:** Levels similar to MIL-PRF-28800F Class 3/4



Safety / EMC complies with applicable Safety and EMC regulations and directives.

**Weight:** ≤ 10.0 kg (21 lbs) net

**Dimensions:**

- incl. rubber: 154 mm H x 467.5 mm W x 342 mm L (6.1 in H x 18.4 in W x 13.5 in L)
- with handle: 154 mm H x 520 mm W x 342 mm L (6.1 in H x 20.5 in W x 13.5 in L)
- handle: radius 230mm (9 in); can be turned 360° in 30° steps

**Document History**

Version	Date	Author	Notes
V100	2020-9-14	JK	first release

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