Faster and easier 14-bit ADC evaluation

Agilent B2961A/B2962A 6.5 Digit Low Noise Power Source

The Agilent 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 (Fig 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.

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 Fig. 2, two examples of DC performance testing for off-the-shelf ADCs will be shown on the next page.

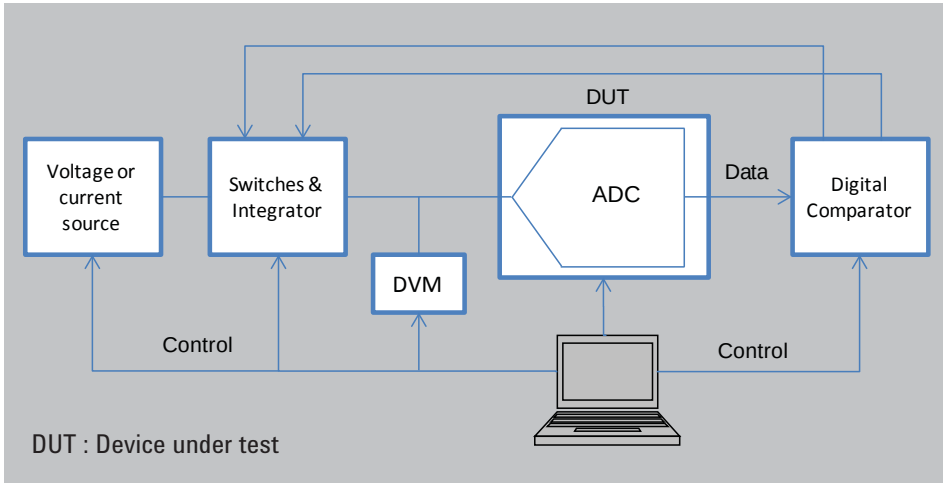

Fig.1 Block diagram of servo-loop test method

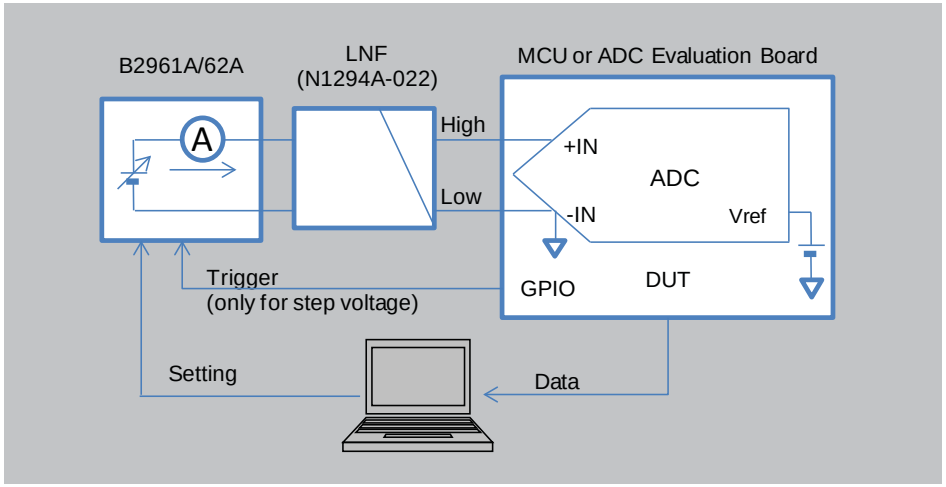

Fig.2 DC performance test with B2961A/62A with LNF

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

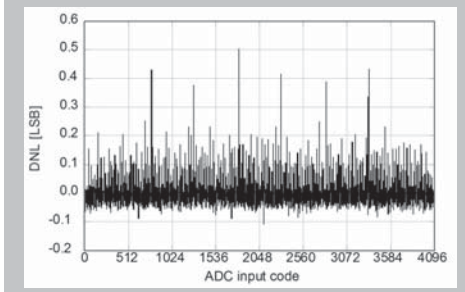

Fig.3 DNL error of 12bit SAR ADC

DUT:

*ATXMEGA256A3BU MCU built in 12bit SAR ADC

Vref = 2.0 V

Step voltage source:
B2961A with LNF

20 uV * 100 k steps, 0 V to 2.0 V

*ATXMEGA256A3 is an Atmel product.

Fig.3 shows DNL error of 12bit ADC measured by B2961A with 0.04LSB size steps of voltage based on Fig. 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.**

Note: The B2961A/62A also provide an External Trigger output port.

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

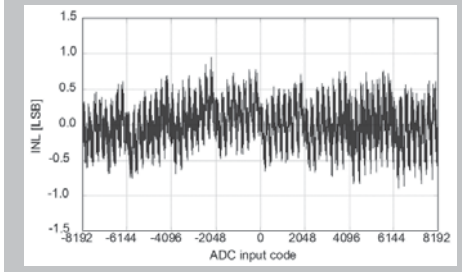

Fig.4 INL error of 14bit SAR ADC

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.

Fig.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 Fig. 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.

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

Product Number	Option	Max DC output	Source Resolution	Output Noise [1] (10 to 20 MHz)	Source Functions
B2961A B2962A	.....	210 V/3.03A	6 ½ digit	3 mVrms	• Arbitrary waveform generation • Programmable output resistance • Time domain waveform viewer
	LN1	42 V/105 mA	6 ½ digit	10 µVrms	
	LN2	210 V/3.03 A	6 ½ digit	350 µVrms	

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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