Model 845-M Specification 1.8

0.01 - 20.0 GHz Low Phase Noise Synthesizer

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Introduction

The MODEL 845-M is a wideband low phase-noise synthesizer operating from 0.01 to 20 GHz. The nominal output power is +23 dBm.

The module has a milli-Hz frequency resolution that uses a high-stability internal reference. The internal reference can be phase-locked to a user-settable external reference. For highest phase coherence, multiple MODEL 845-Ms can be cascaded with just one master reference clock.

The MODEL 845-M 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 it consumes les than 10 watts.

Signal Specification

The specifications in the following pages describe the warranted performance of the signal generator for 23 ± 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 µs	40 µs	
Frequency update rate List/Sweep mode		200 µs 130 µs		time from receipt of SCPI command
SSB Phase noise at 1 GHz				
at 1 kHz from carrier		-118 dBc/Hz		
at 20 kHz from carrier		-128 dBc/Hz		
Wideband noise		-150 dBc/ Hz		
Output power level		+23 dBm		(see the Output Power plot on page 6)
Reverse Power Protection				
DC Voltage		7 V		
RF power			20 dBm	
Output impedance VSWR		50 Ω 1.8		
Spectral purity Output harmonics Sub-harmonics		 -15 dBc -75 dBc	 -60 dBc	(see the Phase Noise Performance plot on page 5)
Non-harmonic spurious		-75 dBc	-60 dBc	

Sweeping Capability

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

Parameter	Min.	Typ.	Max.	Note
Frequency sweep Sweep type: linear, logarithmic, random				
Step time (t_{step})	130 µs			
Dwell time (t_{dwell})	50 µs			
Off-time (incl. transient time) (t_{off})	0		t_{step}	
Frequency Chirps (linear ramp, up/down)				
Bandwidth		10%		
Dwell time (t_{dwell})	10 ns		tbd	
Number of frequencies			65,000	

Frequency Reference

Parameter	Min.	Typ.	Max.	Note
Reference frequency input **Max. 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 degC)			±100 ppb	
Aging 1st year		0.5 ppm		
Aging per day (after 30days operations)			5 ppb	
Warm-Up time		5 min		

Trigger (TRIG IN)

Input is TRIG IN at front panel

Parameter	Min.	Typ.	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			

Modulation Capabilities

Parameter	Min.	Typ.	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 dependent		
Repetition frequency	DC		10 MHz	
Pulse width	30 ns			ALC hold
Pulse rise/fall time		7 ns		
Pulse train 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

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Frequency Chirps (linear ramp, up/down)				
Bandwidth	10 %			of carrier frequency
Dwell time (t_{dwell})	10 ns		10000 µs	
Slope			100 MHz / µs	
Number of frequencies			65,000	

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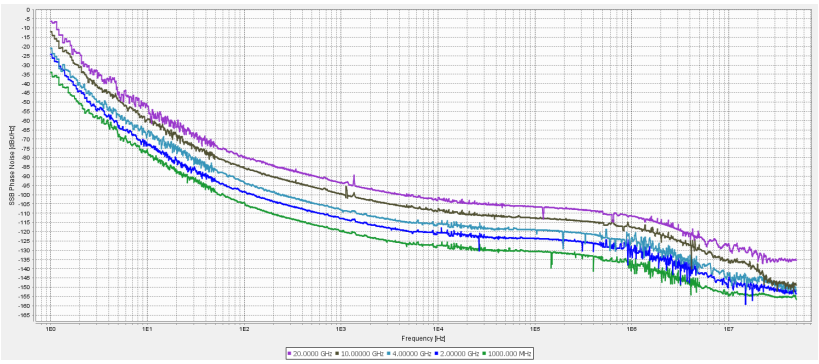
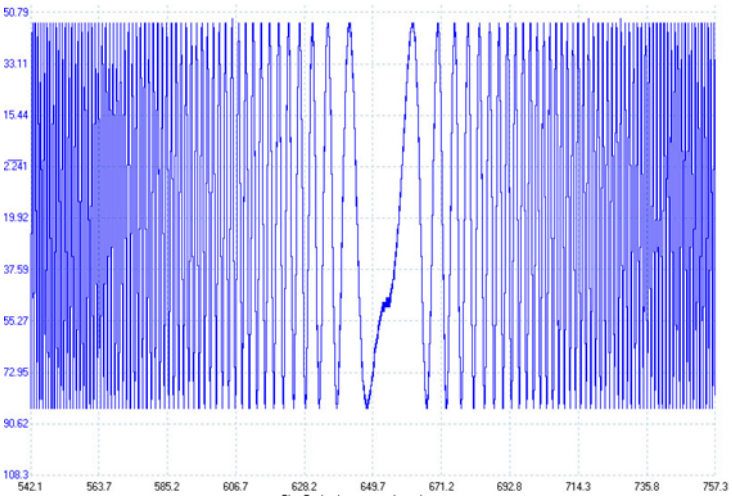
Model 845-M

Typical performance curves

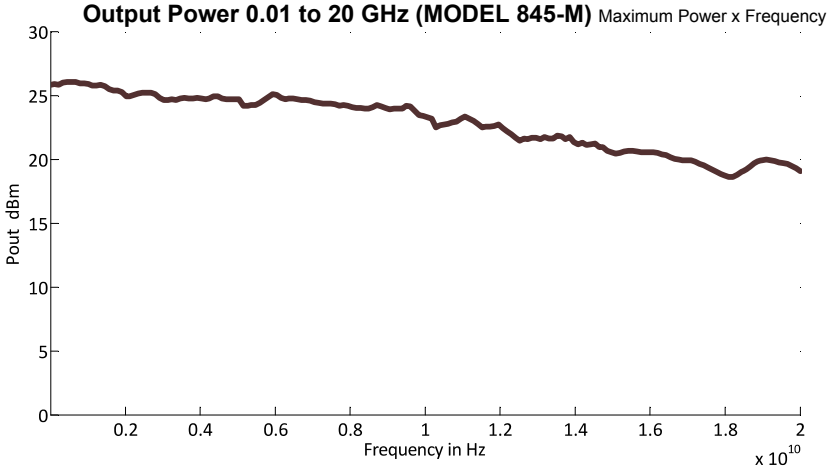
Phase Noise Performance



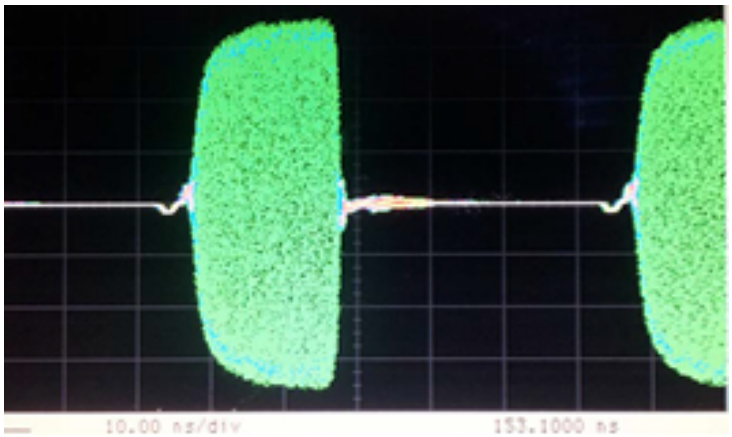
Chirp (phase continuous, 1 GHz bandwidth)



Output Power 0.01 to 20 GHz (MODEL 845-M) Maximum Power x Frequency



Pulse Modulation (20 ns width, 100 ns period)



Connectors

845-M Front Panel

845-M Rear Panel

General Characteristics

Weight ≤ 0.5 kg (1.1 lbs) net
Dimensions 21 x 10.5 x 6 cm

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; 10 W maximum
Main 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

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

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