Precise VCO characterization requires a low noise DC source

To maintain a stable output signal, voltage controlled oscillator (VCO) characterization requires a low noise DC voltage source. For optimal VCO characterization a noise density between 1 nVrms/√Hz to 10 nVrms/√Hz at 10 kHz is desirable, but conventional power supplies typically cannot achieve this level of performance. However, the Keysight Technologies, Inc. B2962A can meet these requirements. The Keysight B2962A is a dual channel low noise power source that can supply either voltage or current from both channels while simultaneously monitoring voltage and current on both channels. The Keysight B2962A also has an available High Current Ultra Low Noise Filter (HC-ULNF) and Ultra Low Noise Filter (ULNF) option that can lower its noise floor to levels that permit precise VCO characterization. Moreover, since the Keysight B2962A has two channels it can source low noise voltage to both the control and supply voltages of the VCO.
Phase Noise Measurement Example

The graph at the left shows the results of a VCO phase noise measurement for a 791 MHz carrier frequency performed using a Keysight B2962A with the ULNF option and a Keysight E5052B Signal Source Analyzer.

The Keysight E5052B was used to measure the VCO signal output port, but the DC control and DC power outputs of E5052B were not used. Instead, as shown in the test setup diagram on the previous page, the Keysight B2962A with its ULNF option was used to supply low noise voltage to both the DC power supply port and the tuning port.

A VCO’s output signal frequency is controlled by the DC voltage at its tuning port. VCOs are extremely sensitive to DC source noise, so a low-noise DC source is crucial for accurate VCO characterization. Unlike comparable power sources, the Keysight B2962A with its HC-ULNF/ULNF option is capable of providing the clean voltage supplies necessary to correctly characterize modern VCOs.

Keysight B2961A/B2962A low noise power source key specifications and characteristics

<table>
<thead>
<tr>
<th>Product Number</th>
<th>Option</th>
<th>Max output DC</th>
<th>Max Power</th>
<th>Source Resolution</th>
<th>Noise 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>B2961A/B2962A</td>
<td>N1294A-020</td>
<td>21 V, 500 mA</td>
<td>10.5 W</td>
<td>6 1/2</td>
<td>&lt; 5 μVpp, 50 pApp</td>
</tr>
<tr>
<td></td>
<td>(HC-ULNF)</td>
<td></td>
<td></td>
<td></td>
<td>10 μVrms (1 nVrms/√Hz at 10 kHz)</td>
</tr>
<tr>
<td></td>
<td>N1294A-021</td>
<td>42 V, 105 mA</td>
<td>4.4 W</td>
<td>6 1/2</td>
<td>&lt; 5 μVpp, 60 pApp</td>
</tr>
<tr>
<td></td>
<td>(ULNF)</td>
<td></td>
<td></td>
<td></td>
<td>10 μVrms (1 nVrms/√Hz at 10 kHz)</td>
</tr>
</tbody>
</table>

1. Supplemental characteristics

B2961A/B2962A Key Features:

- 6.5 Digit High Resolution and Wide Bipolar Range
- 10 μVrms Ultra Low Noise
- Precision 10 kHz Arbitrary Waveform Generation Capability
- Programmable Output Resistance
- Time Domain Voltage/Current Waveform Viewer

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Published in USA, March 9, 2018
5991-1616EN
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