

Modular Instruments Extend Capabilities

New instruments and repair/calibration services reinforce one company's dedication to achieving accurate measurements from dc through millimeter-wave frequencies.

Modular test equipment provides a compact architecture for performing many different types of measurements. By plugging the appropriate module into a chassis, a function can be added to a test system, in the total size once required for a traditional single-function instrument, such as a spectrum analyzer or a vector network analyzer (VNA).

Modern test instruments are available in a variety of modular formats, such as PXI and AXIe modules. These are increasingly being used with traditional benchtop measurement systems, often with multiple chassis holding the many modules needed for complex measurement functions—e.g., evaluating antenna arrays and multiple-input, multiple-output (MIMO) communications systems.

For those faced with trying to decide whether to move to modular instruments or which modular format is better, Keysight Technologies (www.keysight.com) recently reinforced its support for AXIe and PXI formats. The company offers a series of modular test instruments in both formats featuring calibration and repair services that can be applied not only to their own modular and benchtop instruments, but to test instruments from most instrument makers around the world.

Modular instruments typically save space in a rack by using a PC for common display and control purposes, enabling essential measurement capabilities to be contained within a universal module that can slide into a rack-mountable chassis. Consequently, the chassis space once occupied by a single analyzer can now hold five or six instrument functions. Whether in PCI or AXIe format, Keysight recently showed its support for modular instruments with a host of introductions, including wideband PXIe and AXIe digital receivers, an AXIe embedded controller, and a PXI M9421A vector signal transceiver (VST).



1. Model M9203A is a PXIe digitizer/digital receiver with instantaneous bandwidths to 2 GHz and sampling rates to 3.2 GSamples/s.

The M9203A digitizer/wideband digital receiver is a compact dual-slot 3U PXIe measurement receiver (*Fig. 1*) with two channels operating at 12-b sampling rates to 3.2 GSamples/s. It provides instantaneous analog bandwidths of DC to 2 GHz. In spite of the small size, it features on-board digital processing and 4-GB of DD3 acquisition memory to capture and record the most exotic waveforms. The digital receiver leverages a Virtex-6 field programmable gate array (FPGA) from Xilinx (www.xilinx.com) for impressive digital processing power.

For those preferring the AXIe modular instrument format, the M9703B high-speed digitizer/wideband receiver also captures signals across an analog input bandwidth of DC to 2 GHz but with eight acquisition channels. It fits on a single-slot



2. Model M9537A is an embedded controller in the AXIe modular format that is equivalent to a powerful Windows 7 personal computer.

AXIe card and operates at sampling rates to 1.6 GSamples/s per channel. By interleaving two channels, sampling rates to 3.2 GSamples/s are available on as many as four channels for instantaneous bandwidths to 1.4 GHz.

The model M9537A embedded controller (*Fig. 2*) is also in the AXIe format—essentially, a “loaded” 64-b, Windows 7-running computer on a single-slot module. It is based on an i7-6820EQ 2.8-GHz quad-core microprocessor from Intel (www.intel.com) and includes a front-removable 240-GB solid-state drive and 8-GB DDR4 random-access memory (RAM). The Gen 3 PCIe link to the AXIe backplane provides as much as 16 GB/s data bandwidth. It includes four USB 3.0 ports and two USB 2.0 ports, along with a variety of other interfaces that include a GPIB and two LAN connectors.

The M9421A vector signal transceiver (VST) is a four-slot PXIe instrument (*Fig. 3*) available with bandwidths of 60 MHz to 3.8 GHz or 60 MHz to 6 GHz. It offers standard analysis bandwidth to 40 MHz with options that can extend the analysis bandwidth to 80 or 160 MHz. It is supported by software



3. Model M9421A is a vector signal transceiver (VST) in a four-slot PXIe module capable of operating to 6 GHz.

for analysis of analog demodulation formats and noise figure measurements. It also includes flexible triggering capabilities with a wide range of trigger delays, from –15 to 500 ms. Amplitude measurement accuracy is typically better than ± 0.40 dB for low-level input signals and typically better than ± 0.55 dB at all frequencies for input levels to +24 dBm.

This is just a small sample of the recently introduced AXIe and PXIe instrument modules, which also included a source-measure unit (SMU) for precise current/voltage measurements and a multiple-channel bit-error-rate tester (BERT) capable of data rates to 16 GB/s. To hold the many new PXIe modules, model M9019A is an 18-slot PXIe chassis (*Fig. 4*) with Gen 3 backplane. It provides enhanced power and bandwidth capabilities for PXIe modules, providing as much as 16 GB/s bandwidth connections to an external computer.

Last but not least, in support of high accuracy for both modular and benchtop instruments, the company recently extended its One-Stop Calibration Services to include non-Keysight test equipment. The company is now offering calibration services for over 100,000 instruments from different vendors around the world.



4. To house a large number of PXIe modules, model M9019A is an 18-slot high-speed PXIe chassis with Gen 3 backplane.

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