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High-bandwidth oscilloscope takes the prize

T&MW's readers have spoken: Agilent's 80000B oscilloscope is the 2007 Test Product of the Year.

Martin Rowe, Senior Technical Editor -- ***Test & Measurement World*****, 3/1/2007**

Covering from what is now midrange to almost the top end for bandwidth, the Agilent Technologies 80000B series of real-time oscilloscopes has been selected as the 2007 Test Product of the Year by a vote of *Test & Measurement World's* readers (www.tmworld.com/awards). The 80000B series instruments are unique in that they let you buy just enough bandwidth for your current application and then let you upgrade through software code when the need to test faster signals arises.

Eight models cover the range of 2 GHz to 13 GHz. Why so many options? “Capital budgets are tight these days,” said product manager Lon Hintze. “It takes almost an act of Congress to get approval for new test equipment. So, we wanted to give engineers the option of buying just enough scope for today's jobs without forcing them to buy a new scope next year.”

Test & Measurement World

’s readers have selected the Agilent 80000B oscilloscope as the Test Product of the Year.
Courtesy of Agilent Technologies.

The different bandwidth models are aimed primarily at different serial buses. For example, the 2-GHz model is used for FPGA development where data rates run from 500 Mbps to 1 Gbps. The 4-GHz model works for 1.25-Gbps signals. At the top end, the 12-GHz model finds use in PCI Express 2 (5 Gbps) and the 13-GHz model is used for SATA 3 (6 Gbps).

Beyond analyzing serial buses, engineers also use the 80000B scopes for aerospace, defense, and RF applications. The scopes are fast enough to directly digitize an RF carrier—no downconverter required. They can also measure laser pulses, neutrino emissions, and electrostatic discharge and electromagnetic interference.

Engineers have already taken advantage of the 80000B bandwidth upgrade since it was introduced in February 2006. “The first came about six months after introduction,” said

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Hintze.

Of course, the wider a scope's bandwidth, the wider a range of noise it can capture. “If you 2X bandwidth, you 2X noise,” said Agilent R&D project manager Mike Karin. “We needed a new approach to reduce noise.” That approach resulted in an RF package that has built-in Faraday shields around the scope's sensitive analog pre-amp and trigger circuits. Agilent engineers created “RFI chambers” to suppress external noise. A new SiGe buffer amplifier, developed for the 12-GHz and 13-GHz models, also lowers noise over those used in previous scopes.

When developing the 80000B, the design team, based in Colorado Springs, CO, leveraged knowledge from other parts of the company. The 20-Gsample/s analog-to-digital converters (ADCs) were developed at Agilent Labs, in Santa Clara, CA. The RF package design came from the company's Microwave Technology Center in Santa Rosa, CA. This package consists of two printed-circuit boards (PCBs) with solder “walls” in between. The Faraday cages are formed when these two boards are soldered together. The package mounts to the main PCB using a surface-mount technology process.

Engineers at Agilent’s Colorado Springs facility designed the 80000B oscilloscope line.
Courtesy of Agilent Technologies.

The Agilent engineers in Colorado Springs also developed a new probe tip topology that raised the bandwidth of the probe tips to 13 GHz, and they designed a new SiGe probe amplifier for the 13-GHz probes. In addition, they developed and built the thick-film substrate used to hold the probe's amplifier close to the measurement point.

What has drawn engineers to the 80000B line? Hintze points to three factors: signal integrity, because of the scope's low noise floor; probing, because of the digital signal processing (DSP) compensation that results in flat frequency response; and a wide variety of application packages including 12 compliance packages for serial buses and jitter analysis.