

TEST EQUIPMENT PLUS

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Signal Hound USB-SA44B

# Application Note 4:

## Phase Noise Utility

This information is being released into the public domain in accordance with the Export Administration  
Regulations 15 CFR 734

## 1 Using the Phase Noise Utility

### *Making Phase Noise Measurements with the Signal Hound*

The Signal Hound USB-SA44B may be used to make phase noise measurements on typical consumer-grade RF transmitter voltage controlled oscillators (VCOs). To use this utility, you must start with a span of 10 KHz or less, with your RF carrier signal within 1 division of the reference level (e.g. within 10 dB). This utility takes between 3 seconds and 30 seconds to run, depending on selected settings. The Phase Noise utility will sweep several times, then combine the sweeps into a phase noise plot. To resume normal operation, click "Phase Noise Plot" a second time to un-check.

### 1.1 The Signal Hound Phase Noise Floor

For RF frequencies above 300 MHz, the phase noise floor from 10 Hz to 1 MHz offset is typically from the phase noise of the Signal Hound's reference and VCO. The data is approximate and is limited by the phase noise of the Signal Hound itself. For best close-in phase noise, use an external 10 MHz reference with > 10 dBm power level.

Below 300 MHz, the phase noise floor begins to be dominated by the noise floor of the Signal Hound's intermediate frequency (IF) Analog to Digital Converter (ADC). This becomes very pronounced at 10 MHz, and results in "steps" appearing in the phase noise floor. This is normal.

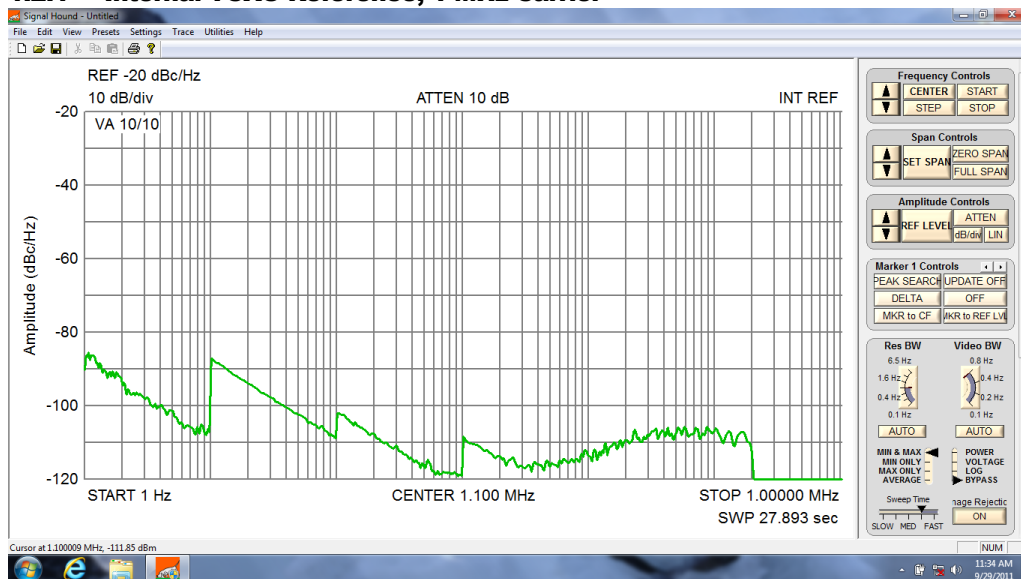
When your offset from carrier is below 100 Hz, typically the majority of the phase noise comes from the 10 MHz reference. The Signal Hound uses an internal TCXO, but you may select an external OCXO to improve performance in the 1 Hz to 1 KHz region.

When your offset from carrier is above 10 KHz, the phase noise is mostly from the signal Hound VCO, and will be optimal with the internal TCXO or a strong, clean external 10 MHz.

## 1.2 Typical Phase Noise Performance

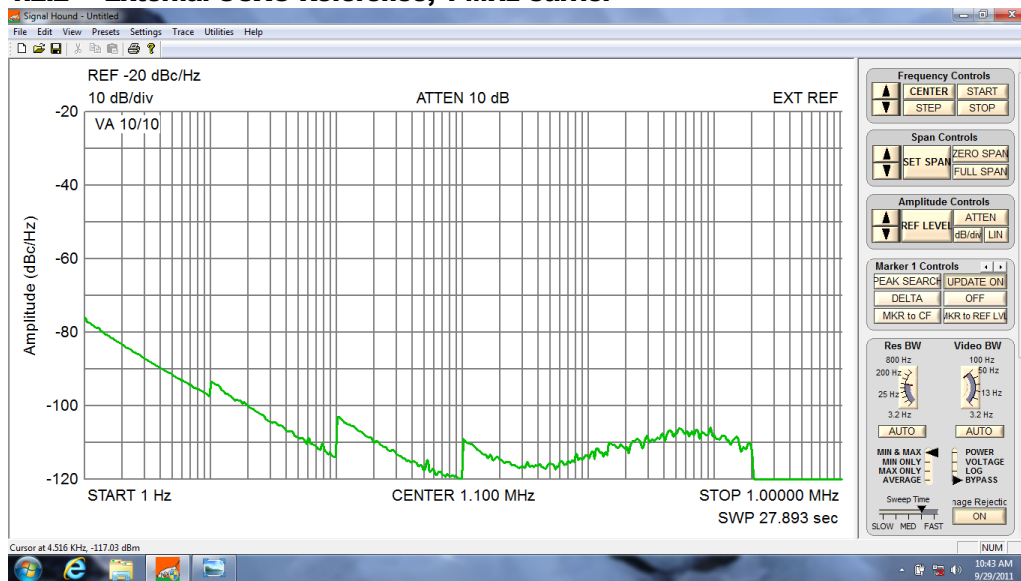
Frequencies of 1 GHz and below were tested with an HP 8662A. Above 1 GHz was tested with an HP 8340A.

### 1.2.1 Internal TCXO Reference, 1 MHz Carrier

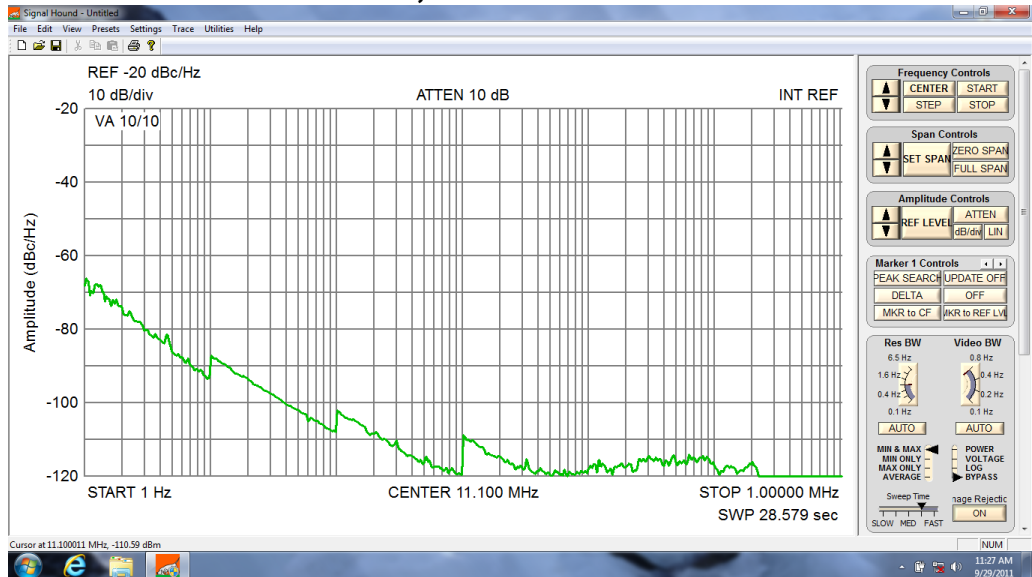


(Note: Readings below 10 Hz are unstable with TCXO. Do not use)

### 1.2.2 External OCXO Reference, 1 MHz Carrier

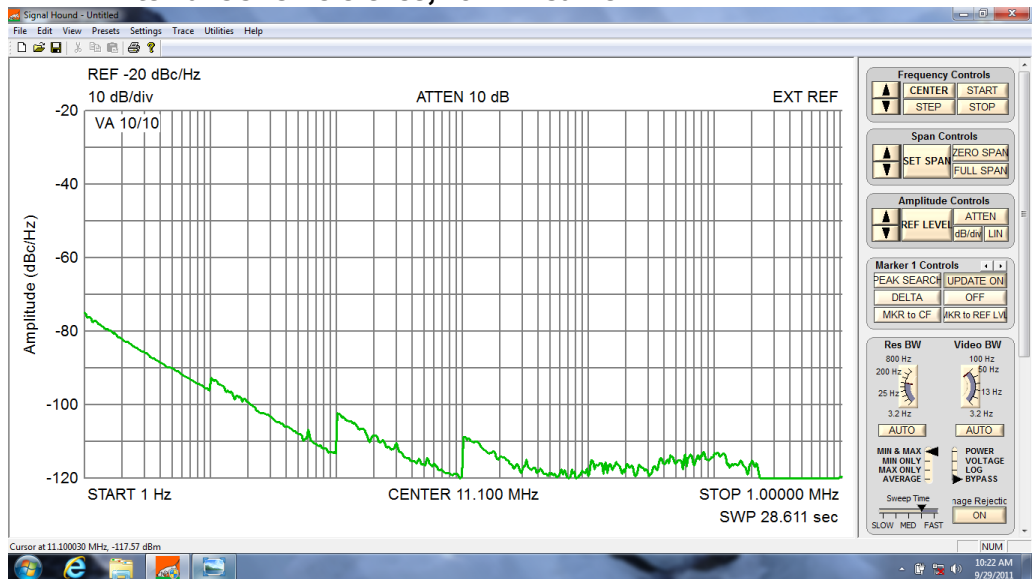


### 1.2.3 Internal TCXO Reference, 10 MHz Carrier

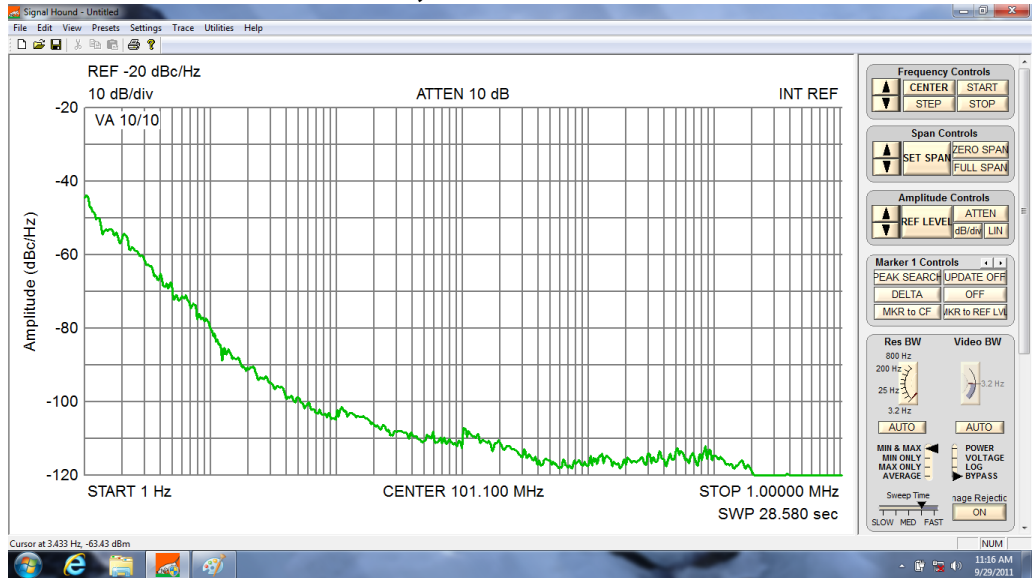


(Note: Readings below 10 Hz are unstable with TCXO. Do not use)

### 1.2.4 External OCXO Reference, 10 MHz Carrier

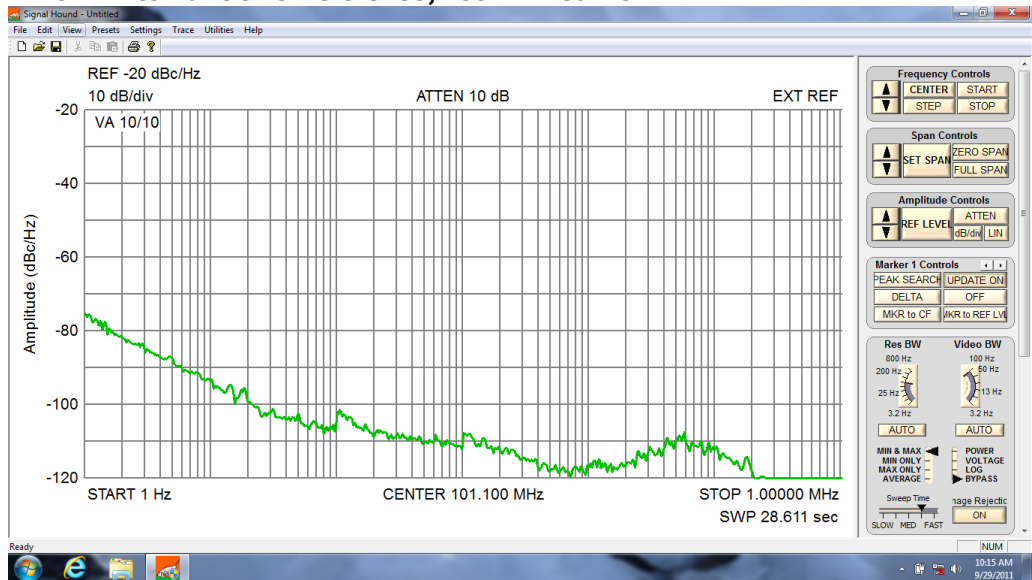


### 1.2.5 Internal TCXO Reference, 100 MHz Carrier

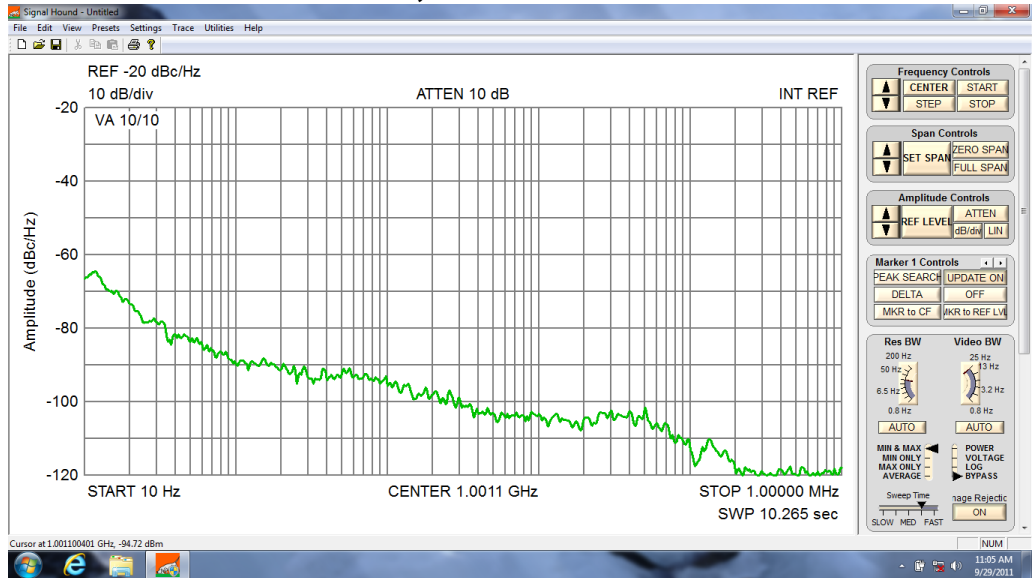


(Note: Readings below 10 Hz are unstable with TCXO. Do not use)

### 1.2.6 External OCXO Reference, 100 MHz Carrier

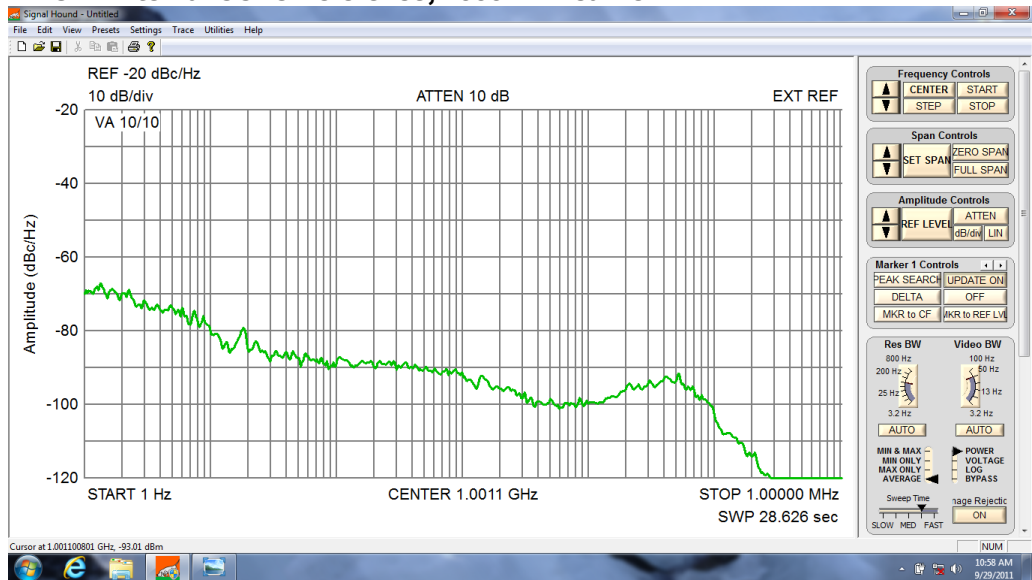


### 1.2.7 Internal TCXO Reference, 1000 MHz Carrier

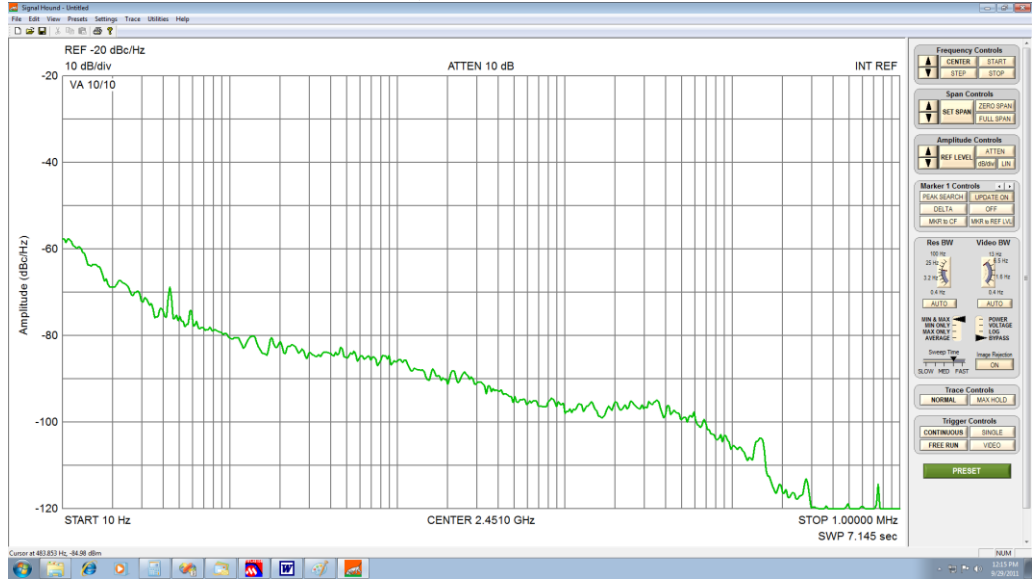


(Note: Plot starts at 10 Hz due to unstable readings below 10 Hz)

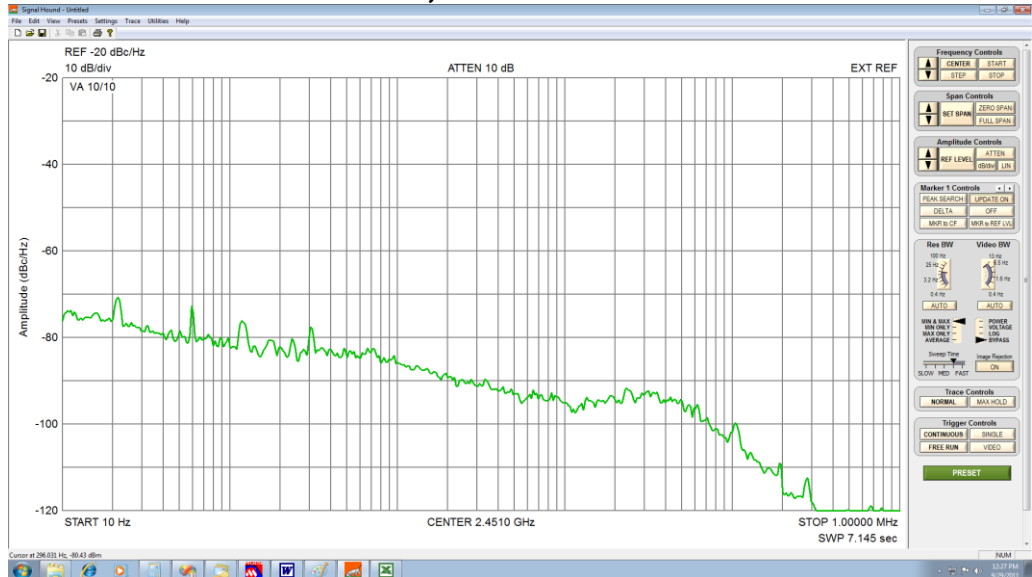
### 1.2.8 External OCXO Reference, 1000 MHz carrier



### 1.2.9 Internal TCXO Reference, 2.45 GHz



### 1.2.10 External OCXO Reference, 2.45 GHz



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