

APSYN140 Specification 1.01

(Aug 2018)

0.01 - 40.0 GHz Wideband Synthesizer



Introduction

The APSYN140 is a wideband low phase-noise synthesizer operating from 0.01 to 40 GHz. The settable output power range is from -10 to +20 dBm.

The module has a mili-Hz frequency resolution uses a high-stability internal reference. The internal reference can be phase-locked to a user-settable external reference. For highest phase coherence, multiple APSYN140 can be cascaded with just one master reference clock.

The APSYN140 offers dedicated sweeping capabilities with switching speeds of only 15 μ s and wideband frequency 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 external 6V DC supply, it consumes less than 10 watts.

Signal Specifications

The specifications in the following pages describe the warranted performance of the signal generator for 23 \pm 10 °C after a 30 minute warm-up period. Typical specifications describe expected, but not warranted performance. Min and Max specifications are warranted.

Parameter	Min.	Тур.	Max.	Note
Frequency range	0.01 GHz		40 GHz	
resolution		0.001 Hz		
Phase resolution		0.01 deg		
Frequency update rate		200 μ s		
List/Sweep mode		15 μ s		Option FS
SSB Phase noise at 1 GHz				
at 1 kHz from carrier		-140 dBc/Hz		
at 100 kHz from carrier		-150 dBc/Hz		
Wideband noise		-160 dBc/ Hz		
At 10 GHz				
at 1 kHz from carrier		-120 dBc/Hz		
at 100 kHz from carrier		-130 dBc/Hz		
Wideband noise		-160 dBc/ Hz		
Output power level				(see also plot)
100 MHz to 20 GHz			+20 dBm	
20 to 35 GHz			+18 dBm	
> 35 GHz	-20 dBm		+15 dBm	
Resolution		0.5 dB		
Reverse Power Protection				
DC Voltage		7 V		
RF power			20 dBm	
Output impedance		50 Ω		
VSWR		1.8		
Spectral purity				
Output harmonics		-15 dBc		
Sub-harmonics		-75 dBc -50 dBc	-50 dBc -30 dBc	< 20 GHz >20 GHz
Non-harmonic spurious				
		-75 dBc	-60 dBc	

Sweeping Capability

Parameter	Min.	Тур.	Max.	Note		
Frequency sweep						
Sweep type: linear, logarithmic, random						
Step time (t _{step})	200 μ s					
	15 μ s			Option FS		
Dwell time (t _{dwell})	15 μ s					

Notes:

Frequency Reference

Parameter	Min.	Тур.	Max.	Note
Internal reference frequency		10 / 100 MHz		
Initial accuracy			±20 ppb	calibrated at 23 \pm 3 $^{\circ}$ C at time of calibration , user adjustable
Temperature stability (0 to 50 degC)			±20 ppb	
Aging 1st year		0.5 ppm		
		0.1 ppm		Option LN
Aging per day (after 30days operations)			5 ppb	
			0.5 ppb	Option LN
Warm-Up time		5 min		
Output of internal reference		10 MHz		
		10/100 MHz		
Output power		0 dBm		
Output impedance		50 Ohms		
Bypass Internal reference				High phase synchronous mode
Input		100 MHz		
		100 MHz,		Option LN
Phase Lock to External Reference		10 MHz		
	1	integer MHz	200	Option VREF
Bypass Mode		100 MHz		
Reference input level				
10 MHz or 1-250 MHz	-5 dBm	0 dBm	+13 dBm	
100 MHz	5 dBm		+15 dBm	
Lock Range				
10 MHz			±1.5 ppm	
100 MHz, 1 GHz, 3 GHz			>100 ppm	
Reference input impedance	-	50 Ohms	-	_

Modulation Capabilities

Parameter	Min.	Тур.	Max.	Note
Pulse Modulation		.36.	maxi	11010
Modulation source		Internal/Exter nal		
External input amplitude		TTL		
Pulse rise/fall time		10 ns		
On/off ratio		40 dB		at +10 dBm
Pulse overshoot			10 %	
Pulse delay		20 ns		
Pulse polarity		Normal, inverse		selectable
Internal pulse generator				
Repetition frequency (PRF)	0.1 Hz		100 MHz	= 1/T
Duty cycle	1 %	% to 99 % in 1%	steps	within specified minimum pulse width
Minimum pulse settling range	30 ns		20 s	
Pulse Pattern Modulation & Staggered PRF				Using internal pattern generator
Pulse width	30 ns		5 s	
Programmable pattern length	2		65536	
Duty cycle	0.05 %		99.95 %	
Pulse width resolution		5 ns		
Pulse period (T) accuracy		0.00005xT+ 3ns		
Pulse width accuracy		0.00005xT+ 5ns		
Pulse width resolution		5 ns		
Pulse jitter		2 ns	5 ns	
Polarity		selectable		
Frequency Modulation				
Modulation source		Internal		
Maximum Frequency deviation (peak)	N · 200 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		0.5 %	2 %	
Distortion (THD)		< 1 %		1 kHz rate, 10 kHz deviation
Modulation rate	0.1 Hz		80 kHz	
Modulation waveforms		Sine		
Phase Modulation				
Modulation source		Internal		
Phase deviation (peak)	0		300 · N· rad	
Deviation accuracy		0.5 %	2 %	
Modulation rate	0.1 Hz		80 kHz	

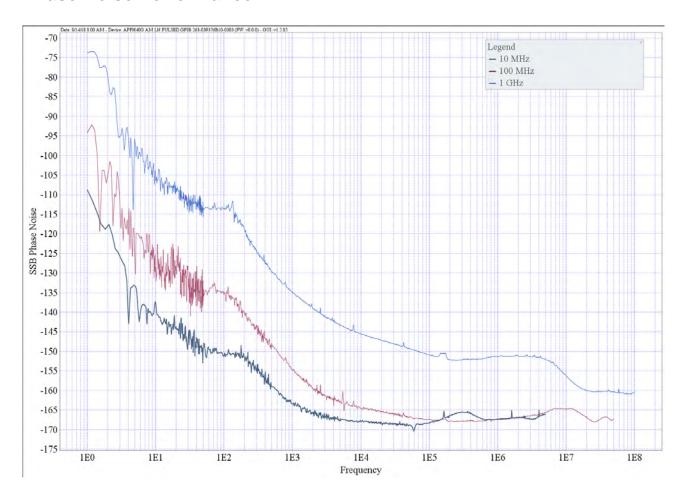
Parameter	Min.	Тур.	Max.	Note
Modulation waveforms	Sine			
Distortion (THD)	< 1%			1 kHz rate & N x rad deviation

Trigger (TRIG IN) Input is TRIG IN at front panel

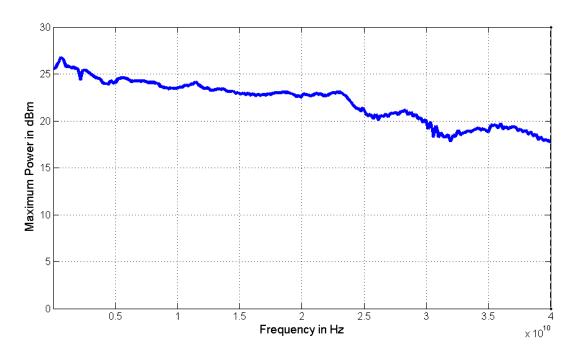
Parameter	Min.	Тур.	Max.	Note
Trigger Types	Continuous, single (point), gated, gated direction			
Trigger Source	external, bus (LAN, USB)			
Trigger Modes	Continuous free run, trigger and run, reset and run			
Trigger latency	tbd			
Trigger uncertainty		5 μ s		
External Trigger delay	50 μ s 40 s		40 s	
External Delay Resolution	15 ns			
Trigger Modulo	1		255	Execute only on Nth trigger event
Trigger Polarity	Rising, falling			

Typical performance curves

Phase Noise Performance

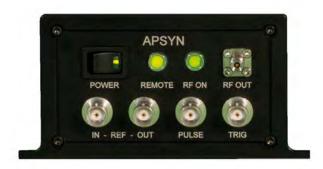


Output Power 0.01 to 40 GHz



Connectors

Front panel:



Rear panel:

General Characteristics

Remote programming interfaces

Ethernet 100BaseT LAN interface, USB 2.0 host & device Control language SCPI Version 1999.0

Power requirements 6 VDC; 20 W maximum

Mains adapter supplied: 100-240 VAC in/ 6 V 6.0 A DC out

Environmental (Levels similar to MIL-PRF-28800F Class 3/4 and MIL STD 810G

Environmental stress Samples of this product have been type tested to be robust against the environmental stresses of storage, transportation, and end-use; those stresses to temperature, humidity, shock, vibration,

altitude, and power line conditions.

Operating temperature range 0 to 40 °C Storage temperature range –40 to 70 °C

Operating and storage altitude up to 15,000 feet



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

Weight \leq 1.0 kg (2.2 lbs) net Dimensions 21 x 10.5 x 6 cm

Document History

Version/Status	Date	Author	Notes
V10	2018-05-01	jk	first release
V10	2018-08-13	jk	