

# DATASHEET APLCXX(-X) Target Specification v1.02

Ultra-low Phase Noise Signal Source  
from 100 kHz to 12.75, 20 or 40 GHz  
(Single and Multi-Channel Versions)



Document size:

1 title page  
12 content pages

## 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

- The APLCXX is an agile ultra-low phase noise signal generator from 100 kHz to 12.75 (APLC12), 20 GHz (APLC20) or 40 GHz (APLC40) with excellent harmonic and spurious performance.

It is available with 1 to 4 phase coherent outputs. The single-channel unit is available as mountable module or in a compact enclosure with display and front panel control.

The multi-channel version APLCXX-X is available in 1, 2, 3 or 4 channel configurations in a standard 1U 19" rack-mountable enclosure. For high phase coherence, RF channels are locked to a single reference source.

The APLCXX-X has USB, LAN and a fast control port interface (FCP) and can be controlled using the SCPI 1999 command set.

Using the FCP port, frequency and amplitude can be switched within less than 20 us.

# SPECIFICATIONS



PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Frequency range</b>	100 kHz		12.75 GHz 20 GHz 40 GHz	APLC12 APLC20 APLC40
Resolution		0.001 Hz		
Phase resolution		0.1 deg		
Switching speed		200 μs	500μs	
<b>SSB Phase noise at 1 GHz</b>				(see also plots / tables)
at 10 Hz from carrier		-87 dBc/Hz -100 dBc/Hz		Option LN
at 1 kHz from carrier		-141 dBc/Hz		
at 20 kHz from carrier		-150 dBc/Hz		
at 100 kHz from carrier		-152 dBc/Hz		
<b>SSB Phase noise at 4 GHz</b>				
at 10 Hz from carrier		-76 dBc/Hz -90 dBc/Hz		Option LN
at 1 kHz from carrier		-130 dBc/Hz		
at 20 kHz from carrier		-142 dBc/Hz		
at 100 kHz from carrier		-143 dBc/Hz		
<b>SSB Phase noise at 10 GHz</b>				
at 10 Hz from carrier		-69 dBc/Hz -80 dBc/Hz		Option LN
at 1 kHz from carrier		-122 dBc/Hz		
at 20 kHz from carrier		-133 dBc/Hz		
at 100 kHz from carrier		-135 dBc/Hz		
<b>Harmonics (at +5 dBm Pout)</b>				
0.01 to 0.9 GHz		-45 dBc	-40 dBc	
>0.9 GHz		-55 dBc	-50 dBc	
<b>Sub-Harmonics</b>				
<8 GHz		-80 dBc		
8 - 20 GHz		-75 dBc		
>20 GHz		-70 dBc	-65 dBc	
<b>Non-Harmonic Spurious (&gt; 10 kHz offset)</b>				
<1.2 GHz		-90 dBc	-85 dBc	
1.2 - 2.5 GHz		-92 dBc	-88 dBc	
2.5 - 5 GHz		-90 dBc	-86 dBc	
5 - 10 GHz		-84 dBc	-80 dBc	
10 - 20 GHz		-80 dBc	-74 dBc	
<b>Output power level (APLC12/20)</b>				
<10 MHz	-20 dBm		+13 dBm	
0.01 to 6 GHz	-20 dBm		+15 dBm	
6 to 12 GHz	-20 dBm		+14 dBm	
12 to 20 GHz	-20 dBm		+13 dBm	
<b>Output power level (APLC40)</b>				
<10 MHz	-20 dBm		+13 dBm	
0.01 to 6 GHz	-20 dBm		+15 dBm	
6 to 20 GHz	-20 dBm		+13 dBm	
20 to 40 GHz	-20 dBm		+10 dBm	

<b>Power Resolution</b>		0.01 dB		
<b>Power Level Uncertainty</b>				
<6 GHz		0.25 dB	0.8 dB 1.2 dB	-15 dBm to Pmax -60 to -15 dBm
6 to 12.75 GHz		0.3 dB	0.9 dB 1.3 dB	-15 dBm to Pmax -60 to -15 dBm
12.75 to 20 GHz		0.3 dB	1.0 dB 1.6 dB	-15 dBm to Pmax -60 to -15 dBm
26 to 40 GHz		0.4 dB	1.2 dB 2.0 dB	-15 dBm to Pmax -50 to -15 dBm
<b>Reverse Power Protection</b>				
DC Voltage			±10 V	
RF Power			30 dBm	
<b>Output impedance</b>		50 Ohms		
VSWR		1.4	1.8	
<b>Frequency reference</b>				
<b>Internal reference frequency</b>		100 MHz 10 MHz		Option LN
Temperature stability 0 to 50 degC			±100 ppb ±20 ppb	Option LN
Aging 1st year			1 ppm 0.03 ppm	Option LN
Aging per day			5 ppb 0.5 ppb	after 30 days operations Option LN
Warm-up time		5 min		
<b>Output of internal reference</b>		10/100 MHz		
Output power		0 dBm		
Output impedance		50 Ohms		
<b>Bypass Internal reference Input</b>		100 MHz		High phase synchronous mode
<b>Phase Lock to External Reference</b>		10 MHz integer MHz 100 MHz	250	Option VREF
Bypass Mode	5			
<b>Reference input level</b>				
10 MHz or 1-250 MHz	-5 dBm	0 dBm	+10 dBm	
100 MHz	5 dBm		+15 dBm	
<b>Lock Range</b>				
10 MHz or 1-250 MHz			±1.5 ppm	
100 MHz			>100 ppm	
<b>Reference input impedance</b>		50 Ohms		



## Sweeping Capability

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Frequency / List sweep</b>				
Sweep type: linear, logarithmic, random				
Step time	500 µs		200 s	
Timing resolution		5 ns		
Timing accuracy per point		20 ns		

### Generalized list sweep

allows individual setting of frequency, step-time, and off-time for each point



## Modulation Capabilities (option MOD)

PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Pulse modulation</b>				
On/off ratio		70 dB		
Repetition frequency	DC		10MHz	
Pulse width	30 ns		20 s	
Pulse rise/fall time		9 ns		
Video crosstalk		-40 dB		
Modulation source		Internal/ external		
External input amplitude		1 V TTL		AC DC
Delay (to RF)		20 ns	40 ns	
<b>Amplitude Modulation</b>				
Modulation source		Internal		
Modulation Depth	0%		80%	
Deviation accuracy		2%	4%	1 kHz rate, 30% depth
Deviation resolution		1%		
Distortion (THD)			1%	1 kHz rate, 30% depth
Modulation rate	0.1 Hz		30 kHz	
Modulation waveforms	Sine			
<b>Frequency Modulation</b>				
Modulation source		Internal		
Maximum Frequency deviation (peak)		10% off out  N · 50 MHz		< 1.25 GHz (N=1) 1.25 GHz to 2.5 GHz (N=0.125) 2.5 GHz to 5 GHz (N=0.25) 5 GHz to 10 GHz (N=0.5) 10 GHz to 20 GHz (N=1) 20 GHz to 40 GHz (N=2)
Deviation accuracy		0.50%	2%	
Distortion (THD)		< 1 %		1 kHz rate, 10 kHz deviation
Modulation rate	0.1 Hz		30 kHz	
Modulation waveforms	Sine			
<b>Phase Modulation</b>				
Modulation source		Internal		
Phase deviation (peak)	0		100 · N · rad	
Deviation accuracy		0.50%	2%	
Modulation rate	0.1 Hz		30 kHz	
Modulation waveforms	Sine			
Distortion (THD)	< 1%	1 kHz rate & N x rad deviation		

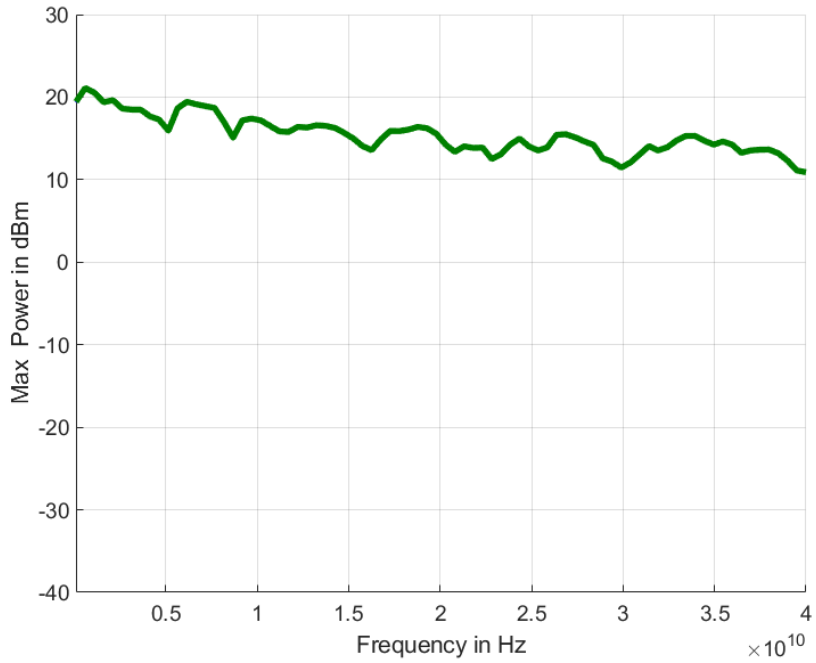


## Trigger (TRIG IN/OUT)

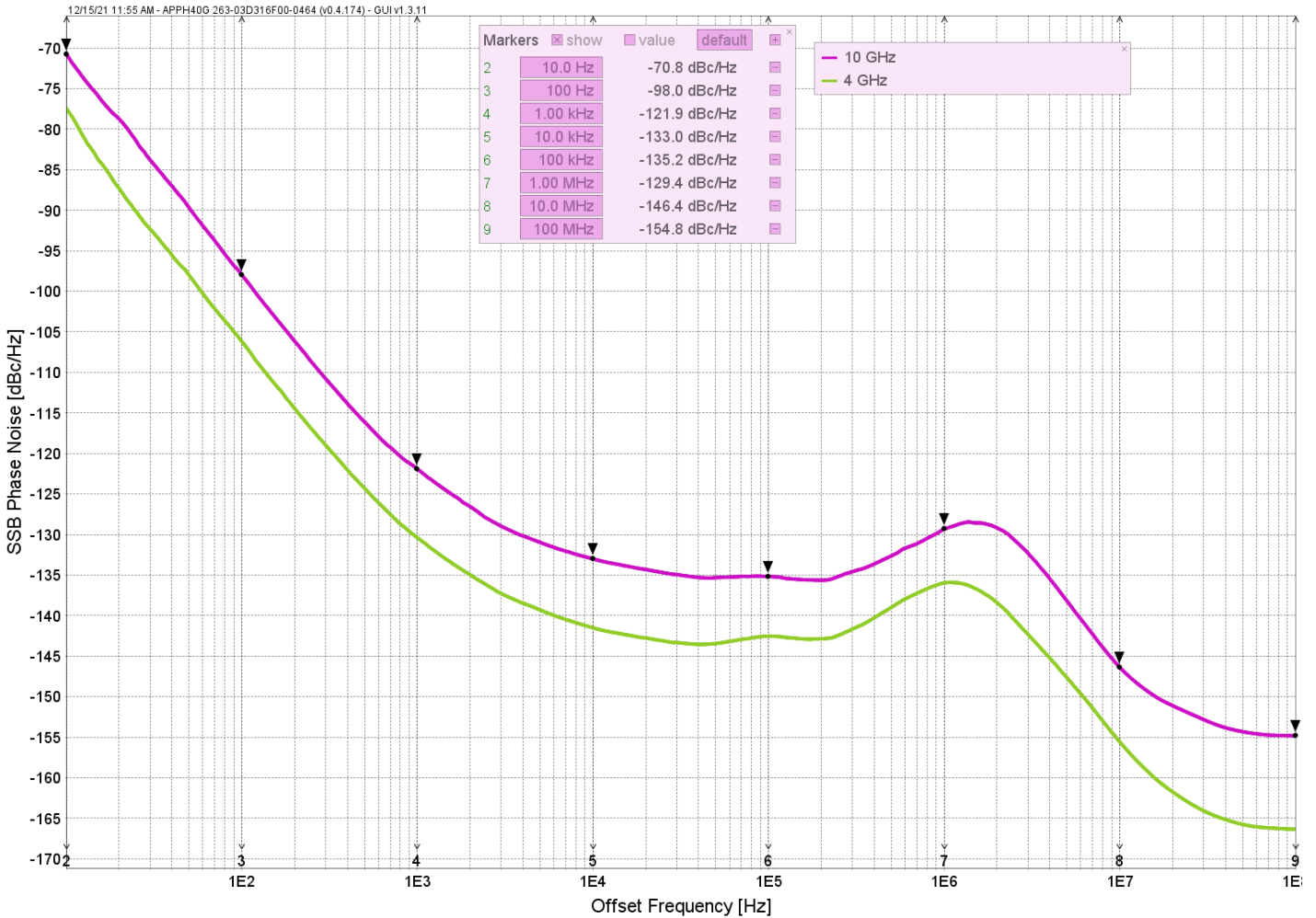
PARAMETER	MIN	TYPICAL	MAX	NOTE
<b>Trigger Types</b>	Continuous, single (point), gated, gated direction			
<b>Trigger Source</b>	external, bus (LAN, USB)			
<b>Trigger Modes</b>	Continuous free run, trigger and run, reset and run			
Trigger uncertainty		tbd		
External Trigger delay	1 $\mu$ s		40 s	
External Delay Resolution		15 ns		
<b>Trigger Polarity</b>		Rising, falling		

# PERFORMANCE CURVES

## Typical Maximum Output Power



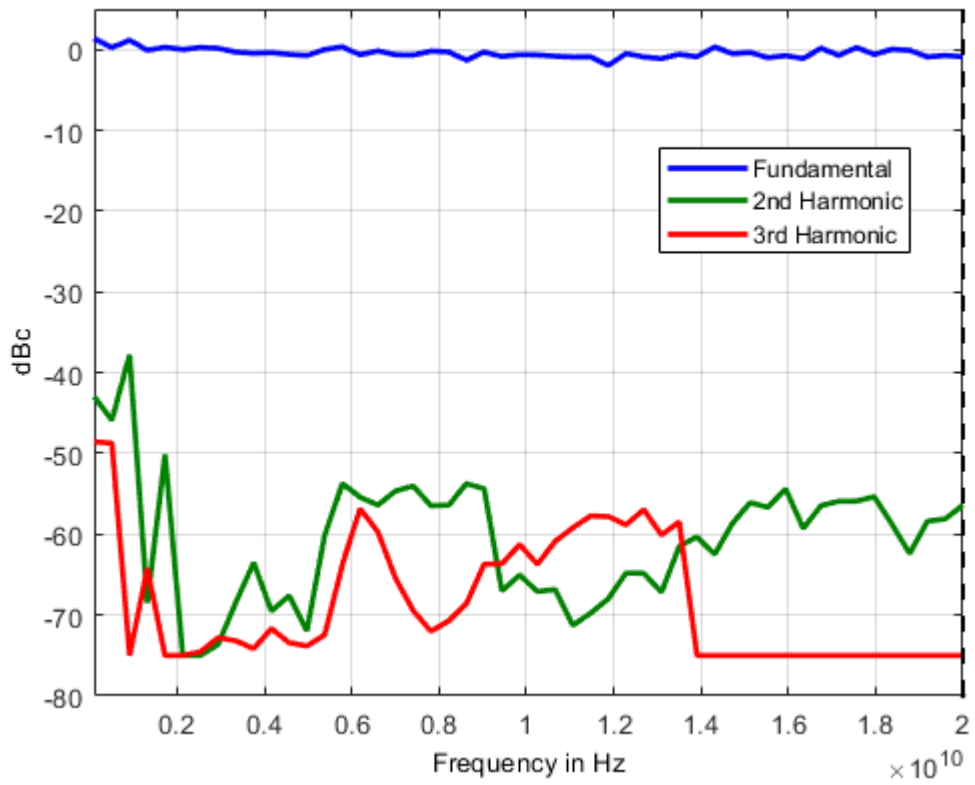
## Phase Noise Performance (without option LN)



 **Power linearity**  
*tba*

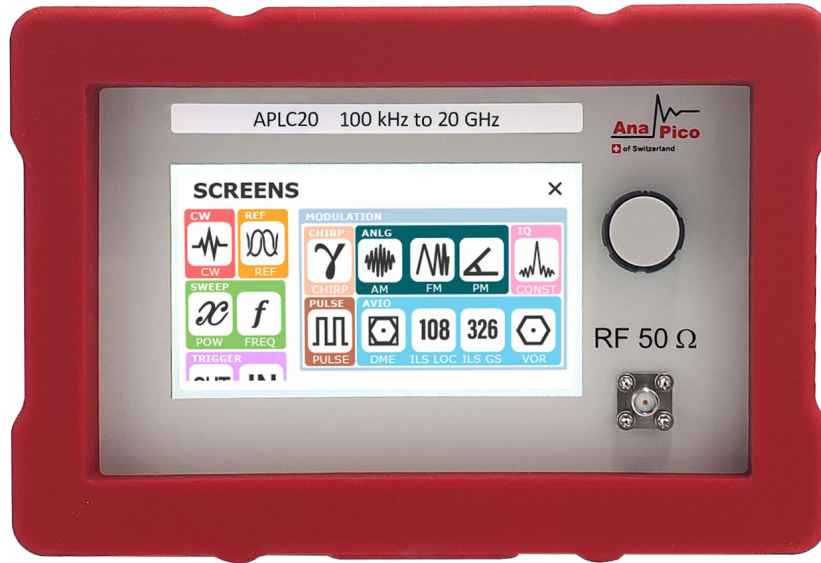
 **Power level accuracy**  
*tba*

 **Harmonic performance at 0 dBm**





APLC20 Front view



APPLC40-4 Front view



APPLCX0-X Rear view

tba

## Fast Control Port

- 8-bit or 16-bit parallel port for fast, time critical settings like frequency
- sequential submission of 48-bit frequency word or access to pre-defined frequency table
- optional amplitude control and support for multi-channel systems (only with 16-bit bus)
- signal generator confirms the received data with ACK (only in 8-bit mode) and informs the controller by the BUSY signal while processing the information.

**Connector:** 26 pin 3M Mini-D Ribbon Receptacle

**8-bit Mode:** Address A<3..0>, Data D<3..0>, STROBE, ACK, BUSY

**16-bit Mode:** Address A<7..0>, Data D<7..0>, STROBE, BUSY

**Input signal:** TTL, 0V / 5 V

**Input impedance:** 4,7 k $\Omega$

**Maximum toggle rate:** 10 MHz, frequency switching starts after transfer of last byte

## ORDERING INFORMATION

HOST MODEL	PRODUCT	DESCRIPTION
APLCXX	APLC12	Single output 12.75 GHz version
APLCXX-X	APLC12-X	Multi-output 12.75 GHz version, 19" 1U rack-mount module
APLCXX	APLC20	Single output 20 GHz version
APLCXX-X	APLC20-X	Multi-output 20 GHz version, 19" 1U rack-mount module
APLCXX	APLC40	Single output 40 GHz version
APLCXX-X	APLC40-X	Multi-output 40 GHz version, 19" 1U rack-mount module
APLCXX(-X)	Option LN	Enhanced frequency stability, improved close-in phase noise
APLCXX-X	Option LN+	Enhanced close in phase noise & further enhanced long term
APLCXX(-X)	Option FS	Fast switching option
APLCXX(-X)	Option GPIB	GPIB interface (only with option TOUCH or as 1U rack-mount)
APLCXX(-X)	Option FLASH	MicroSD card slot for removable microSD
APLCXX(-X)	Option WE	One year warranty extension (standard: 2 years)
APLCXX(-X)	Option ReCal	Recalibration with certificate (recommended: 2 years interval)

## GENERAL CHARACTERISTICS APUASYN20

### Remote programming interfaces

Ethernet interface  
 USB2.0 device interface  
 Control language: SCPI Version 1999.0  
 Fast Control Port FCP

**Power requirements:** *tba*

**Mains adapter supplied:** *tba*

**Storage temperature range:** -50 to 85 °C

**Operating temperature range:** 0 to 40 °C

**Operating and storage altitude:** up to 15,000 feet



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

**Weight:** *tba*

**Recommended calibration cycle:** 24 months



