

### Faster and easier 14-bit ADC evaluation

The Keysight B2961A/62A's 6.5 digit resolution, low noise performance and great linearity speed up and simplify ADC testing

### Conventional ADC testing solution can be complex and expensive

The servo-loop based ADC testing method (Figure 1) is widely used to evaluate an ADC's differential & integral non-linearity (DNL/INL). However, this technique has several issues:

- Issue 1: This test method requires many different components, such as a voltage/current source, a digital multimeter (DVM), servo circuitry, etc. It also requires a complicated program to control and synchronize everything.
- Issue 2: Conventional voltage/current sources used in the servo-loop test require significant averaging to eliminate noise as well as frequent PC communication, creating lots of test over head time.
- Issue 3: The histogram testing method is the most desirable technique due to its simplicity and efficiency; however, most conventional instrumentation does not have the required resolution, noise floor and linearity to test high bit ADCs.

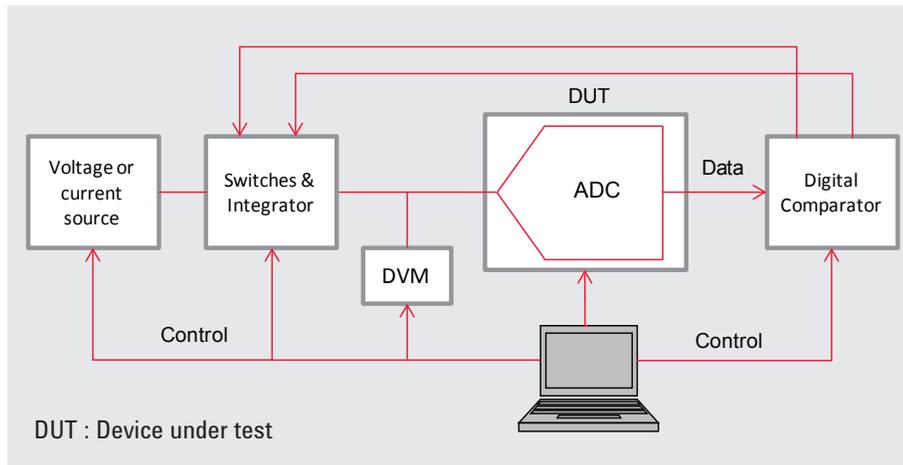


Figure.1 Block diagram of servo-loop test method



### B2961A/62A with LNF option streamlines 14-bit ADC testing

- Solution 1: The B2961A/62A with its low noise filter (LNF) has superior source resolution that does not require external monitoring by a DVM. This improves and simplifies ADC testing.
- Solution 2: The superior noise performance of the B2961A/62A with its LNF reduces averaging times. In addition, its external trigger input and 100k point waveform memory reduce PC communication frequency. All of these factors improve ADC testing efficiency.
- Solution 3: The B2961A/62A's excellent arbitrary waveform generation function linearity supports ramp voltage histogram evaluation of 14bit ADC DNL/INL. Using the simple test setup shown in Figure. 2, two examples of DC performance testing for off-the-shelf ADCs will be shown on the next page.

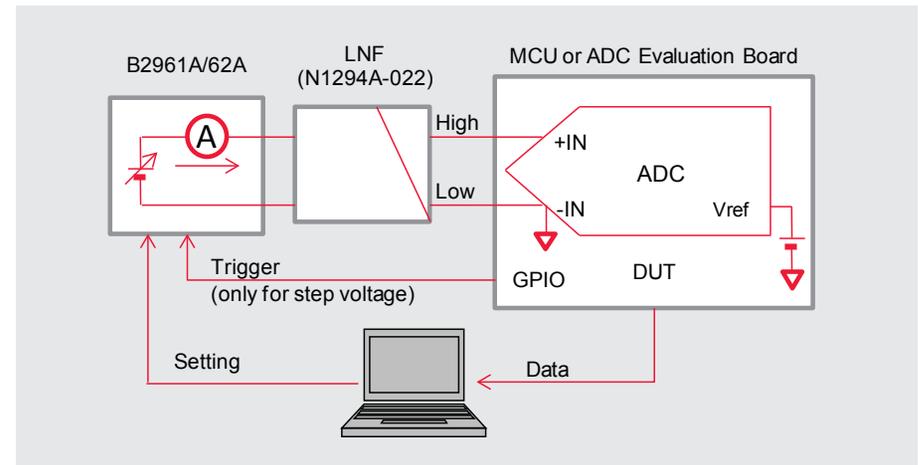


Figure.2 DC performance test with B2961A/62A with LNF

## Example 1: 12 bit ADC step voltage test using external trigger and waveform memory

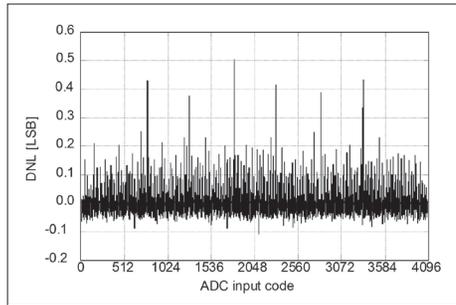


Figure.3 DNL error of 12bit SAR ADC

Figure.3 shows DNL error of 12bit ADC measured by B2961A with 0.04LSB size steps of voltage based on Figure. 2 test setup.

Unlike the servo-loop based method, the simpler B2961A/62A test setup eliminates the convergence loop and reduces PC communication frequency. The B2961A/62A's 6.5 digit source resolution and better noise performance eliminate the need for DVM monitoring. In addition, the external trigger port and internal waveform memory improve ADC testing efficiency. As a result, the B2961A/62A with LNF allows you to implement simpler ADC testing methods and speed-up your testing.

DUT:  
 \*ATXMEGA256A3BU MCU built in 12bit SAR ADC  
 Vref = 2.0 V  
 Step voltage source:  
 B2961A with LNF  
 20  $\mu$ V \* 100 k steps, 0 V to 2.0 V  
 \*ATXMEGA256A3 is an Atmel product.

## Example 2: 14 bit ADC linear ramp voltage histogram test for DNL/ INL measurement

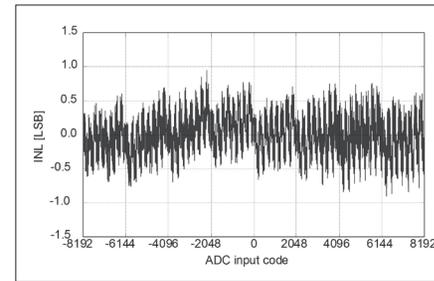


Figure.4 INL error of 14bit SAR ADC

Figure.4 shows the INL error for a 14bit ADC measured by a B2962A using the ramp voltage histogram test for the test setup shown in Figure. 2.

An ADC's DNL/INL performance can also be tested by applying a ramp voltage using the B2962A (histogram test). In this test method the ADC samples the ramp voltage at even intervals. This method requires a very linear voltage source, but the measurement time is shorter and the ADC controller can be simpler as compared to the step voltage method. The B2961A/arbitrary waveform generation function has the necessary linearity to permit evaluation of 14bit ADC DNL/INL using a ramp voltage.

Note: The B2961A/62A can also generate low distortion sinusoidal voltages.

DUT:  
 ADS8324EVM 14bit SAR ADC evaluation board  
 Vref = 1.6 V  
 Ramp voltage source:  
 B2962A with LNF  
 30 sec ramp, -50 mV to 3.25 V  
 Averaged 8 times  
 \*ADS8324EVM is a Texas Instruments product.

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

Product Number	Option	Max DC output	Source Resolution	Output Noise <sup>1</sup> (10 to 20 MHz)	Source Functions
B2961A	.....	210 V/3.03A	6 1/2 digit	3 mVrms	- Arbitrary waveform generation
B2962A	LN1	42 V/105 mA	6 1/2 digit	10 $\mu$ Vrms	- Programmable output resistance
	LN2	210 V/3.03 A	6 1/2 digit	350 $\mu$ Vrms	- Time domain waveform viewer

1. Supplemental characteristics



### Related applications:

- ✓ ADC evaluation with sinusoidal wave
- ✓ I/V source for handheld DMM calibration source
- ✓ Analog IC test and evaluation

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