



ERASynth: An Open Source, Arduino-Compatible RF Signal Generator with Wi-Fi Connectivity

DATASHEET



GENERAL DESCRIPTION

ERASynth is an open source analog RF signal generator featuring an Arduino Due microcontroller and an ESP8266 powered web GUI. ERASynth uses advanced PLL/VCO technology, coupled with an internal ultra-low phase noise frequency reference to form a programmable analog signal generator capable of generating a low phase noise signals up to 20 GHz. ERASynth provides fast frequency switching and fine tuning resolution using a multi-loop PLL architecture. ERASynth also offers frequency, amplitude and pulse modulation capabilities. The frequency tuning and control commands are loaded into the instrument via the serial interface or the web GUI or Windows GUI.



FEATURES

Architecture: Multiloop Integer-N PLL driven by a tunable reference.

Frequency Range:

- ERASynth: 250 kHz to 6 GHz
- ERASynth+: 250 kHz to 15 GHz
- ERASynth++: 250 kHz to 20 GHz

Amplitude Range: -60 to +15 dBm (typical)

Phase Noise: -120 dBc/Hz (typical phase noise @ 1 GHz output and 10 kHz offset)

Frequency Switching Time: 250 μ s (typical)

Reference: Ultra-low noise 100 MHz VCXO locked to a

- ± 0.5 ppm TCXO for ERASynth
- ± 25 ppb OCXO for ERASynth+ and ERASynth++

MCU: Arduino Due board with BGA package Atmel Microcontroller (ATSAM3X8EA-CU)

Interfaces:

- Wi-Fi interface for web-based GUI access
- Serial-USB (mini USB) for serial access
- Micro USB for power input
- Trigger Input (SMA) for triggered sweep
- REF In (SMA) for external reference input
- REF Out (SMA) for 10 MHz reference output
- RF Out

Dimensions: 10 cm x 14.5 cm x 2 cm

Weight: 400 g (14.1 oz)

Power Input: 5 to 12 V

Power Consumption:

- < 6 W for ERASynth
- < 7 W for ERASynth+ and ERASynth++

Enclosure: Precision-milled, nickel-plated aluminum case

Open Source: Schematics, embedded Arduino code, Web GUI source code, and RS-232 command set

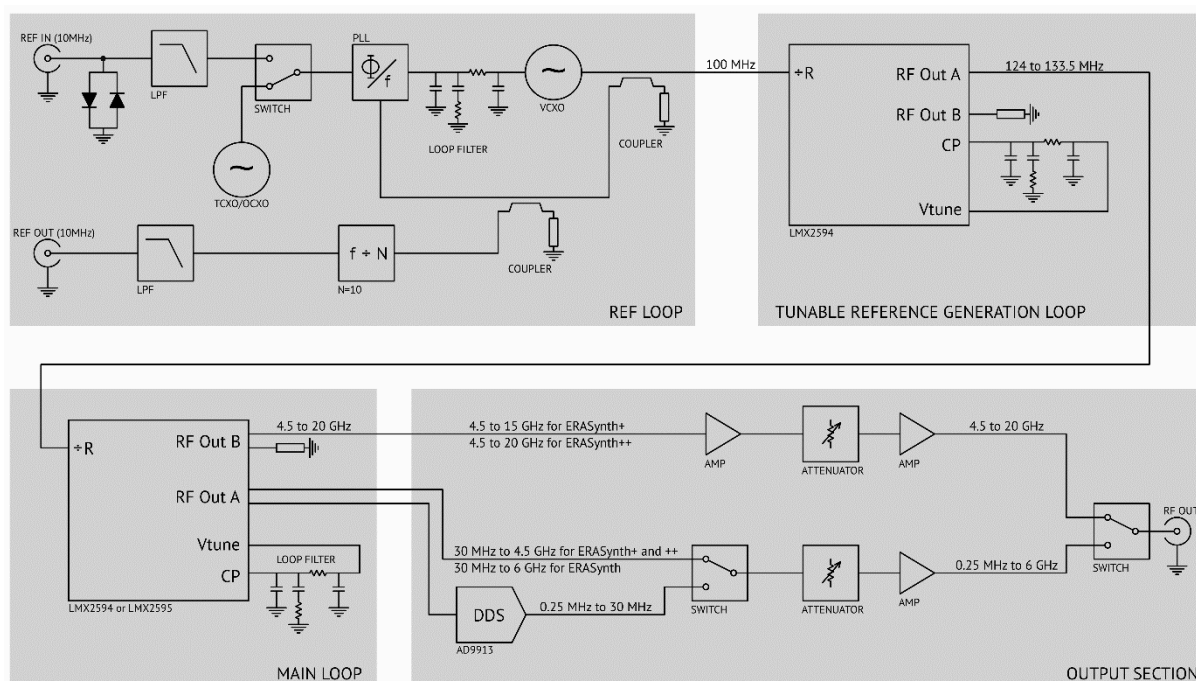


Figure 1: ERASynth general block diagram

ORDER GUIDE

	ERASynth	ERASynth+	ERASynth++
Frequency Range	250 kHz to 6 GHz	250 kHz to 15 GHz	250 kHz to 20 GHz (*)
Architecture	LMX2594 driven by LMX2594	LMX2594 driven by LMX2594	LMX2595 driven by LMX2594
Reference	±0.5 ppm TCXO	±0.5 ppm TCXO and ±25 ppb OCXO	±0.5 ppm TCXO and ±25 ppb OCXO
Price	\$749	\$1,249	\$1,749
* ERASynth++ comes with a 15 to 20 GHz cavity filter for subharmonic rejection.			

ELECTRICAL CHARACTERISTICS

	Minimum	Typical	Maximum
Supply Voltage	4.5 V	5 V	12 V
Supply Current		1.1 A	
Supply Current, RF Out Muted		300 mA	
External Reference Input	-10 dBm	0 dBm	+10 dBm
External Reference Lock Range		10 MHz \pm 30 ppm	
External Trigger Low Level Input Voltage			0.7 V
External Trigger High Level Input Voltage	2 V		
External Modulation Input Voltage Level			0 \pm 1.65 V

THERMAL CHARACTERISTICS

Operating temperature range: 0 to +50 °C

Non-operating temperature range: -40 to +85 °C

Warm-up time: 1 minute

TYPICAL PERFORMANCE

1) Max Unleveled Output Power

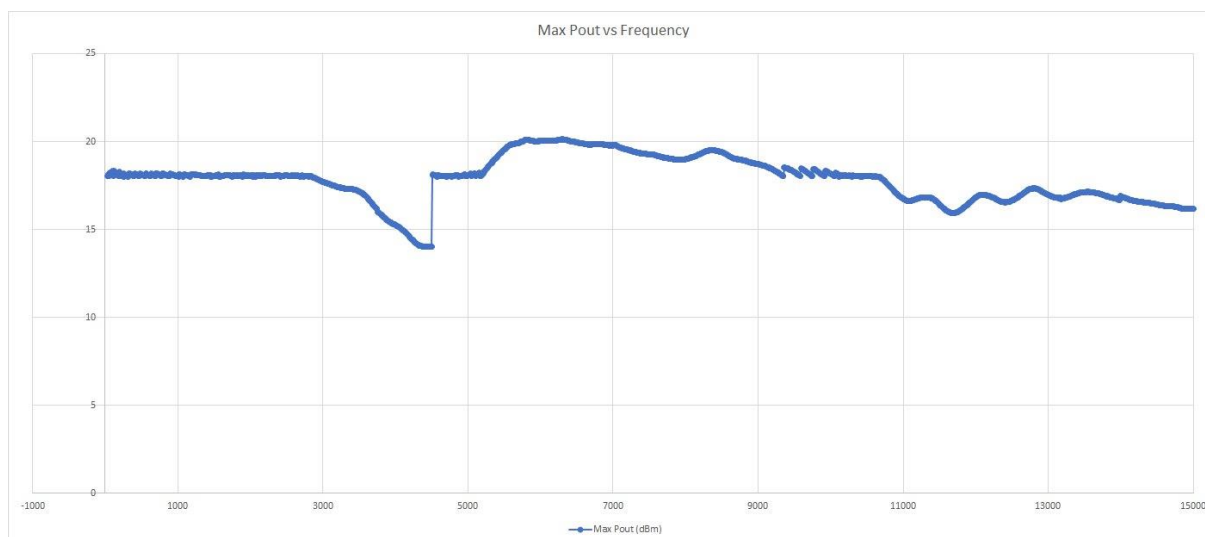


Figure 2: ERASynth+ Max Unleveled Power Output

2) Spurs

ERASynth's multiloop architecture minimizes the spurious artifacts commonly encountered in fractional frequency synthesizers.

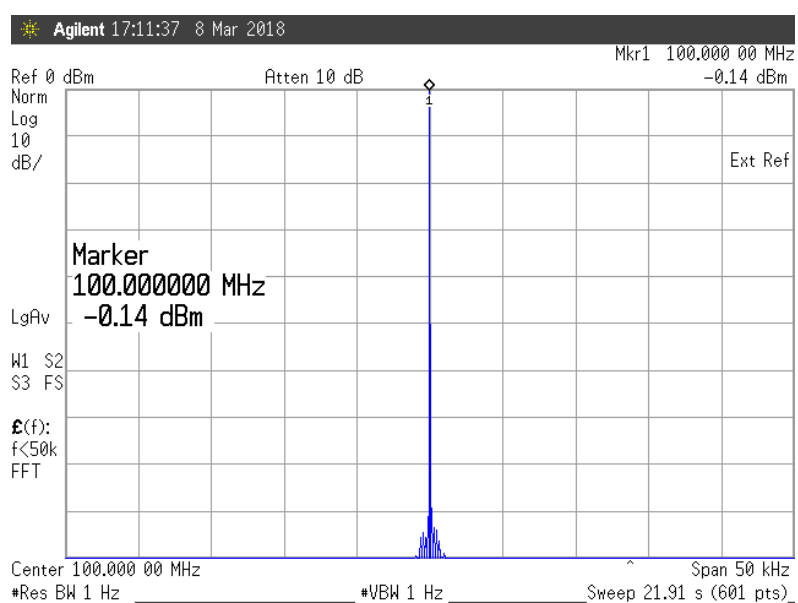


Figure 3: ERASynth+ Narrow-band Spurious Performance at 100 MHz

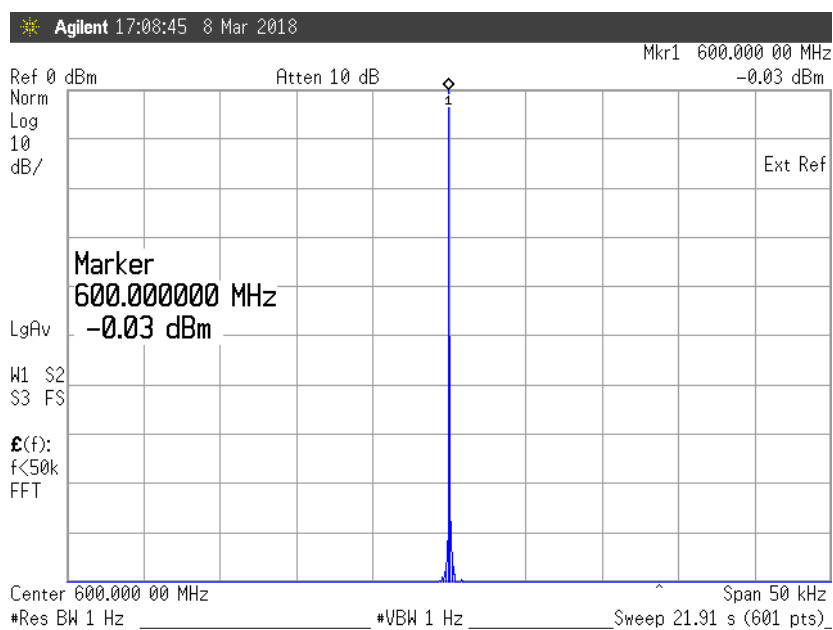


Figure 4: ERASynth+ Narrow-band Spurious Performance at 600 MHz

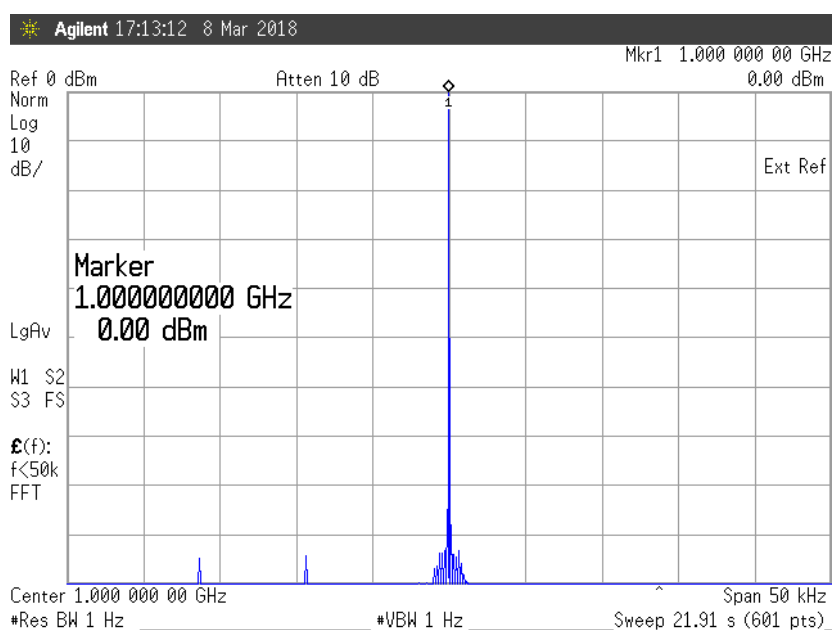


Figure 5: ERASynth+ Narrow-band Spurious Performance at 1 GHz

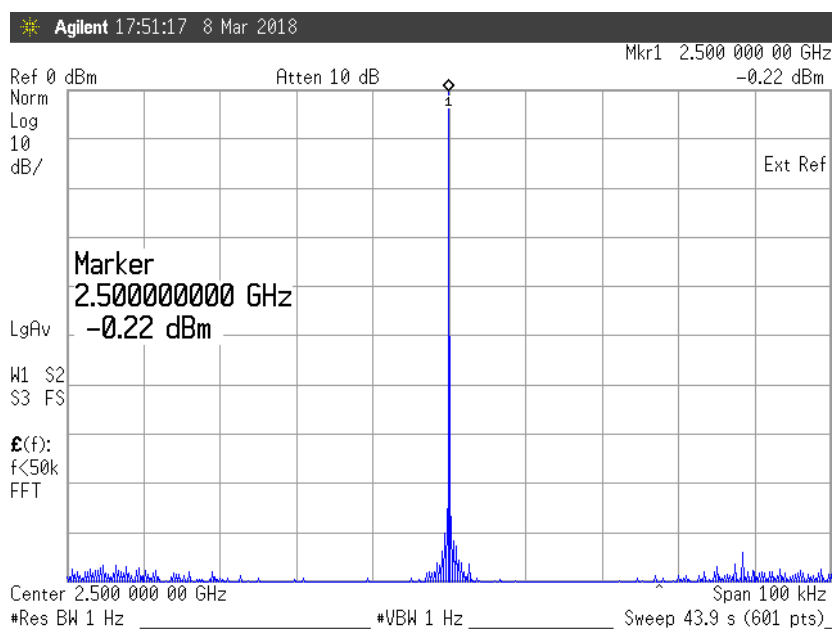


Figure 6: ERASynth+ Narrow-band Spurious Performance at 2.5 GHz

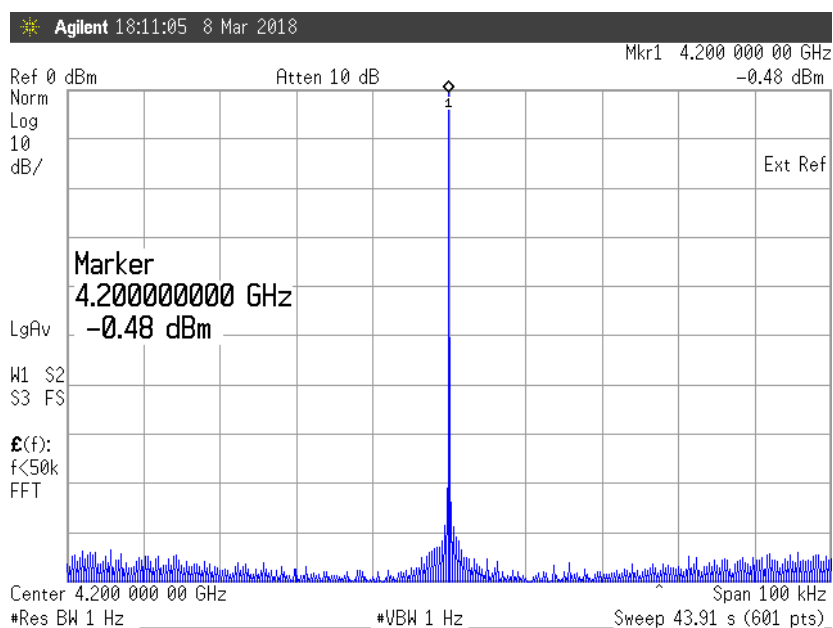


Figure 7: ERASynth+ Narrow-band Spurious Performance at 4.2 GHz

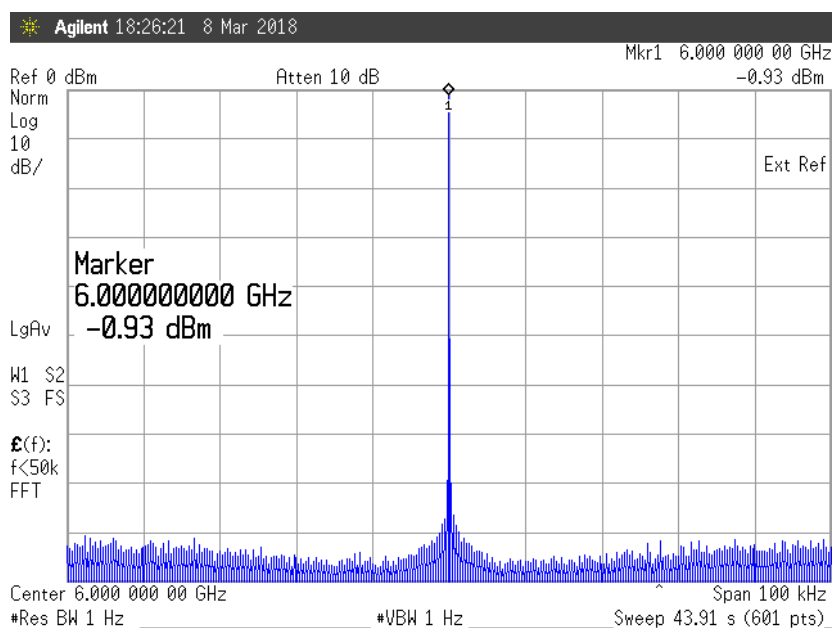


Figure 8: ERASynth+ Narrow-band Spurious Performance at 6 GHz

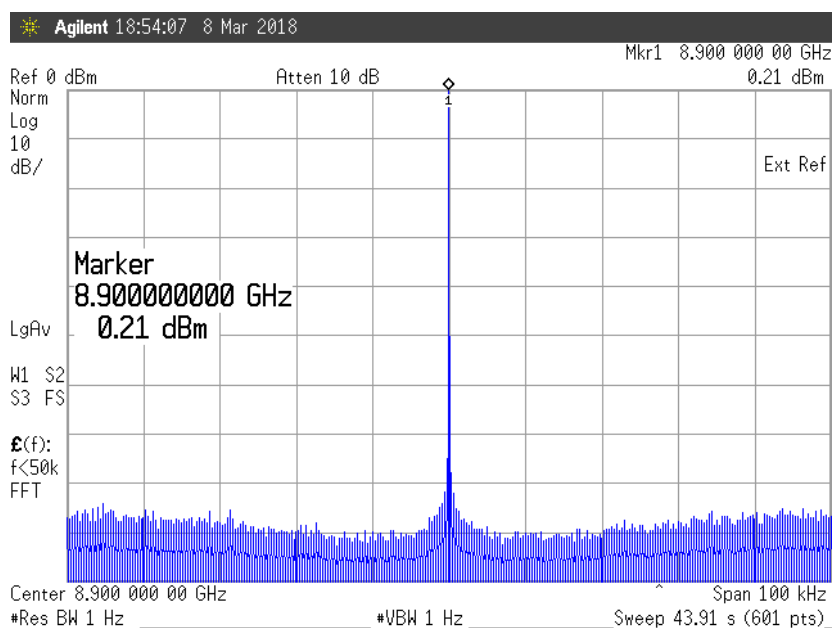


Figure 9: ERASynth+ Narrow-band Spurious Performance at 8.9 GHz

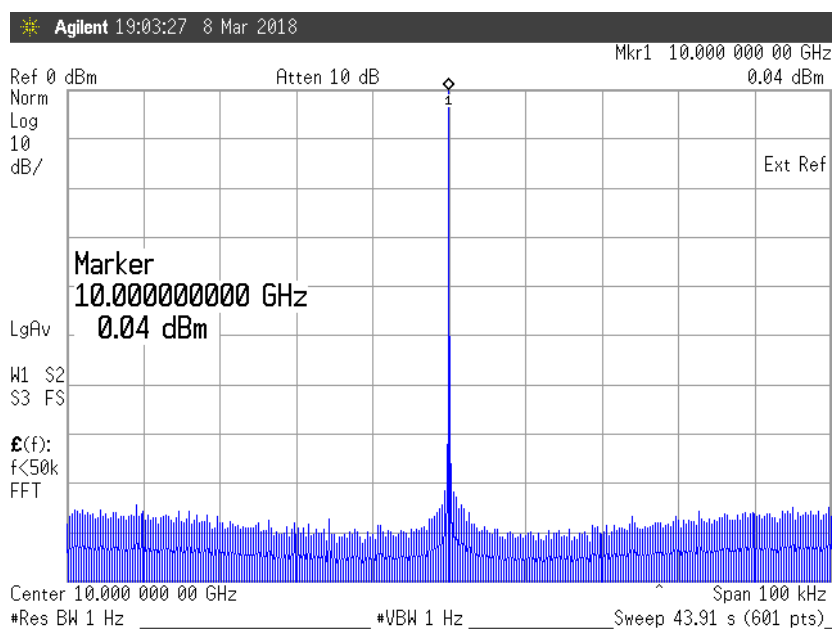


Figure 10: ERASynth+ Narrow-band Spurious Performance at 10 GHz

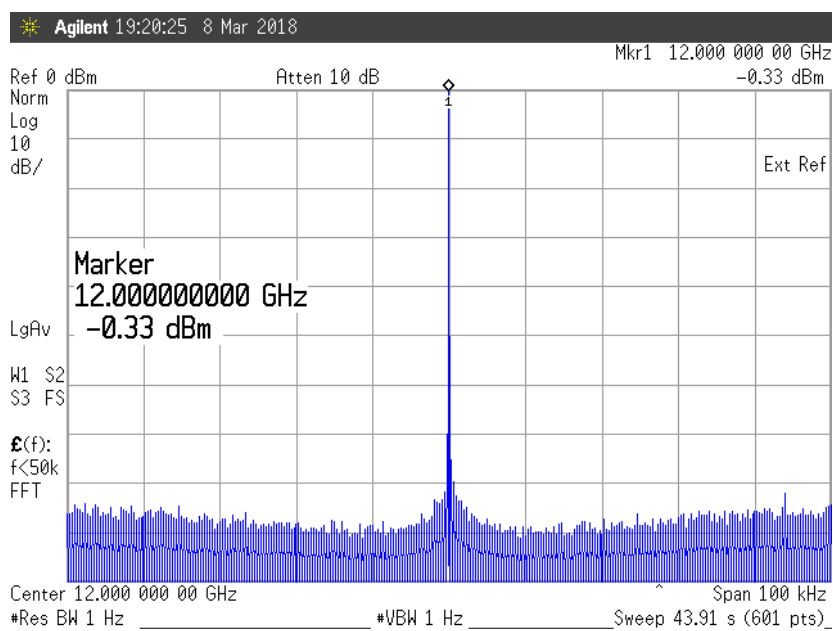


Figure 11: ERASynth+ Narrow-band Spurious Performance at 12 GHz

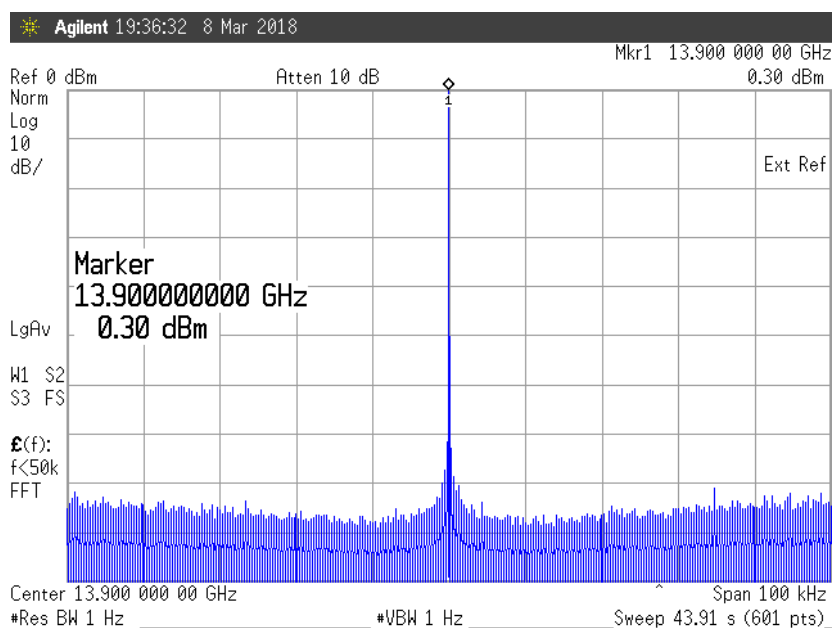


Figure 12: ERASynth+ Narrow-band Spurious Performance at 13.9 GHz

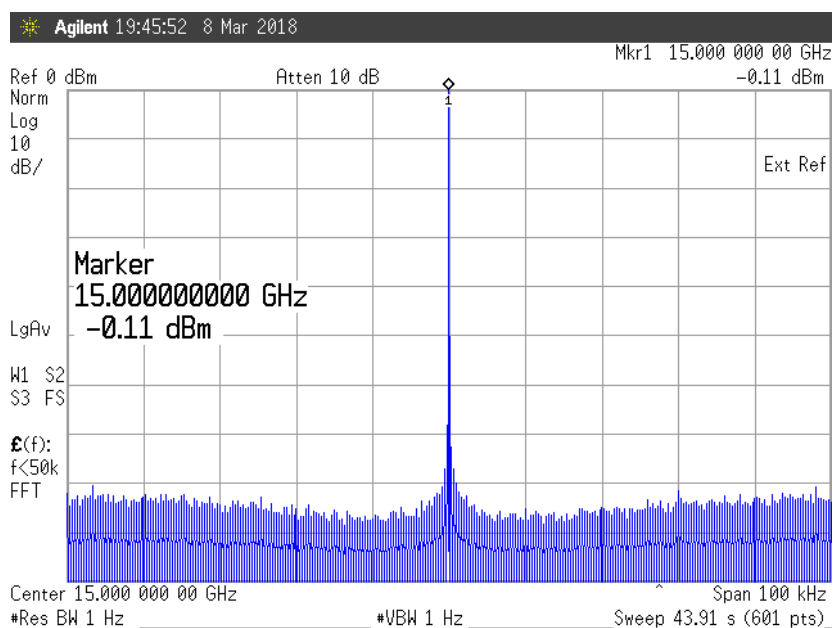


Figure 13: ERASynth+ Narrow-band Spurious Performance at 15 GHz

3) Phase Noise

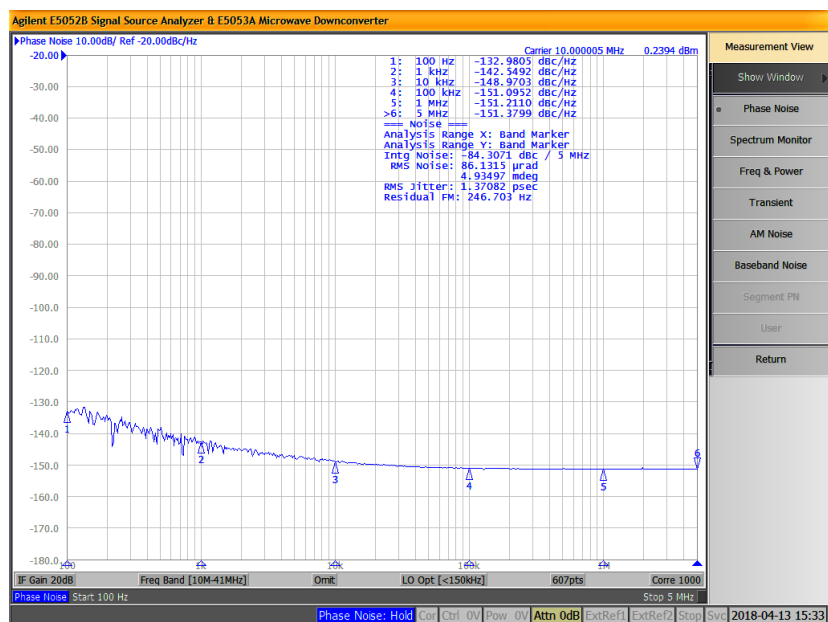


Figure 14: ERASynth+ Phase Noise Performance at 10 MHz RF Output

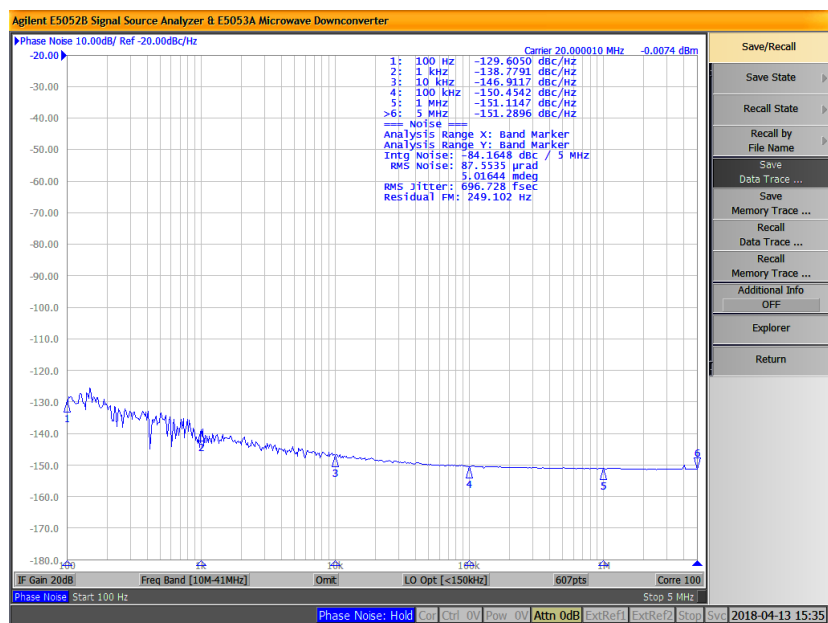


Figure 15: ERASynth+ Phase Noise Performance at 20 MHz RF Output

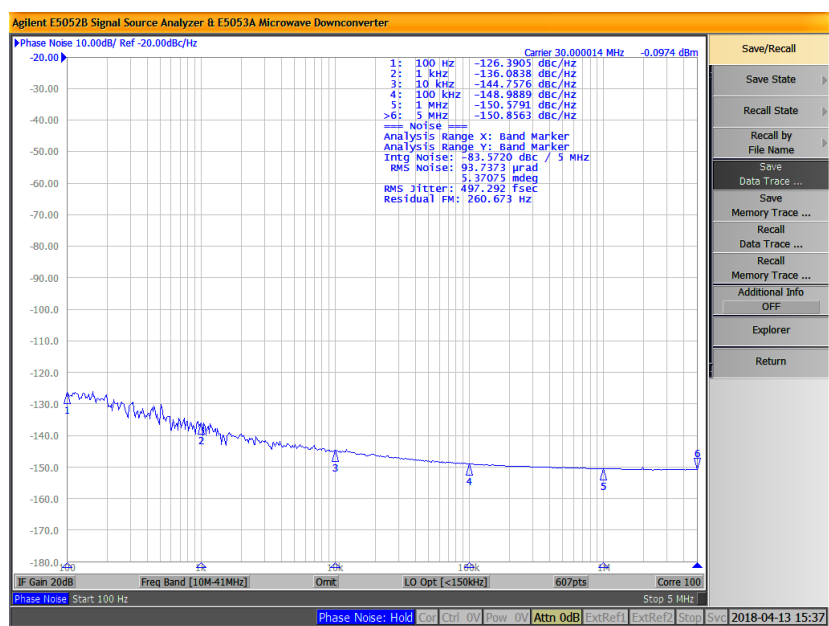


Figure 16: ERASynth+ Phase Noise Performance at 30 MHz RF Output

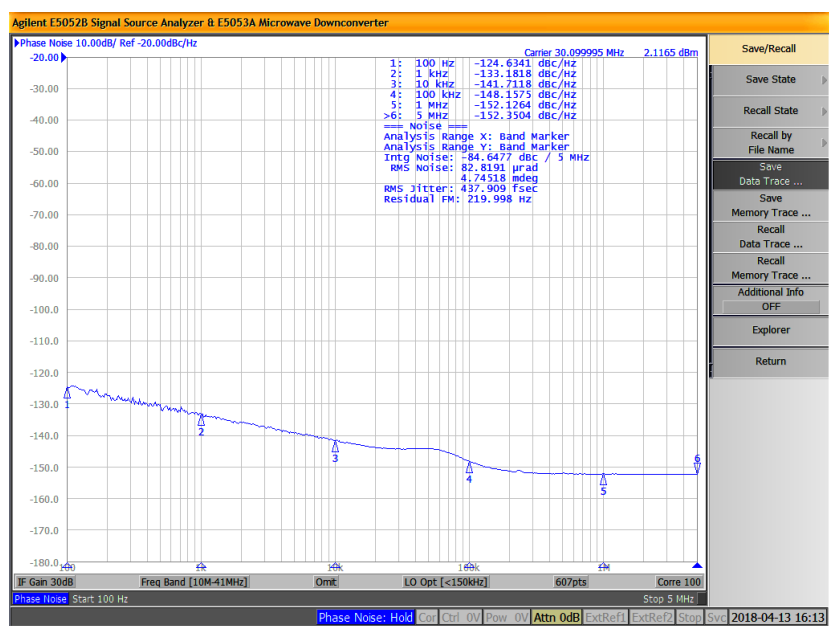


Figure 17: ERASynth+ Phase Noise Performance at 30.1 MHz RF Output

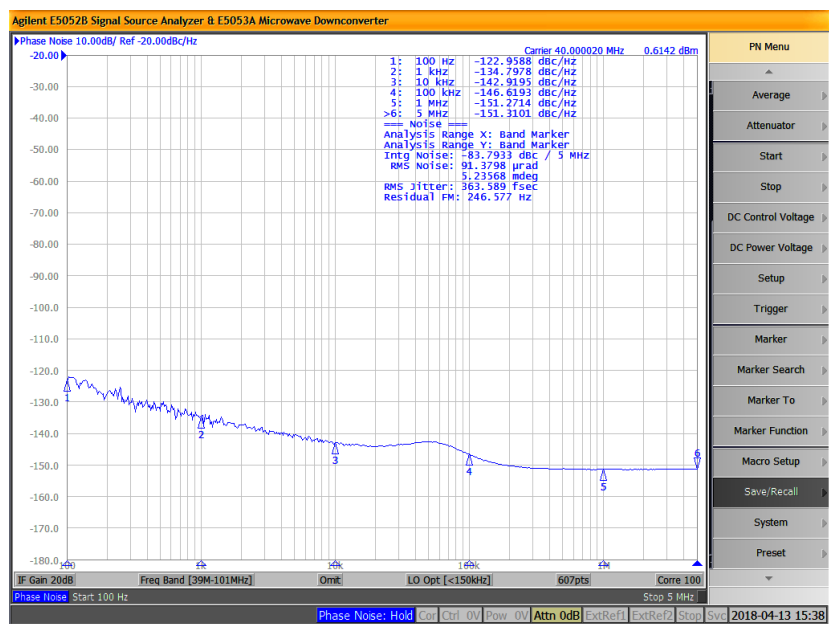


Figure 18: ERASynth+ Phase Noise Performance at 40 MHz RF Output

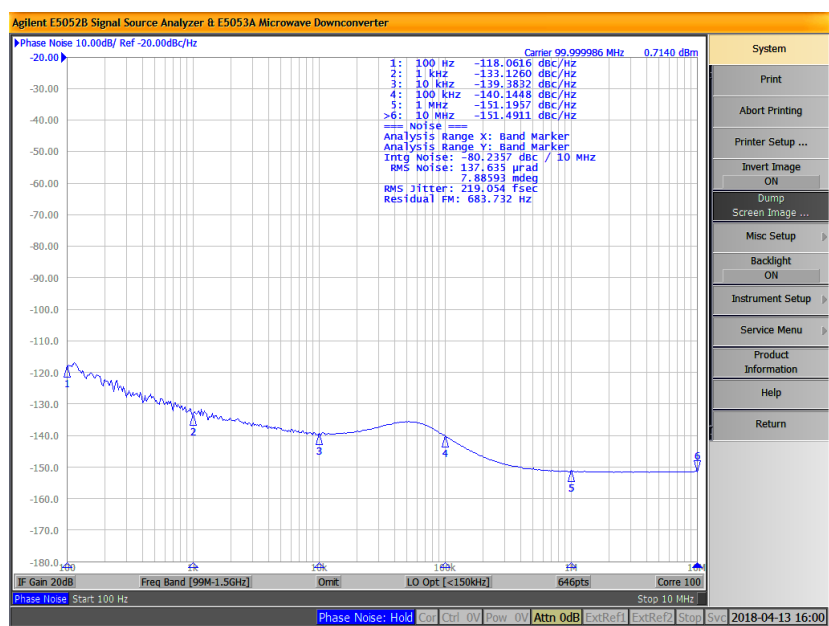


Figure 19: ERASynth+ Phase Noise Performance at 100 MHz RF Output

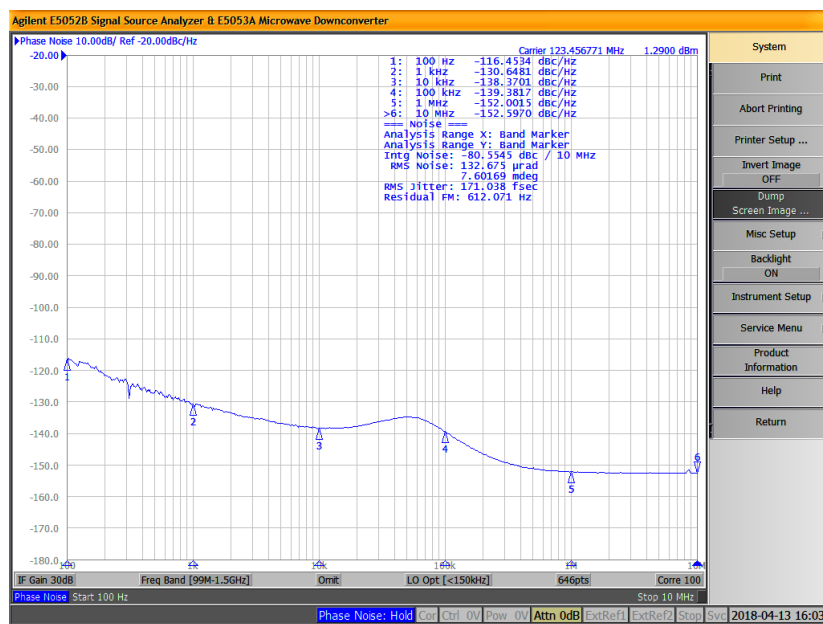


Figure 20: ERASynth+ Phase Noise Performance at 123.456789 MHz RF Output

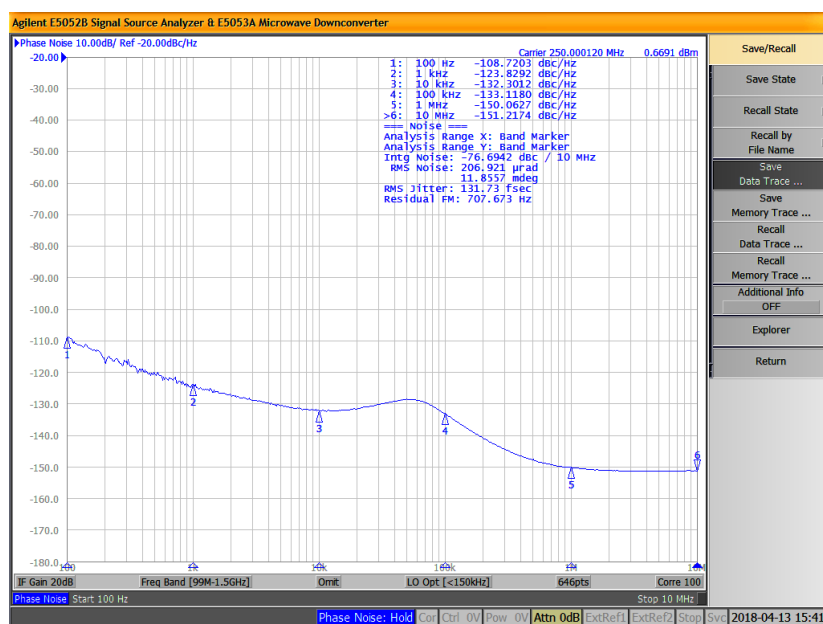


Figure 21: ERASynth+ Phase Noise Performance at 250 MHz RF Output

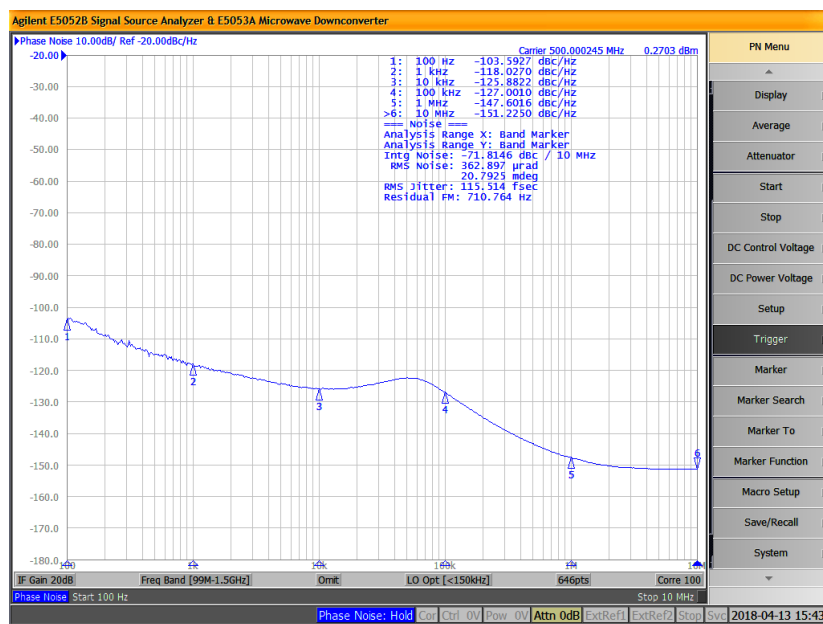


Figure 22: ERASynth+ Phase Noise Performance at 500 MHz RF Output

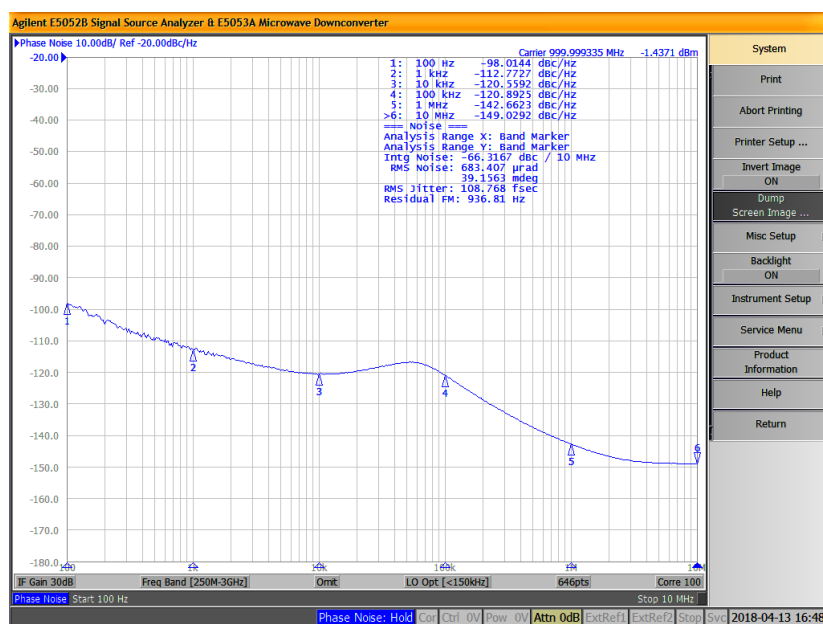


Figure 23: ERASynth+ Phase Noise Performance at 1 GHz RF Output

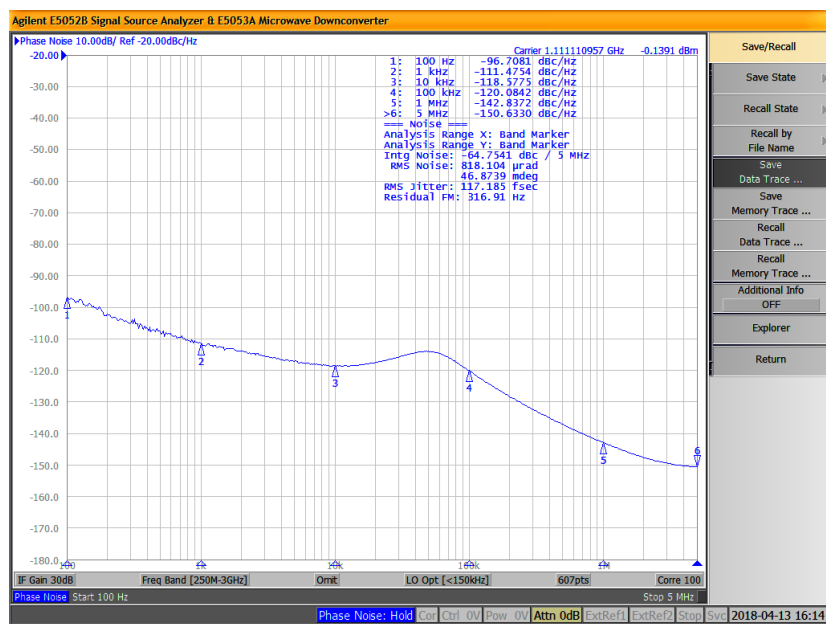


Figure 24: ERASynth+ Phase Noise Performance at 1.11111111 GHz RF Output

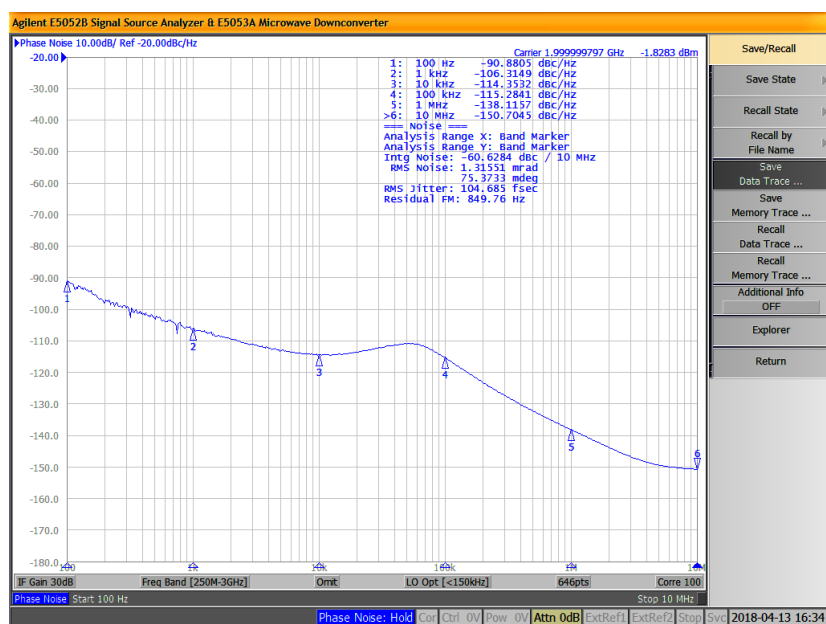


Figure 25: ERASynth+ Phase Noise Performance at 2 GHz RF Output

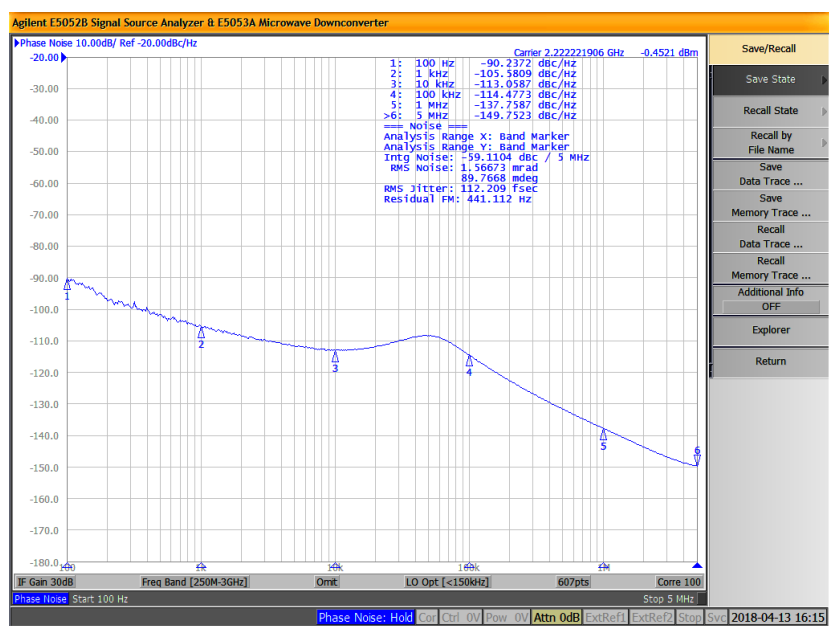


Figure 26: ERASynth+ Phase Noise Performance at 2.22222222 GHz RF Output

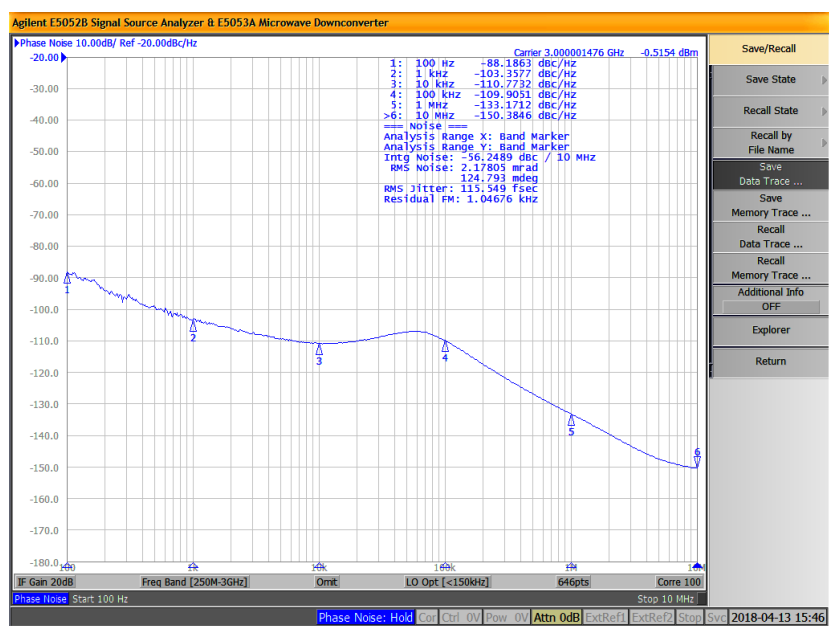


Figure 27: ERASynth+ Phase Noise Performance at 3 GHz RF Output

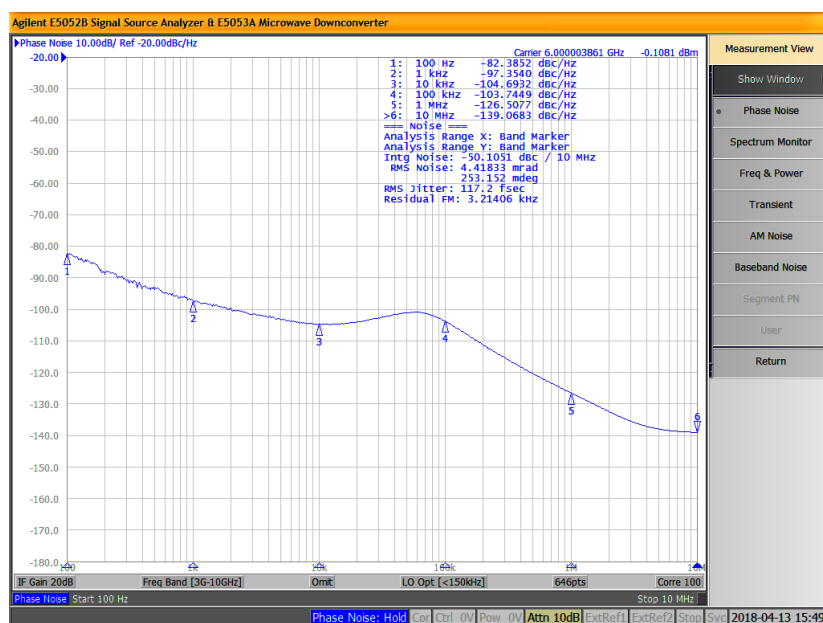


Figure 28: ERASynth+ Phase Noise Performance at 6 GHz RF Output

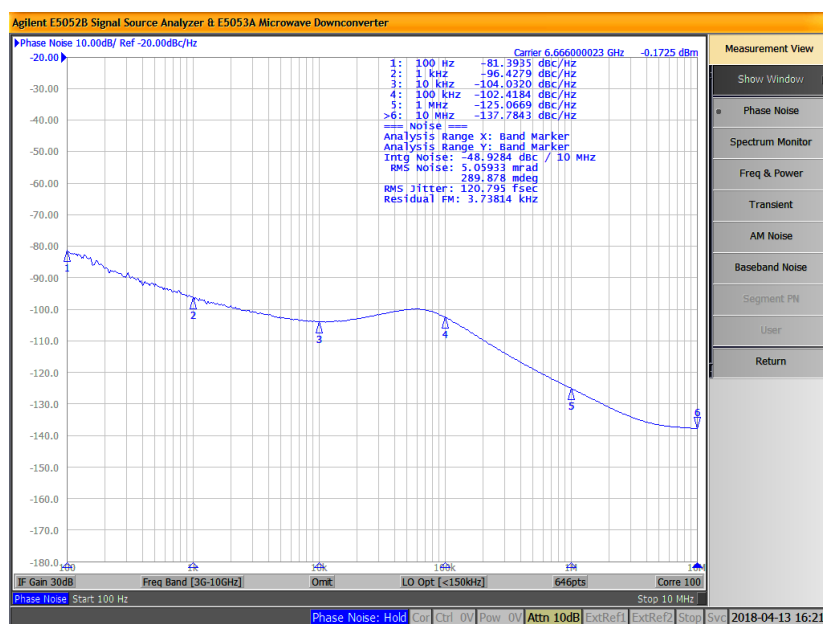


Figure 29: ERASynth+ Phase Noise Performance at 6666 MHz RF Output

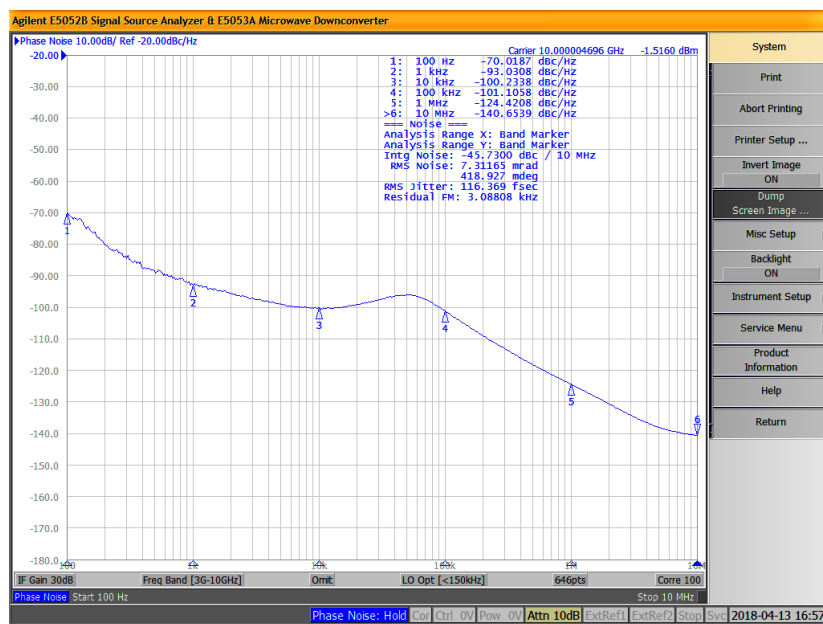


Figure 30: ERASynth+ Phase Noise Performance at 10 GHz RF Output

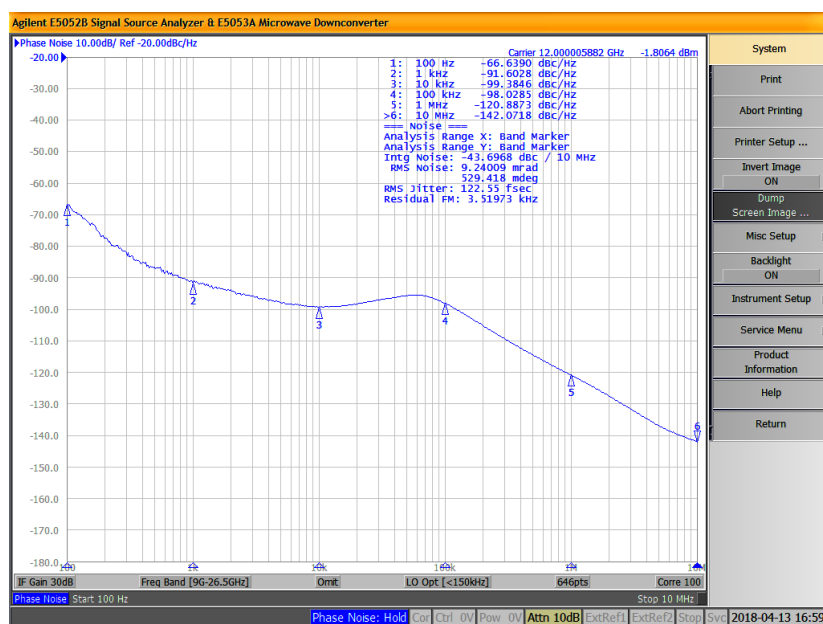


Figure 31: ERASynth+ Phase Noise Performance at 12 GHz RF Output

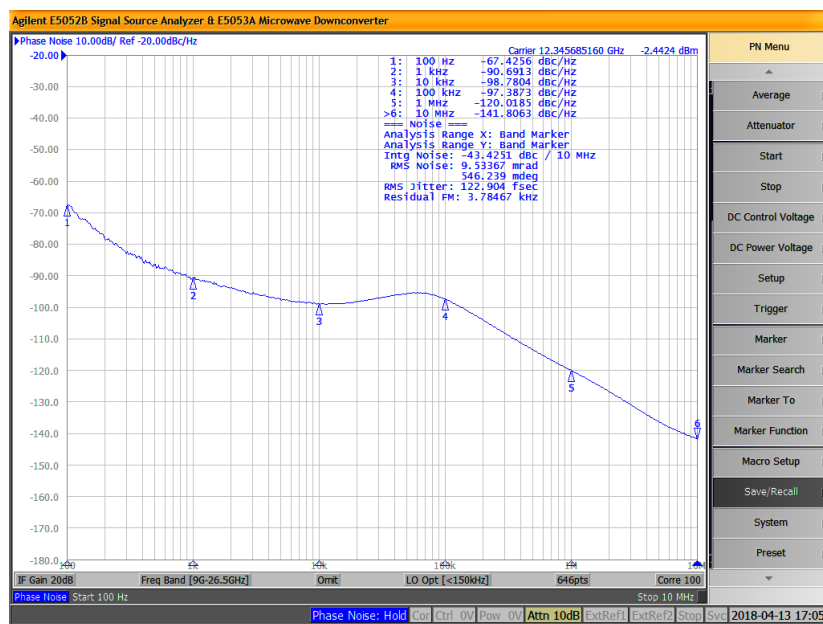


Figure 32: ERASynth+ Phase Noise Performance at 12.345678900 GHz RF Output

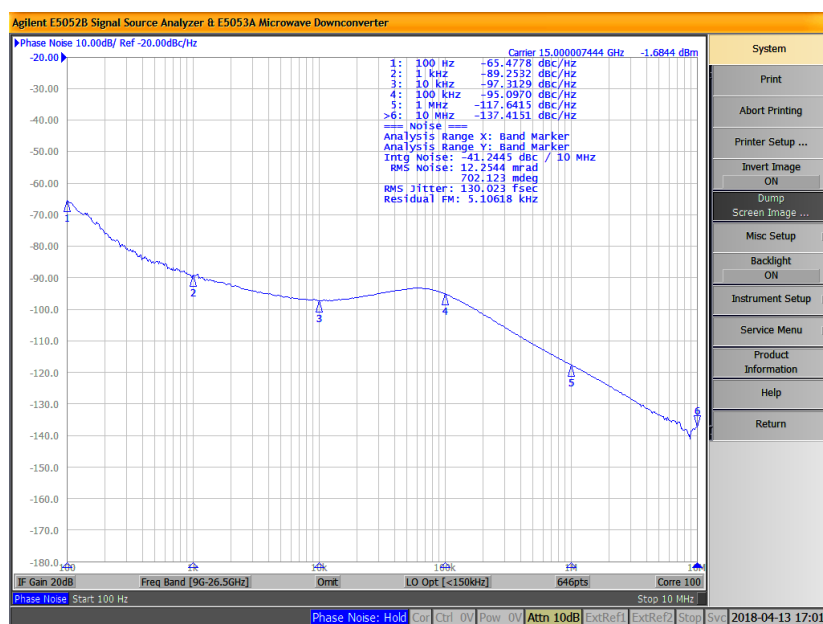


Figure 33: ERASynth+ Phase Noise Performance at 15 GHz RF Output

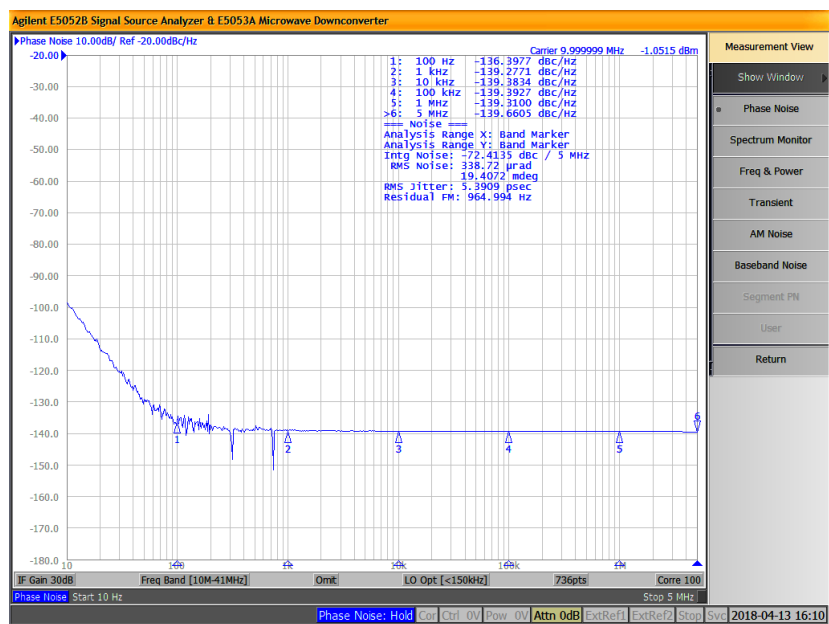


Figure 34: ERASynth+ 10 MHz REF OUT Phase Noise (Internal REF Source is selected as OCXO)