DATASHEET APSYN420-2
Specification v1.5

Dual-Output Phase-Synchronous Low Phase Noise Synthesizer from 0.01 to 20 GHz

Document size:

1 title page
11 content pages

DEFINITIONS

The specifications in the following pages describe the warranted performance of the instrument for 23 ±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

0.01 to 20 GHz Dual-Output Phase-Synchronous Low Phase Noise Synthesizer

The APSYN420-2 is a dual-output wideband low phase-noise synthesizer operating from 0.01 to 20 GHz. The nominal output power is +23 dBm per output.

The RF outputs can be independently programmed with a mHz frequency resolution. The two independent synthesizers are operated from a single internal reference to maximize the phase coherence between the two outputs.

The internal reference can be phase-locked to a user-settable external reference in the range from 1 to 250 MHz.

The APSYN420-2 offers dedicated sweeping capability and wideband frequency and phase modulation as well as narrow pulse modulation.

The module has a USB and LAN interface and can be controlled using SCPI 1999 command set. Operated with an AC supply, it consumes less than 20 W.

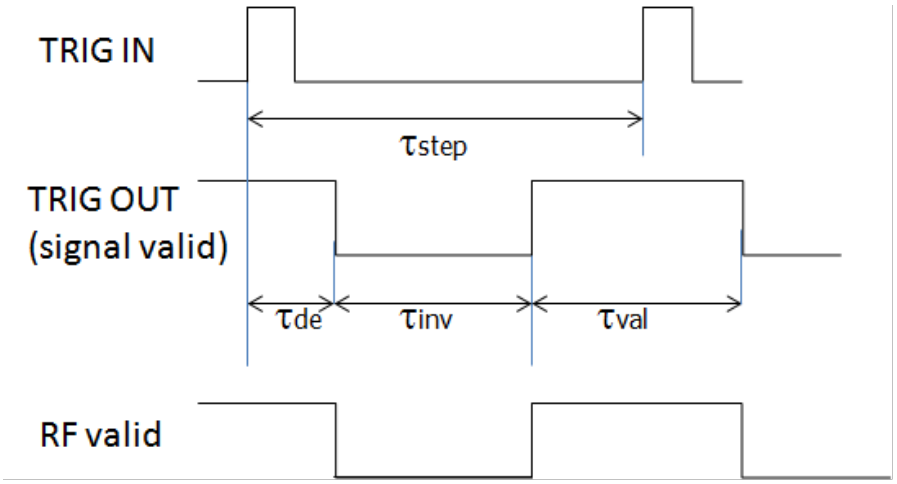
FACTS & FIGURES & SPECIFICATIONS

PARAMETER	MIN	TYPICAL	MAX	NOTE
Frequency range	0.01 GHz		20 GHz	
Frequency resolution		0.001 Hz		
Phase resolution		0.1 deg		
Settling time		20 µs	100 µs	
Frequency update rate List / Sweep mode		200 µs 130 µs		time from receipt of SCPI command
SSB Phase noise at 10 GHz				
at 1 kHz from carrier		-98 dBc/Hz		
at 20 kHz from carrier		-108 dBc/Hz		
Wideband noise		-150 dBc/ Hz		
Output power level		+23 dBm		(see also plot)
Reverse power protection				
DC voltage		7 V		
RF power			20 dBm	
Output impedance VSWR		50 Ω 1.8		
Spectral purity Harmonics Sub-harmonics		 -15 dBc -75 dBc	 -60 dBc	
Non-harmonic spurious		-50 dBc		

Sweeping Capability

Sweep type: Power / frequency / list; linear / logarithmic / random

PARAMETER	MIN	TYPICAL	MAX	NOTE
Step time (τ_{step})	150 µs 25 µs			only one channel Option FS: per channel, if 2 channels are swept synchronously, minimum step time is N times 25 µs
Dwell time (τ_{val})	25 µs		9999 s	
Off-time (incl. transient time) (t_{off})	0		9999 s	
Transient time (τ_{inv})			15 µs	
Timing delay (τ_{de})		50 ns		
Time resolution		5 ns		
Timing accuracy per point		5 ns		



Frequency Reference

PARAMETER	MIN	TYPICAL	MAX	NOTE
Reference frequency input **Phase coherent mode**	1 MHz	 100 MHz	250 MHz	
Reference input level	-5 dBm	0 dBm	+13 dBm	
Lock range			±1.0 ppm	
Reference input impedance		50 Ohms		
Internal reference output frequency		10/100 MHz		
Output power		>0 dBm 50 Ohms		
Temperature stability (0 to 50 °C)			±100 ppb	
Aging 1st year		0.5 ppm		
Aging per day (after 30 days operation)			5 ppb	
Warm-up time		5 min		

Modulation Capability

PARAMETER	MIN	TYPICAL	MAX	NOTE
Frequency modulation (internal) **Maximum frequency deviation (peak)**	*N · 500 MHz*			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)
Modulation rate	DC		800 kHz	> -3dB frequency response
Total harmonic distortion	< 1%			1 kHz rate & 2 N · 1 MHz deviation
Phase modulation (internal) **Phase deviation (peak)**	 0		 N·100 rad	
Modulation rate	DC		800 kHz	> -3dB frequency response
Total harmonic distortion	< 1%			1 kHz rate & 2 N x 100 rad deviation
Pulse modulation (int & ext) **On/off ratio**		Frequency dependant		
Repetition frequency	DC		10 MHz	
Pulse width	30 ns			ALC hold
Pulse rise/fall time		7 ns		
Pulse trains length (pulses)	2		4192	
Pulse width	30 ns		100 ms	(internal generator)
Pulse resolution		15 ns		(internal generator)

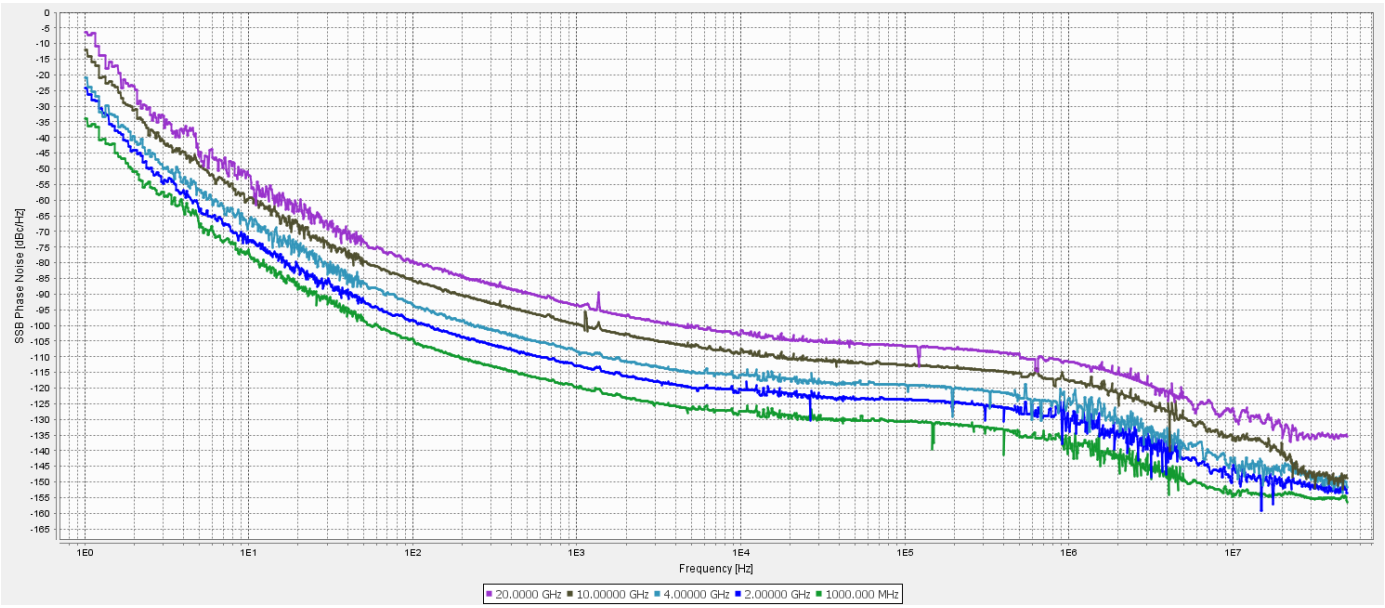
Polarity		selectable		
External input threshold	0.85 V	0.9 V	0.95 V	TTL compatible
External input voltage range	-0.5 V		+5.5 V	TTL compatible
External input hysteresis		60 mV		

Trigger

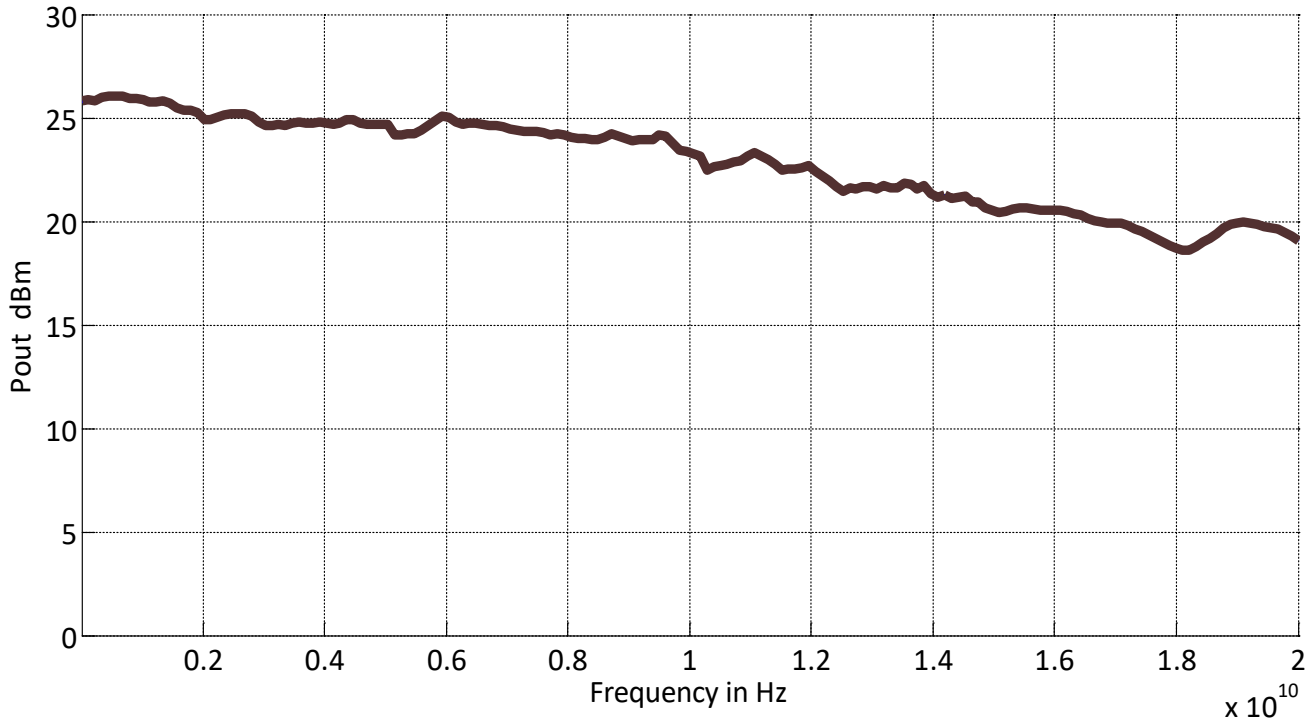
PARAMETER	MIN	TYPICAL	MAX	NOTE
Trigger types	Continuous, single (point), gated, gated direction			
Trigger source	external, bus (LAN, USB)			
Trigger modes	Continuous free run, trigger and run, reset and run			
Trigger latency		tbd		
Trigger uncertainty		5 µs		
External trigger delay	50 µs		40 s	
External delay resolution		15 ns		
Trigger modulo	1		255	Execute only on Nth trigger event
Trigger polarity	Rising, falling			
External trigger input threshold	0.85 V	0.9 V	0.95 V	TTL compatible
External trigger input range	-0.5 V		+5.5 V	TTL compatible
External trigger input hysteresis		60 mV		

TYPICAL PERFORMANCE CURVES

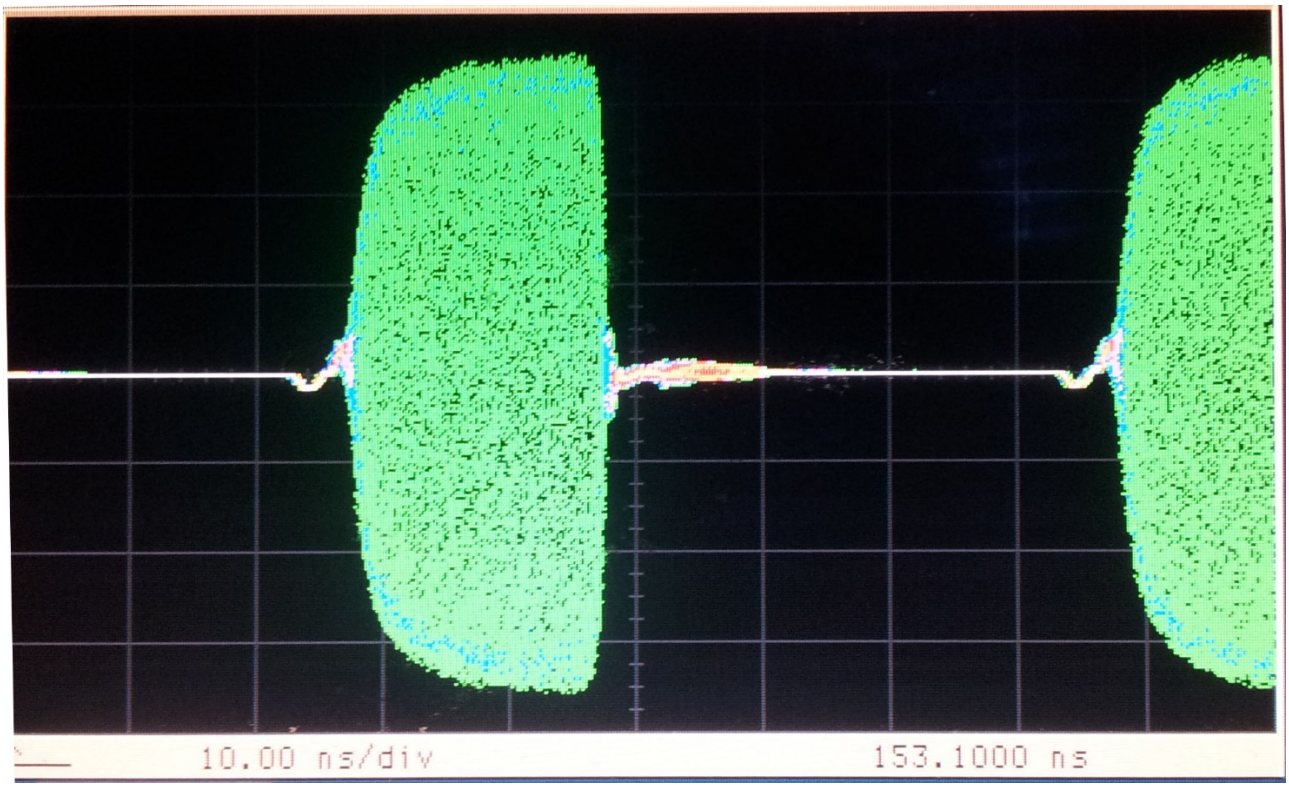
Phase Noise Performance



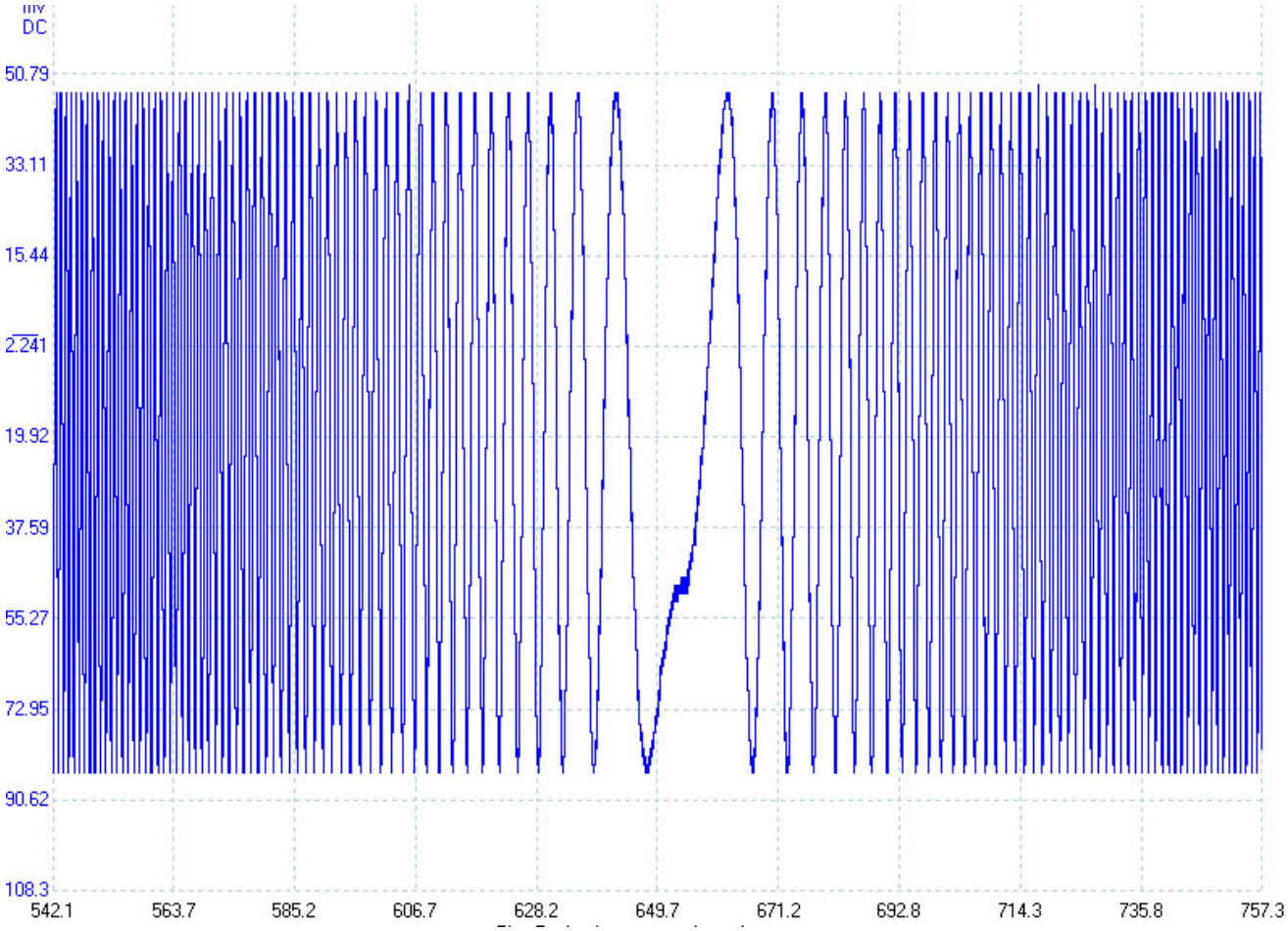
Output Power 0.01 to 20 GHz



Pulse Modulation (20 ns width, 100 ns period)



Chirp (phase continuous, 1 GHz bandwidth)



CONNECTORS

Front panel:

Rear panel:

ORDERING INFORMATION

HOST MODEL	PRODUCT	DESCRIPTION
APSYN420	**APSYN420-2**	2 channel 20 GHz Synthesizer, 19" 1HU rack-mount module
APSYN420	**Option FS**	Ultra-fast switching speed
APSYN420	**Option GPIB**	GPIB interface

GENERAL CHARACTERISTICS

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

Power requirements: 6 VDC; 20 W max.

Mains adapter supplied: 100-240 VAC in/ 6 V 2.5 A DC out

Operating temperature range: 0 to 40 °C

Storage temperature range: –40 to 70 °C

Operating and storage altitude: up to 15,000 feet

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

Weight: 8 kg (17 lbs) net

Dimensions: 43 mm H x 430 mm W x 460 mm L (1.69 in H x 16.93 in W x 18.11 in L)

Document History

Version	Date	Author	Notes
V10	2011-08-01	jk	First release
V11	2014-10-01	jk	Harmonics adjusted
V12	2015-8-31	jk	Product pictures, output power levels
V13	2016-4-22	jk	Option FS
V14	2020-06-15	ee	New layout
V15	2021-05-25	db	Pulse and Trigger input electrical specifications

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