

# DUAL -APSYN420D Specification 1.0

(Oct 2014)

0.01 - 20.0 GHz Dual Output Phase Synchronous Low Phase Noise Synthesizer



## Introduction

The DUAL-APSYN420D is a dual output wideband low phase-noise synthesizer operating from 0.01 to 20 GHz. The nominal output power is +16 dBm per output.

The module outputs can be independently programmed with a milli-Hz frequency resolution. The two independent synthesizer can also be 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.

The DUAL-APSYN420 offers dedicated sweeping capabilities 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 20 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.	Typ.	Max.	Note
Frequency range	0.01 GHz		20 GHz	
resolution		0.001 Hz		
Phase resolution		0.1 deg		
Settling time		20 $\mu$ s	100 $\mu$ s	
Frequency update rate		200 $\mu$ s		time from receipt of SCPI command
List/Sweep mode		100 $\mu$ s		
<b>SSB Phase noise at 10 GHz</b>				
at 1 kHz from carrier		-98 dBc/Hz		
at 20 kHz from carrier		-108 dBc/Hz		
Wideband noise		-150 dBc/ Hz		
<b>Output power level</b>				(see also plot)
		+16 dBm		
<b>Reverse Power Protection</b>				
DC Voltage		7 V		
RF power			20 dBm	
Output impedance		50 $\Omega$		
VSWR		1.8		
<b>Spectral purity</b>				(see also plot)
Output harmonics		-25 dBc -75 dBc	-10 dBc	
Sub-harmonics			-60 dBc	
Non-harmonic spurious		-75 dBc	-60 dBc	

## Sweeping Capability

Sweeps can be performed with combined internal or external AM/FM/PM/pulse modulation running. With modulation enabled, the minimum step time increases to 2 ms.

Parameter	Min.	Typ.	Max.	Note
<b>Frequency sweep</b>				
Sweep type: linear, logarithmic, random				
Step time ( $t_{step}$ )	200 $\mu$ s			
Dwell time ( $t_{dwell}$ )	50 $\mu$ s			
Off-time (incl. transient time) ( $t_{off}$ )	0		$t_{step}$	
<b>Frequency Chirps (linear ramp, up/down)</b>				
Bandwidth		10%		
Dwell time ( $t_{dwell}$ )	10 ns		tbd	
Number of frequencies			65'000	

Notes:

## Frequency Reference

<b>Reference frequency input</b>	1 MHz		250 MHz	
<b>Max. phase coherent mode</b>		100 MHz		
Reference input level	-5 dBm	0 dBm	+13 dBm	
Lock Range			$\pm$ 1.0 ppm	
Reference input impedance		50 Ohms		
<b>Internal Reference Output</b>		10/100 MHz		
<b>Frequency</b>				
Output Power		>0 dBm 50 Ohms		
Temperature stability (0 to 50 degC)			$\pm$ 100 ppb	
Aging 1 <sup>st</sup> year		0.5 ppm		
Aging per day (after 30days operations)			5 ppb	
Warm-Up time		5 min		

Notes:

## Modulation Capabilities

Parameter	Min.	Typ.	Max.	Note
<b>Frequency modulation (internal)</b> 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
<b>Phase modulation (internal)</b> 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
<b>Pulse Modulation (int &amp; ext)</b> On/off ratio		Frequency dependant		<b>APSYN420B only</b>
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 µs	(internal generator)
Pulse resolution		15 ns		(internal generator)
Polarity		selectable		
External input amplitude		1 V TTL		AC DC

Notes:

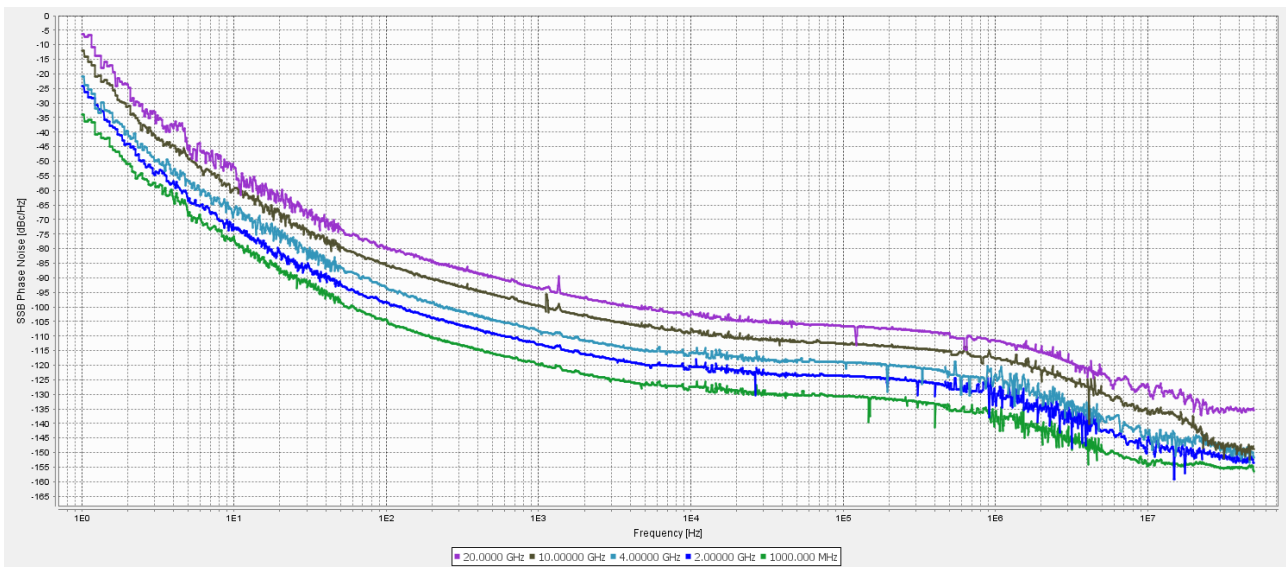
## Trigger (TRIG IN)

Input is TRIG IN at front panel

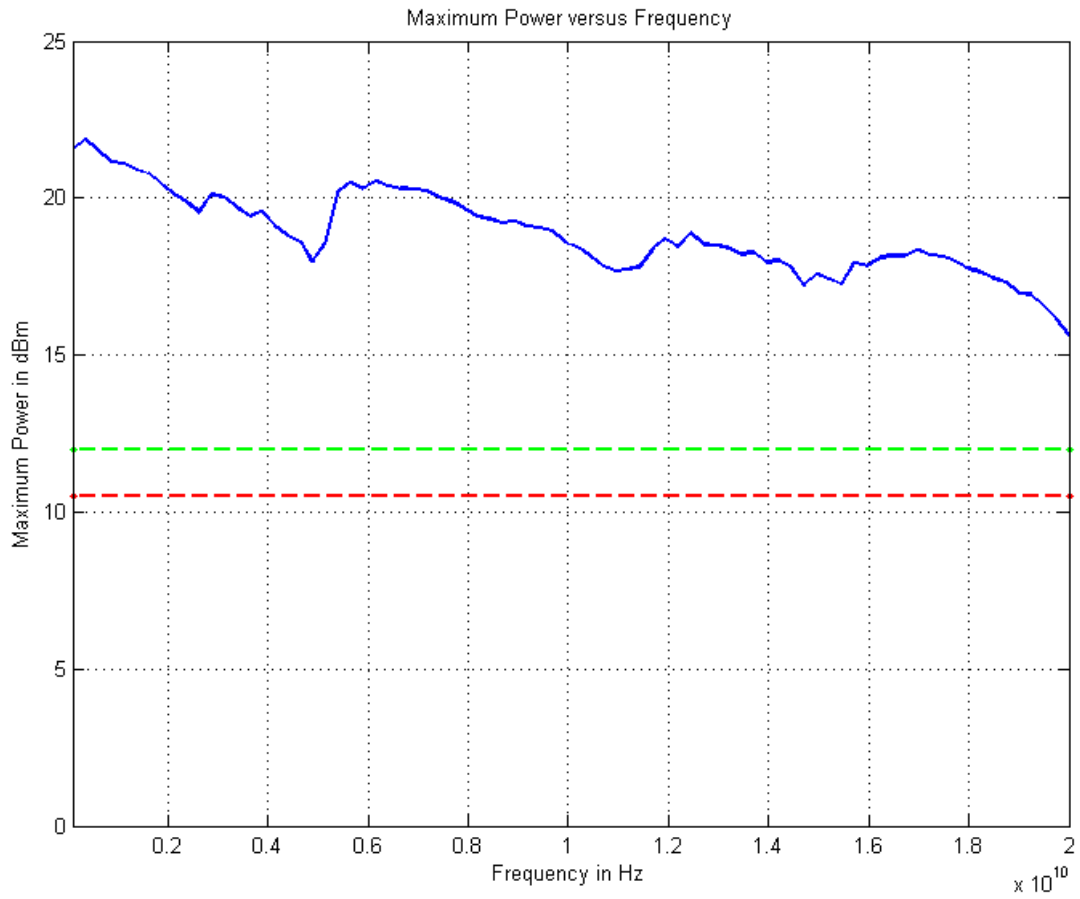
Parameter	Min.	Typ.	Max.	Note
<b>Trigger Types</b>	Continuous, single (point), gated, gated direction			
Trigger Source	external, bus (LAN, USB)			
Trigger Modes	Continuous free run, trigger and run, reset and run			
Trigger latency		tbd		
Trigger uncertainty		5 µs		
External Trigger delay	50 µs		40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

# Typical performance curves

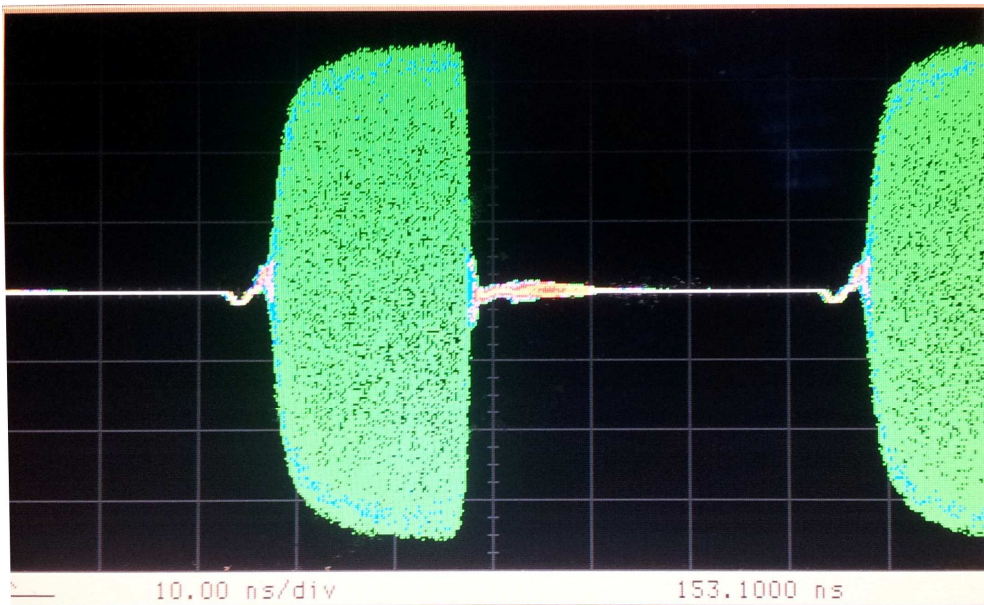
## Phase Noise Performance



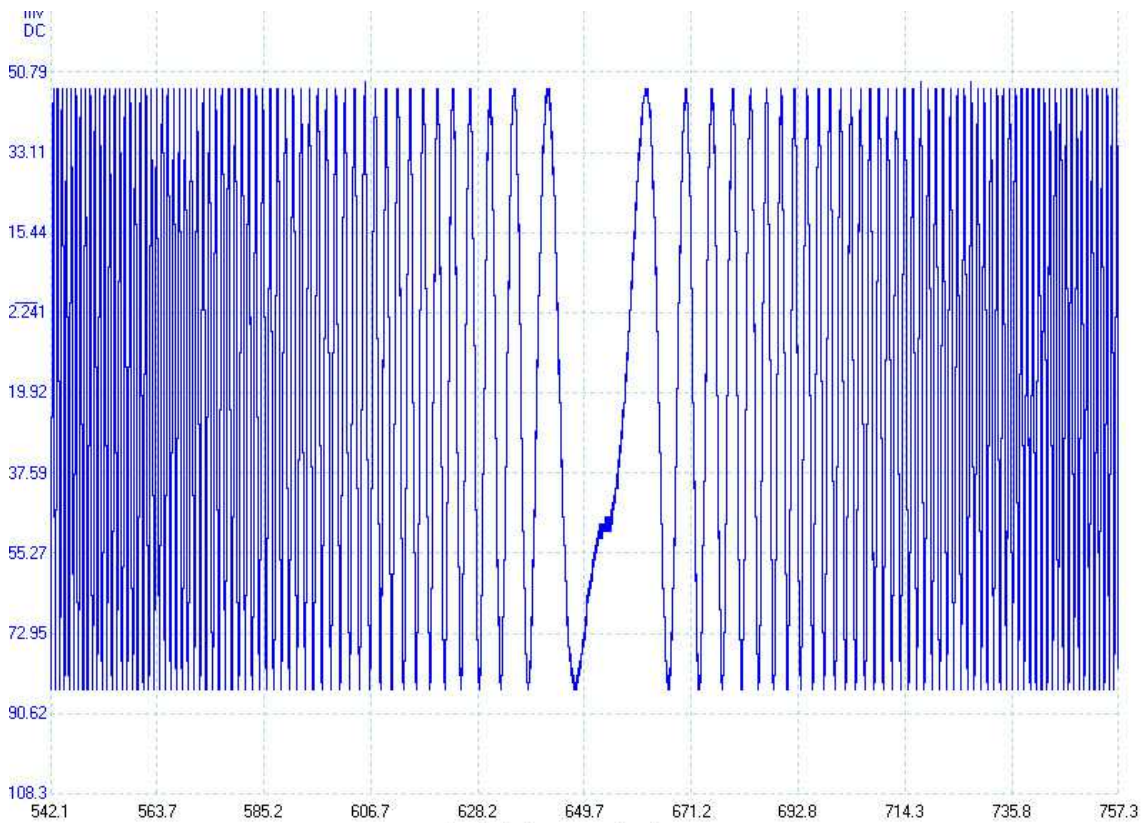
## Output Power 0.01 to 20 GHz



## Pulse Modulation (20 ns width, 100 ns period)



## Chirp (phase continuous, 1 GHz bandwidth)



# Connectors

Front panel:

Rear panel:





# General Characteristics

## Remote programming interfaces

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

**Power requirements** 6 VDC; 20 W maximum

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



**notice**

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

**Weight** ≤ 2.5 kg (6 lbs) net

**Dimensions** 43 x 30 x 4 cm (W x L x H)

## Document History

Version/Status	Date	Author		Notes
V10	2011-08-01	jk		first release