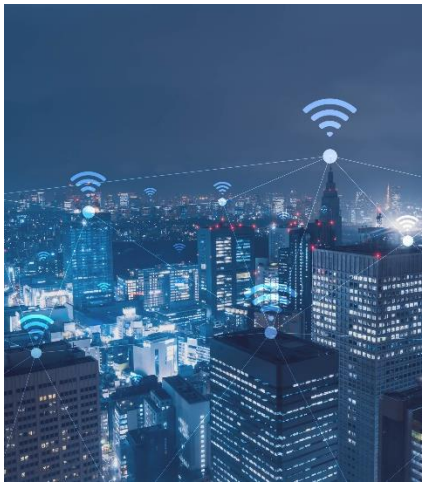
Model 825-M Ultra-Agile Signal Source



Features

- Phase Coherent
- Fast Switching as Low as 5 µs
- FM, Chirps, Pulse
- Internal OCXO, External Variable Reference

Applications

- ATE
- LO for Frequency Converters
- Telecom / Satellite Com

Model 825-M

8 kHz to 20 GHz Ultra-Agile Signal Source

CONTENTS

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

The Model 825-M-20 is a very compact, very agile signal source series with frequency range of up to 20 GHz. It combines fast switching speed with low phase noise and good signal purity. The single-channel unit is available as flange- and rack-mountable module or in a compact desktop enclosure with front panel control.

The multi-channel version Model 825-M-20-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 common frequency reference. The Model 825-M-20 has standard communication ports USB and ETHERNET, and optionally GPIB. All communication ports support the SCPI 1999 command set. The Model 825-M-20 also features an FCP (Fast Control Port) allowing for ultra-fast user-controlled list sweeping and frequency hopping.

SPECIFICATIONS

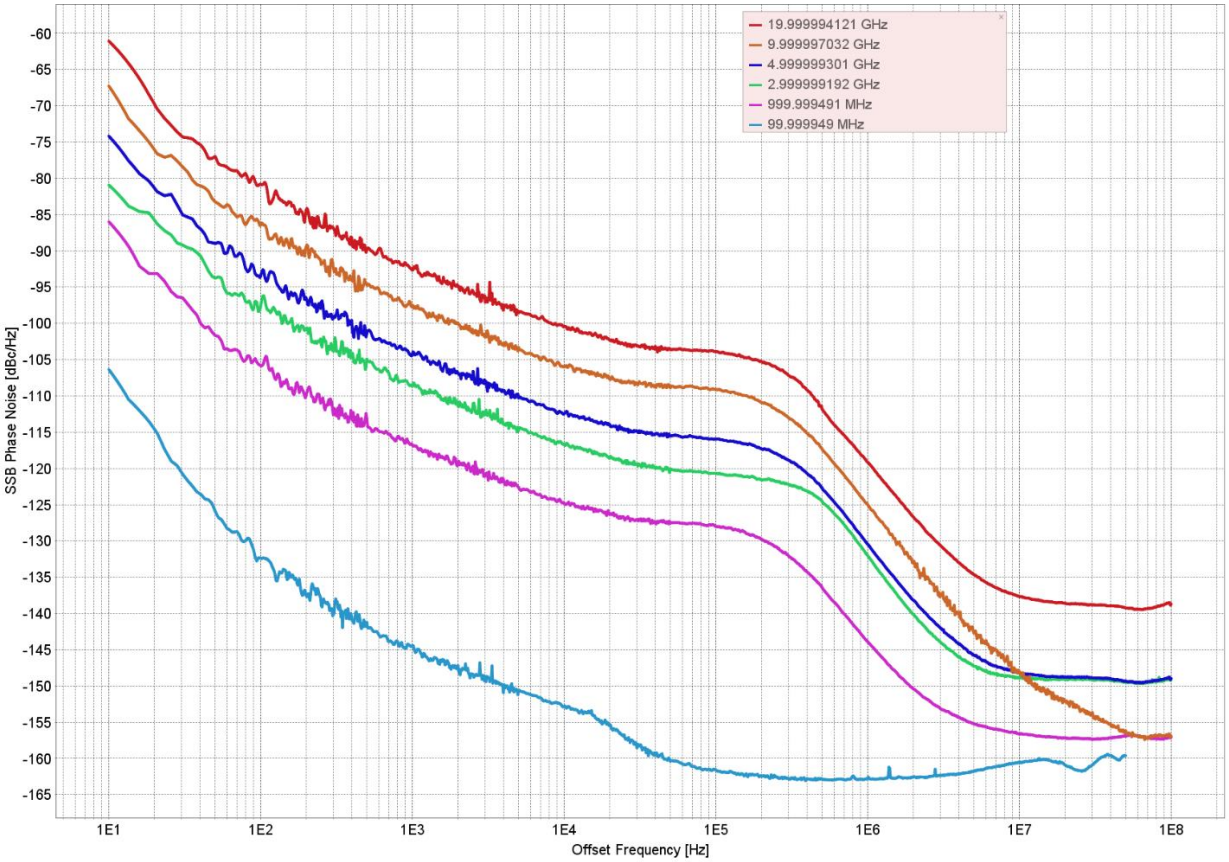
Frequency Parameters / Range

PARAMETER	MIN	TYPICAL	MAX	NOTE
Frequency Range	100 kHz 8 kHz		20 GHz 20 GHz	 Option 8K
Resolution		0.01 Hz		
Phase Resolution		0.1 deg		
Switching Speed		200 µs 5 µs	500 µs 10 µs	In sweep mode Option FS

Phase Noise

PARAMETER	MIN	TYPICAL	MAX	NOTE
SSB Phase noise at 1 GHz				See also plots
At 10 Hz from carrier		-85 dBc/Hz		
At 1 kHz from carrier		-115 dBc/Hz		
At 20 kHz from carrier		-125 dBc/Hz		
At 10 MHz from carrier		-155 dBc/Hz		

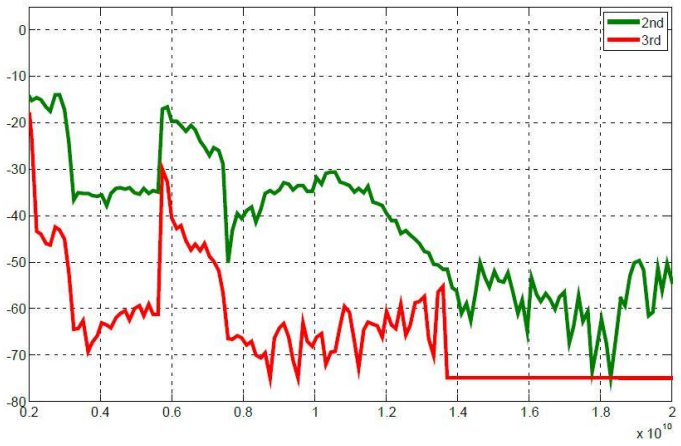
Figure 1: Phase Noise Performance



Spectral Purity

PARAMETER	MIN	TYPICAL	MAX	NOTE
Output Harmonics				P_{out} = 0 dBm
< 3.0 GHz		-15 dBc	0 dBc	
3.0 – 7.5 GHz		-25 dBc	-10 dBc	
7.5 – 12.0 GHz		-30 dBc	-20 dBc	
> 12.0 GHz		-40 dBc	-30 dBc	
Sub-harmonics				P_{out} = 0 dBm
< 10.0 GHz		-80 dBc	-50 dBc	
10.0 – 18.0 GHz		-55 dBc	-40 dBc	
>18.0 GHz		-40 dBc	-20 dBc	
Non-harmonic spurious				(10 kHz < offset < 500 MHz)
<= 18.0 GHz		-65 dBc	-50 dBc	
> 18.0 GHz		-55 dBc	-35 dBc	

Figure 2: Harmonic performance at 0 dBm – Harmonic output power [dBc] vs. frequency [Hz]



Level Performance

PARAMETER	MIN	TYPICAL	MAX	NOTE
Range	0 dBm		+18 dBm	Settable to -10 to +23 dBm
Resolution		0.5 dB		

Figure 3: Typical Maximum Output Power

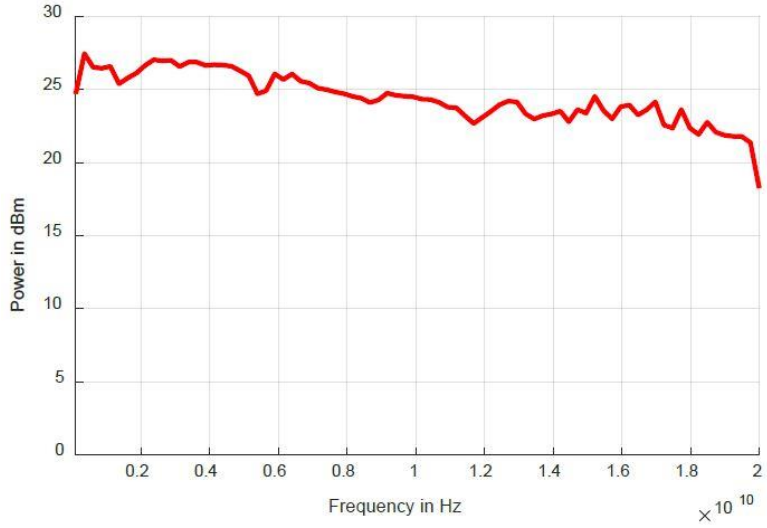


Figure 4: Power Linearity

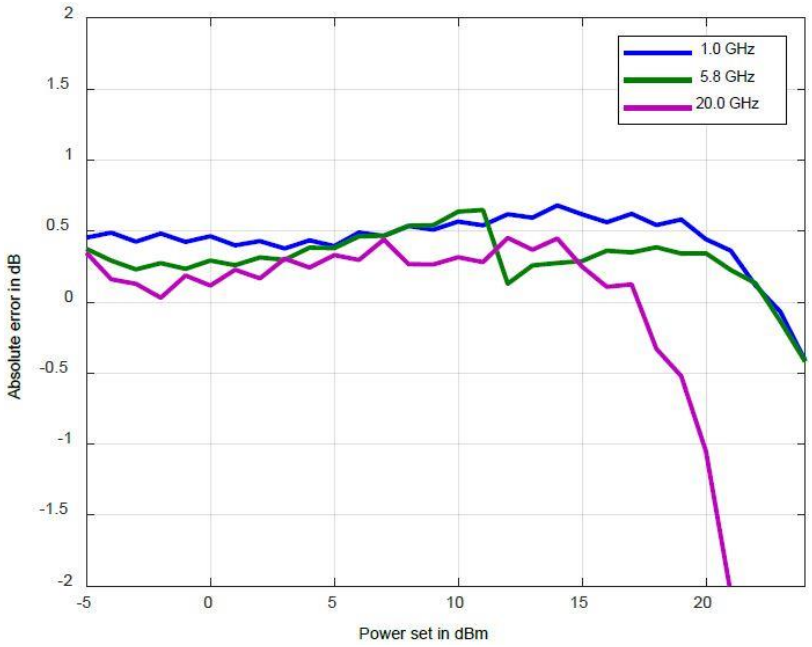
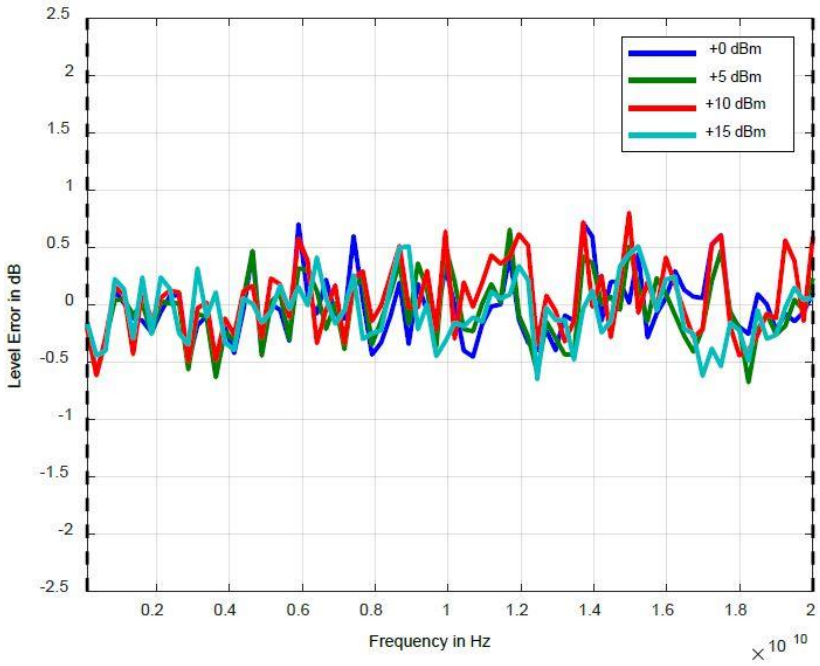


Figure 5: Power level accuracy



Level Uncertainty and VSWR

PARAMETER	MIN	TYPICAL	MAX	NOTE
Level uncertainty		±1.5 dB		
Output impedance		50 Ω	2.0	
VSWR		1.7		

Reverse Power Protection

PARAMETER	MIN	TYPICAL	MAX	NOTE
DC Voltage		7 V		
RF Power			23 dBm	

Channel to Channel Performance

PARAMETER	MIN	TYPICAL	MAX	NOTE
Isolation				
< 3.0 GHz	90 dB			
3.0 – 8.0 GHz	70 dB			
> 8.0 GHz		60 dB		
Relative phase stability		15 mrad		@5 GHz over 5 hours

Figure 6: Channel to channel isolation – the measurement shows the impact of channel #2, #3 and #4 at f0+9 MHz on the channel #1 channel under test) operating at f0. All channels have dBm output power.

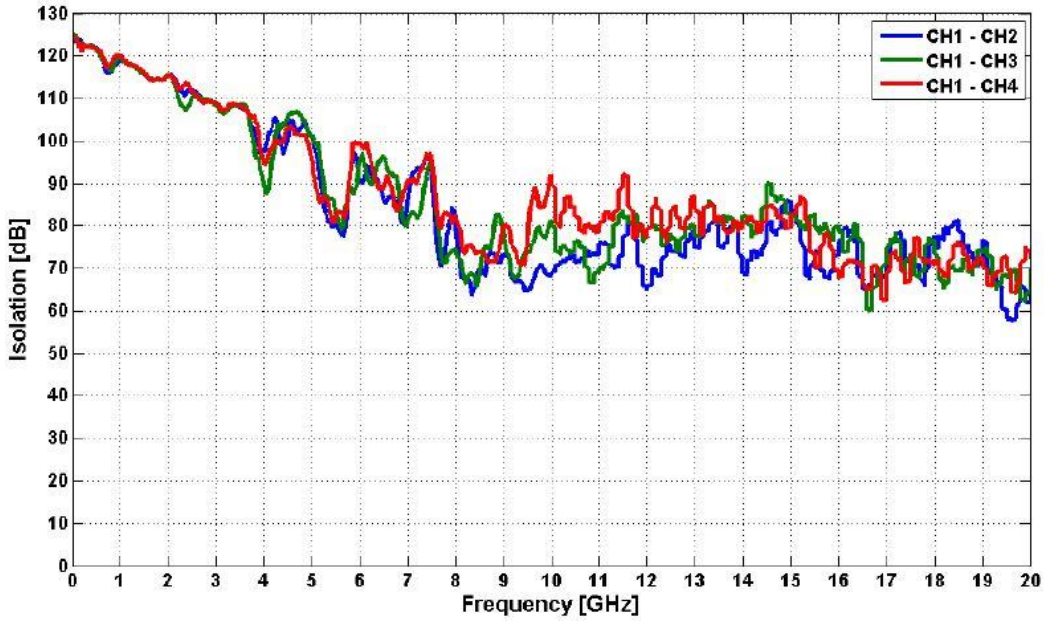


Figure 7: Channel to channel phase stability – the measurement shows the phase fluctuation between two RF channels in the same device, measured over 5 hours with a 5 GHz CW signal.

Model 825-M typical time domain channel-to-channel phase error at 5.000 GHz

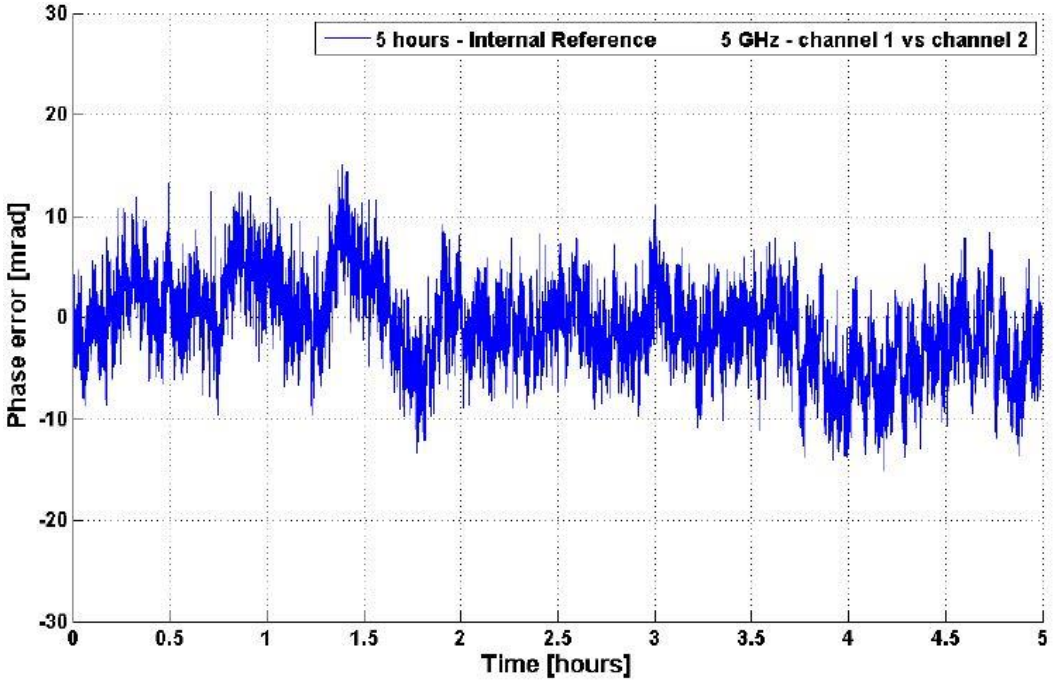


Figure 8: 825-M typical time domain channel-to-channel phase error at 10 GHz – measured over 12 hours

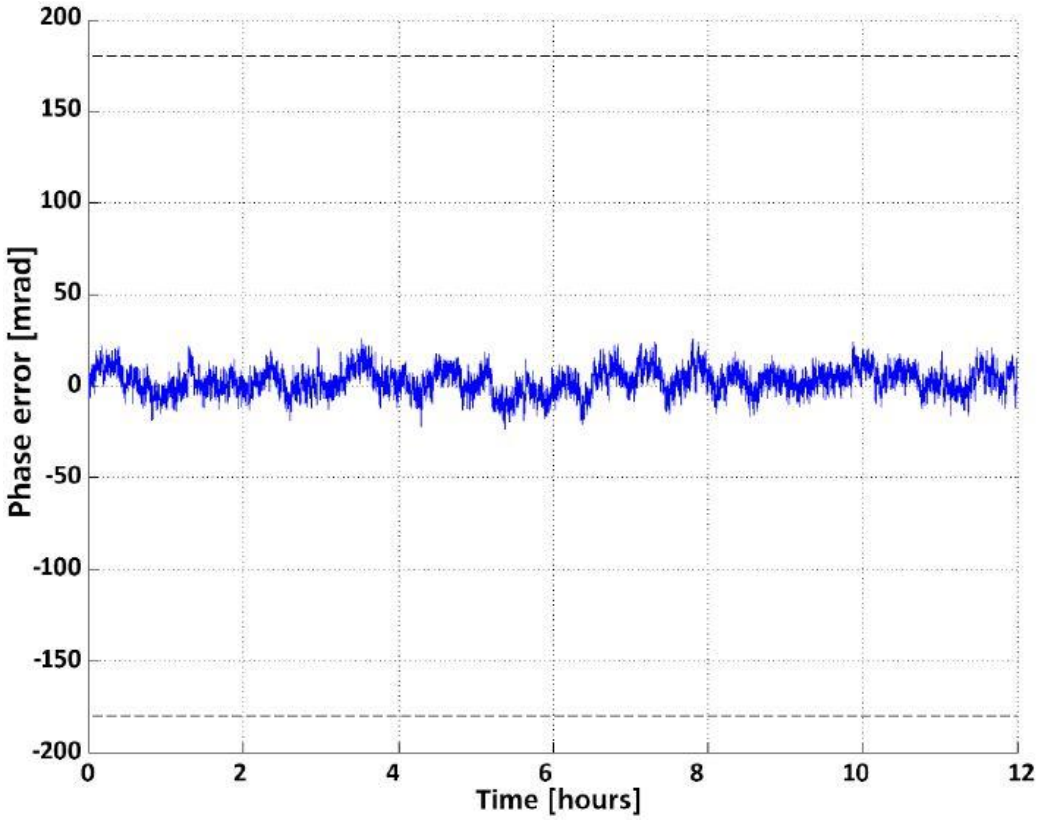
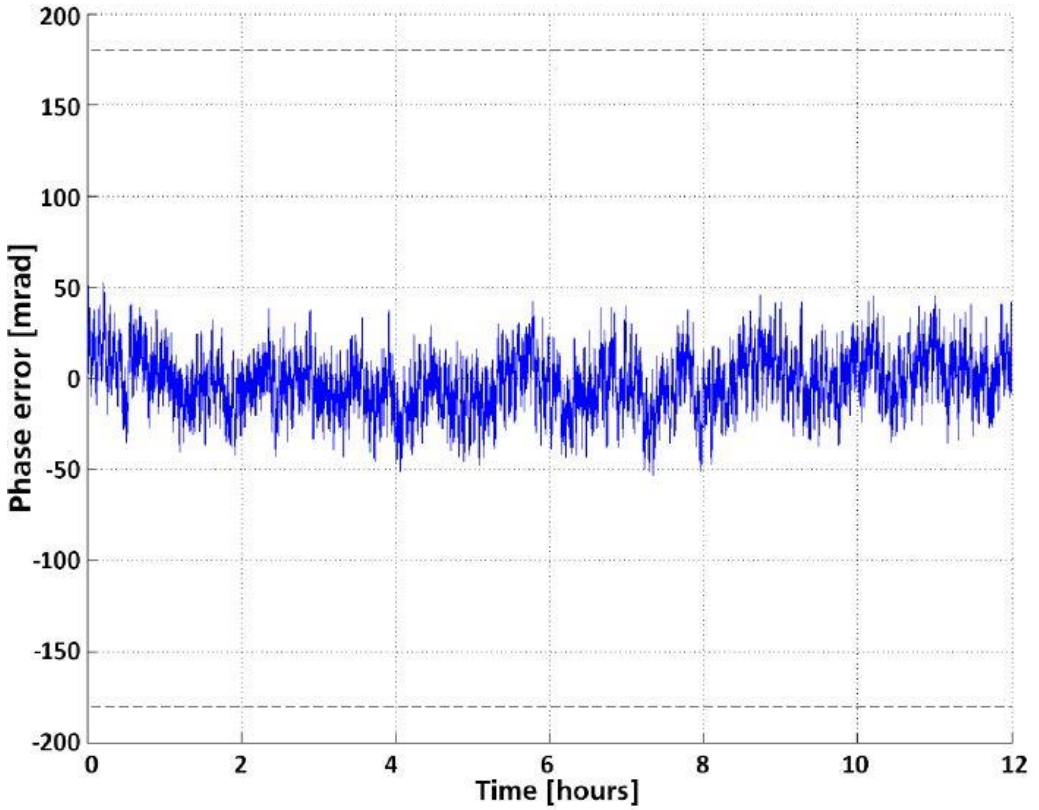


Figure 9: 825-M typical time domain channel-to-channel phase error at 20 GHz – measured over 12 hours



Modulation Capabilities

PARAMETER	MIN	TYPICAL	MAX	NOTE
Pulse Modulation				
On/off ratio		60 dB		
Repetition frequency	DC		10 MHz	
Pulse width	30 ns		20 s	
Pulse rise/fall time		9 ns		
Pulse trainslength (pulses)	2		4192	
Video crosstalk		-40 dB		
Modulation source		Int. / ext.		
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		
Delay (to RF)		20 ns	40 ns	

Sweeping Capability

PARAMETER	MIN	TYPICAL	MAX	NOTE
Frequency / List sweep				
Sweep type: linear, logarithmic, random				
Step time	500 µs 5 µs		200 s	 Option FS
Timing resolution		5 ns		
Timing accuracy per point		20 ns		
Generalized list sweep				
Allows for individual setting of frequency, step-time, and off-time for each point				

Frequency Reference

PARAMETER	MIN	TYPICAL	MAX	NOTE
Reference frequency input	1 MHz		200 MHz	Integer MHz
Reference input level	-5 dBm	0 dBm	+13 dBm	
Lock Range			±1.0 ppm	
Reference input impedance		50 Ω		
Internal reference frequency output		100 MHz		
Initial accuracy of internal reference		±40 ppb		calibrated at 23 ± 3 °C
Temperature stability (0 to 50 degC)			±100 ppb	
Aging				
Aging 1st year		0.5 ppm		
Aging per day			5 ppb	After 30 days operation
Warm-Up time		5 min		
Output of internal reference		+0 dBm 50 Ω		

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 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 voltage range	-0.5 V		+5.5 V	TTL compatible
External trigger input hysteresis		60 mV		

*TRIG OUT connector is not available in standard flange-mount enclosure

CONNECTORS

Front Panel and Rear Panel

Front View

Rear View

With Option HI

Fast Control Port (FCP)

- 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 models (only with 16-bit bus)
- Signal Source 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: 0 to 5 V
Input impedance: 4,7 kΩ
Maximum toggle rate: 10 MHz, frequency switching starts after transfer of last byte

ORDERING INFORMATION

HOST MODEL	PRODUCT	DESCRIPTION
825-M	**825-M**	20 GHz wideband frequency synthesizer, flange-mount
825-M	**825-M**	Multi-channel 20 GHz frequency synthesizer, 19” 1U rack-mount
825-M	**Option EB**	External power bank adapter cable
825-M	**Option 8K**	Frequency range extension to 8 kHz
825-M	**Option FS**	Fast switching option (with FCP port)
825-M	**Option HI**	High Isolation Enclosure
825-M	**Option GPIB**	GPIB interface (only with option 1U rack-mount)
825-M	**Option FLASH**	MicroSD card slot for removable SD memory
825-M	**Option Retrofit**	Applies when options are back-ordered

GENERAL CHARACTERISTICS

Remote Programming Interfaces:

Ethernet interface
USB2.0 device interface
GPIB (option)
Control language: SCPI Version 1999.0

Power requirements: 24 VDC; 20 W maximum

Mains adapter supplied: 100-240 VAC in / 24 V, 2 A DC out

Storage temperature range: - 40 to 70 °C

Operating temperature range: 0 to 45 °C

Operating and storage altitude: Up to 15,000 feet

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

Dimensions (W x L x H) / Weight [Including Connectors]	
Standard Flange-Mount	4.13 x 10.63 x 2.36 in [105 x 270 x 60 mm] / ~2 lbs (≤1.0 kg)
Model 825-M in 1U Rackmount	16.85 x 18.39 x 1.73 in [428 x 467 x 44 mm] / ~21 lbs (≤10.0 kg)

Recommended calibration cycle: 24 months

Document History

Version	Date	Author	Notes
V10	2019-05-20	Jk	First release
V11	2019-09-20	Jk	Added options
V12	2020-02-27	Jk	Single and multi-channel version
V121	2020-03-25	Jk	Plots added
V122	2020-05-08	Jk	FCP specification added
V123	2020-06-01	Db	FCP details added
V124	2020-10-20	Jk	Refined harmonic specs
V125	2020-12-07	Yg	Added multi-channel specs and pictures
V126	2021-02-25	Db	Pulse and trigger input electrical specifications
V127	2021-04-13	Ah	Environmental specification updated
V128	2022-08-22	Ee, Db	Corrected dimensions, corrected harmonic specifications
V129	2023-05-30	Mh	Corrected harmonics and non-harmonic values
V130	2023-06-14	Mh, ee	New layout structure
V131	2023-11-29	Ap	Added phase stability plots for 10 GHz and 20 GHz
V132	2024-08-15	AT	Removing the touch option

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