Using AWGs to Generate Signals for Simulated Test

Submitted by Keysight Technologies

Basic testing of an electronic device or system includes applying the right stimuli and analyzing the resulting behavior. In some cases, real world stimuli can be used, but in most situations simulated signals must be created and supplied by a test instrument. Many instruments are capable of generating signals including signal generators, noise sources, function/arbitrary waveform generators, pattern generators or pulse generators. These instruments are each designed to generate signals for specific applications. As devices and interfaces become faster and more complex, the flexibility of test instruments becomes more and more important.

The number of devices that need to be tested and the simulated signals they require determines the number of signal generating instruments that are needed. Purchasing multiple instruments for different types of signal generation can be very expensive. Engineers are also challenged to develop expertise in configuration and programming for the various signal generators, to ensure repeatable and deterministic results.

This article discusses the advantages of using a single arbitrary waveform generator (AWG) for signal generation instead of multiple signal simulation test instruments. An AWG is very flexible and offers distinct advantages while generating the same types of signals as the other instruments. Situations where an AWG provides advantages over other signal generators include: a wider modulation bandwidth, the ability to generate multiple carriers simultaneously, and fast hopping. An AWG provides more flexible noise source signals and can generate custom spectral signals with notches, narrowband noise, and other signal features. Unlike function generators, which are limited to a simple set of waveforms, an AWG allows the user to specify a source waveform in a variety of different ways. BERT and pattern generators are not as flexible as an AWG which can provide variable rise times, multi-level signals and pre-distortion. An AWG is also more flexible than a pulse generator when different pulse shapes are needed or when adding pre-distortion. An AWG combines the functionality of these various instruments into a single, flexible signal generating device.

Key AWG specifications include the memory size, dynamic range and the sampling rate. Signals are digital and can be described mathematically and then downloaded to memory. The size of the memory determines the maximum playtime of the signal. Large memory is especially important for radar applications. An AWG's dynamic range (or vertical resolution) determines the signal quality and is derived from the number of bits of the internal digital to analog converter (DAC). For a given vertical resolution N, the DAC will be able to generator 2N different levels. Higher vertical resolutions provide more detailed waveforms. A good dynamic range is important for electronic warfare (EW) and aerospace/defense applications. Until recently, AWGs either provided good vertical resolution or high sample rates. With modern technology, AWGs can provide both high sample rate and good resolution. High sample rates and bandwidth are most important in digital applications.

To learn more about the fundamentals of arbitrary waveform generation please view:

https://event.on24.com/eventRegistration/EventLobbyServlet?target=registration.jsp&eventid=1107394&sessionid=1&key=D974E8597CE0AB3953EB6041C022140B&sourcepage=register