



## Network analyzer evaluation of RF amplifier using Agilent B2961A/62A

### Agilent B2961A/B2962A 6.5 Digit Low Noise Power Source

The Agilent B2961A/62A provides precise DC voltage or current for RF amplifier S-parameter measurements



### RF device Evaluation

To determine RF device performance, design and test engineers generally measure electrical characteristics such as S-parameters, frequency bandwidth, distortion, etc.

Analyzers (network analyzers, spectrum analyzers, etc.) are commonly used to perform these measurements. Since most RF devices do not have an on-chip bias circuit, in addition to an analyzer a voltage or current source is usually required to power and bias the device (in conjunction with a bias resistor). This document outlines how to perform MMIC RF amplifier S-parameter measurements using the Agilent B2961A as the DC bias source.

### Using the Agilent B2961A/62A as a precise bias source

- The B2961A/62A's **voltage source mode** can be used to bias amplifiers. The applied bias current will be the difference between the source and device voltages divided by the value of the external bias resistor used.
- In situations where characteristics over temperature or multiple bias current values need to be observed, it is more convenient to use the B2961A/62A's **current source mode** as opposed to its voltage source mode since the device voltage will vary depending on both temperature and bias current
- The Agilent B2961A/62A's internal feedback mechanisms enable it to source precise and stable voltages and currents at their specified setting values despite varying load conditions. In addition, users can easily switch between voltage and current sourcing without changing any cable connections.

### Advantages of the B2961A/62A Low Noise Power Source

A revolutionary power supply for precision low-noise voltage and current sourcing

Superior 6.5 digit 100 nV/10 fA resolution

Wide 210 V/3 A (10.5 A pulse) bipolar range

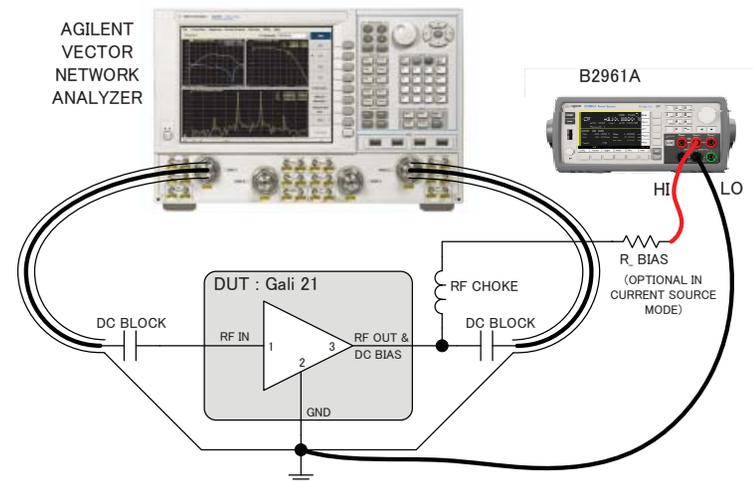
Outstanding 10  $\mu$ Vrms ultra low noise

Innovative Source Functions

Intuitive Graphical User Interface

### Benefits

- More precision test & evaluation
- Reveals true DUT characteristics
- More efficient test & evaluation



Gali 21 is a product from Mini-Circuits®



Agilent Technologies

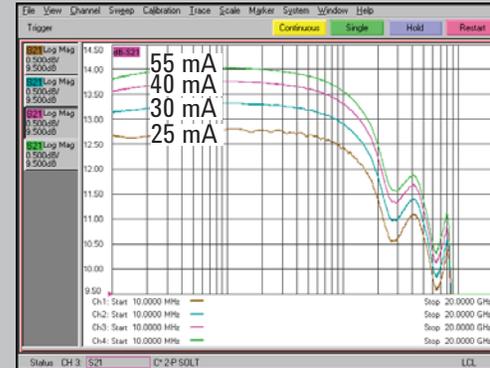
## The B2961A/62A bias source facilitates network analyzer S-parameter measurements



**DUT:**  
Gali 21 on Test Board  
**VNA:**  
Agilent PNA series  
**Bias source:**  
B2961A in the voltage source mode

Ideally, the best means to bias this amplifier would be to use a constant current DC source since it provides a stable operating point. However, combining a constant voltage source and a bias resistor is the most practical way to bias this circuit, because the device voltage varies from device to device and drifts with temperature changes. The net result is variations in bias current that affect the amplifier characteristics (e.g.: P1dB). The amount of current deviation is strongly related to the inaccuracy of the bias source voltage (and the bias resistor); therefore, the B2961A's precise and stable voltage sourcing and current monitoring capabilities make it an ideal choice to bias this circuit.

In tests where amplifier characteristics under various bias current conditions need to be observed, it is best to use the B2961A as a current source. This mode is not only more efficient and easier to use, but it also provides a more precise and repeatable current bias. A repeatable and stable current bias is critical, especially when evaluating device performance variability and design margin in the development phase.



Spec. @ 25°C:  
Min Gain @ 2 GHz = 11.5  
Operating current = 40 mA

Forward gain (S21) of Gali 21 at different bias current conditions

The Agilent B2961A's broad voltage and current sourcing capabilities allow many different types of tests to be conducted more easily and with better repeatability.

## Agilent B2961A/B2962A Low Noise Power Source Key Specifications and Characteristics

Product Number	Option	Max output		Min source Resolution		Output Noise 10 to 20 MHz <sup>1</sup>	Source Functions
		DC	Pulse	Voltage	Current		
B2961A B2962A	.....	210 V/3.03 A	200 V / 10.5 A	100 nV	10 fA	3 mVrms	<ul style="list-style-type: none"> <li>Arbitrary waveform generation</li> <li>Programmable output resistance</li> <li>Time domain waveform viewer</li> </ul>
	LN1	42 V/105 mA	42 V / 105 mA	100 nV	10 pA	10 μVrms	
	LN2	210 V/3.03 A	200 V / 3.03 A <sup>2</sup>	100 nV	10 pA	350 μVrms	

- Supplemental characteristics
- 10 A pulse range is not supported

### Related applications:

Power /bias source for:

- ✓ Other types of amplifiers
- ✓ Active mixers
- ✓ Oscillators
- ✓ Passive devices, e.g. bias tees

### To Learn More...

Please visit our website below:

[www.agilent.com/find/precisionSOURCE](http://www.agilent.com/find/precisionSOURCE)

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