The Best in Test

Test Measurement World Staff - December 01, 2003

Cast your vote for Test Product of the Year

Each year, Test & Measurement World's technical editors choose products we think are particularly innovative or useful. The following pages present this year's 12 Best in Test winners as well as a collection of products worthy of honorable mention. T&MW's editors narrowed this year's field from scores of deserving products. Nominations in T&MW's 2004 Best in Test competition came from both manufacturers and users of products that were introduced between November 1, 2002, and October 31, 2003. Our editors also nominated products they had seen or written about.

Sapphire NP SOC Test System
NPTest, www.nptest.com

Based on its vendor's Npower open architecture and XTOS (eXtendable Test Operating System) software, the Sapphire NP supports SOC test from design to production. The system's Npower Isochronous Fabric Interface enables communications and synchronization between instruments. The XTOS software uses STIL, Java, and XML formats so test engineers can link to EDA tools to feed test data back into design models. While Sapphire's power and cooling units are housed in its mainframe, tester functions are integrated within instruments in the test head. A Sapphire tester is configurable from DC to multiple gigahertz.

Arendar Test Data Management Software VI Technology, www.vi-tech.com
Designed for manipulating and storing test data, the Arendar software lets you combine your test data from engineering, manufacturing, and service test stands into one structured-query-language database. You can use data from any source, store it in XML format, and export it into Excel or into National Instruments' DIAdem for plotting and analysis. In addition, Arendar includes interfaces to LabView, Visual Basic, C#, LabWindows/CVI, and TestStand, so you can integrate your data-management function into existing test applications. Arendar comes in both desktop and enterprise versions and runs over a network.

WBI-FOX X-Ray System  
Feinfocus, www.feinfocus.de

The WBI-FOX x-ray inspection system detects wafer-bump voids. Unlike optical, laser, and UV inspection techniques (which can only determine surface anomalies such as scratches, nodules, pits, and contaminants or measure volume parameters such as diameter, height, and roundness), WBI-FOX can determine true solder mass. The programmable system can serve in 200- or 300-mm wafer production. It features fully automated wafer loading and unloading and provides real-time image processing. It accommodates x-ray tubes to 160 kV. Other features include a 9-in. triple-field high-contrast and high-resolution image intensifier, a CCD camera, and a Windows-based flat-panel screen.

E2960 PCI Express Bus Analyzer  
Agilent Technologies, www.tm.agilent.com

PCI Express—a high-speed serial interconnect bus—is coming to a computer near you, and the E2960 lets you analyze PCI Express bus signals for standards compliance. The E2960 platform consists of a chassis, an I/O module, a probe card, and software. Insert the probe card into a computer's PCI Express slot, attach a PCI Express peripheral to the card, and connect the card to the protocol-analyzer chassis to monitor and analyze packets traveling over the bus. The chassis is available in two-slot and four-slot models so you can monitor from one to eight PCI Express "lanes."
9101 Handheld Spectrum Analyzer
Willtek, www.willtek.com

With a frequency range of 100 kHz to 4 GHz, the 9101 handheld spectrum analyzer serves mobile-phone and wireless-LAN applications. Typical measurements include modulator alignment and amplifier gain. The analyzer can be controlled through the front panel or via a PC, and most applications are conducted with a push of just one button. The 140° viewing angle and a color display with enhanced graphics make it easy for users to see measurement details. Limit templates let the instrument deliver pass/fail verdicts to allow technicians to quickly assess the signal quality. The 9101 includes many features offered by sophisticated lab instruments, all in a handheld package weighing less than 5 lbs, including battery.

EmiScope-II Diagnostic System
Optonics, a Credence Co., www.optonics.com

EmiScope-II handles transistor-level backside analysis of complex integrated circuits that employ either wire-bond or flip-chip packaging technologies. Featuring a new solid-immersion lens (SIL), EmiScope-II provides sub-0.25-µm image resolution to enable analysis of device performance. The system's high-speed acquisition and data-processing capabilities enable semiconductor manufacturers to quickly perform design debug, failure analysis, and characterization, improving time-to-market and lowering device development costs. EmiScope-II offers multiple lens types for manufacturers working with wire-bond technologies and standard multi-layer metal flip-chip devices (down to 65 nm), including long-working-distance (LWD) and high-resolution imaging options.

GX7100 Combination PXI Chassis
Geotest-Marvin Test Systems, www.geotestinc.com

When you need the flexibility of using both 6U- and 3U-sized PXI and CompactPCI instrument cards in one test stand, look to the GX7100. You can install up to seven 3U-sized cards and up to six 6U-sized cards. The chassis occupies a 4U-sized rack space, yet lets you build ATE, data-acquisition, or production test systems, or portable test stations. The chassis is expandable by adding a slave chassis, and its hinged door accommodates any mass-interconnect
device from which you connect test signals.

**PT100 Parallel Tester**
**Intellitech, [www.intellitech.com](http://www.intellitech.com)**

The PT100 enables the simultaneous test and configuration of an unlimited number of PCBs that comply with the IEEE 1149.1 standard. The tester balances test times with handling times to optimize throughput. A collection of self-contained parallel-tester cards connected by a flexible ribbon cable, the PT100 preserves individual access to each board under test. The cards are housed in 19-in., 3U-height rack-mountable boxes, each of which can hold 16 cards. Each card supports one IEEE 1149.1 controller and 24 reconfigurable tester channels. Each tester card also has a high-speed clock channel that supports clock rates to 500 MHz.

**NI CVS-1454 Industrial Compact Vision System**
**National Instruments, [www.ni.com](http://www.ni.com)**

The NI CVS-1454 Industrial Compact Vision System features three IEEE 1394 (Firewire) ports for connectivity to a variety of imaging sensors. To program the system, developers can employ NI Vision Builder for Automated Inspection, an interactive software environment that simplifies the task of developing inspection systems. Alternatively, they can leverage the LabView graphical development environment to create more customized vision applications. The LabView code-generation feature in Vision Builder enables developers to easily migrate between these two software environments.

**Model 3117 waveguide horn antenna**
**ETS-Lindgren, [www.ets-lindgren.com](http://www.ets-lindgren.com)**

EMC engineers have generally assumed that a horn antenna's lobe pattern remains consistent at frequencies to 18 GHz, but this isn't always true. Above 12.5 GHz, lobe patterns often split and leave gaps. The Model 3117 waveguide horn antenna offers the uniform field strength that other antennas lack at these frequencies, enabling you to make consistent measurements. You can use the Model 3117 for EMI emissions and immunity measurements and for e-field measurements of military and commercial microwave communications systems.

**DL7400 Series Digital Oscilloscopes**
**Yokogawa, [www.us.yokogawa.com](http://www.us.yokogawa.com)**
Some scopes give you two analog and 16 logic inputs, and some provide four analog channels, but the DL7400 Series scopes are the only ones that give you eight analog inputs plus 16 logic inputs. You can make measurements with the DL7400 that otherwise require two scopes and a logic analyzer. The analog inputs have 500-MHz bandwidth, enough for finding signals in applications such as embedded systems. You also get numerous power calculations and an automatic deskew that aligns signals properly for instantaneous measurements across channels.

PowerDNA distributed data-acquisition system United Electronic Industries, www.ueidaq.com

Place a PowerDNA I/O cube wherever you need it, connect the cube to a PowerDNA central controller (PCI or PXI) with an Ethernet link, and you have a remote data-acquisition system. You complete the system by adding analog or digital I/O modules and connecting the I/O signals. Cubes can accept either three or six of the available types of I/O cards: analog inputs, analog outputs, temperature, digital I/O, and serial ports. Each cube runs its own real-time operating system and can take control of the Ethernet link to get your data to you on time.

HONORABLE MENTIONS

Boundary Scan Probe Handheld Tool
Goepel Electronic, www.goepel.com

Designed to speed diagnostic debugging and structural verification of boundary-scan designs, the Boundary Scan Probe handheld instrument features various modes for the static and dynamic test of weak logic levels while providing simultaneous measurement feedback. LEDs indicate driven and measured levels, which are accessible via the integrated IEEE 1149.1 TAP interface.

Tiger SSPE Source-Synchronous ATE Option Teradyne Semiconductor Test Division, www.teradyne.com

The SSPE, a source-synchronous pin-electronics option for the Tiger SOC test platform, delivers comprehensive functional at-speed production test for parallel differential buses such as HyperTransport and Rapid I/O. SSPE maximizes quality, yield, and overall economics for manufacturers and designers requiring high fault coverage. With SSPE, data is latched with its "same-cycle" associated device clock, reducing jitter and widening the measured data eye to
increase yield.

**PETracer ML PCI Express Protocol Analyzer** Computer Access Technology, [www.catc.com](http://www.catc.com)

Get those PCI Express designs off the ground with the PETracer, a protocol analyzer that lets you capture and analyze packets in both bus directions. Insert the PETracer's interposer card and midbus probe into a PCI Express motherboard and get access to the serial bus signals. The analyzer's software decodes transaction layer packets, data-link layer packets, and PCI Express primitives. One PETracer lets you perform bidirectional decodes on one, two, or four bus "lanes" or on one eight-lane unidirectional decode. For an eight-lane bidirectional decode, you need two PETracers.

**N4901A Serial BERT** Agilent Technologies, [www.tm.agilent.com](http://www.tm.agilent.com)

The N4901A bit-error-rate tester makes measurements at data rates to 13.5 Gbits/s. You can use the instrument to test data streams such as 10 Gigabit Ethernet, PCI Express, and Fibre Channel. The instrument generates PRBS data streams at up to 2³¹–1 bits and performs BER measurements, provides eye diagrams with mask tests, and performs jitter analysis such as random and deterministic jitter extraction. It also performs clock-data recovery, eliminating the need for a separate instrument.

**S600DC/RF Series Parametric Testers** Keithley Instruments, [www.keithley.com](http://www.keithley.com)

The S600DC/RF Series parametric testers measure critical device parameters during product and process development and in production. The systems' 40-GHz capabilities provide for accurate, automated, wafer-level S-parameter measurements. The RF capability combines with the system's 10-fA measurement capability and 300-mm automation to provide parametric tests at 65-nm technology nodes and beyond.

**Automated Wireless Voice Quality Test System** GL Communications, [www.gl.com](http://www.gl.com)

Unless your wireless phone provides good voice quality, nobody will buy it. GL's wireless voice-quality tester uses the most popular testing algorithms (PSQ, PSQM, PSQM+, and PAM5) to help you evaluate voice quality in your wireless products. With this tester, you remove the subjective nature of voice-quality testing. You perform voice-quality tests with two laptop PCs; both PCs connect to wireless phones so you can test the voice quality in both directions over a wireless network. Each PC sends and receives reference voices, analyzes them, and reports the results.

**TopCAT Boundary-Scan Tool** Asset InterTech, [www.asset-intertech.com](http://www.asset-intertech.com)

TopCAT (Topology and Cluster Analysis Technology) for the ScanWorks boundary-scan environment speeds automatic test generation. It analyzes a PCB schematic to identify the nonscan devices that are candidates for boundary-scan cluster tests. Benchmark tests on a board with almost 9000 nets, more than 40,000 solder joints, and approximately 6000 components (including more than 60 memory clusters and more than 40 logic clusters) showed that boundary-scan test development time could shrink to less than a day.

**90IP Instrumentation Platform** Frequency Devices, [www.freqdev.com](http://www.freqdev.com)

When you need signal conditioning, look to the 90IP, a four-slot chassis that holds programmable filter and amplifier cards. With the 90PF two-channel filter card, you can remove unwanted signals prior to digitizing them while adding less than –100 dB of distortion from 0.1 Hz to 300 kHz. The two-channel 90PGA amplifier card provides up to 60 dB of gain with a 1-MHz bandwidth. The 90IP
chassis can operate as a stand-alone instrument or under PC control through its GPIB and RS-232 ports.


The R&S SMU200A vector signal generator employs a two-path design that combines two digitally modulated signal generators, offering outputs up to 6 GHz and 3 GHz, respectively. Consequently, a single SMU200A can serve applications that traditionally required two signal generators. The instrument features a fully digital I/Q baseband section; the I/Q modulator has a 200-MHz bandwidth.

T2000 Series SOC Test System **Advantest America**, [www.advantest.com](http://www.advantest.com)

The industry's first ATE system based on the Semiconductor Test Consortium's Openstar platform, the T2000 is designed to test SOC and other complex devices embedded in computer, communications, and consumer-electronics products. The T2000 uses a Windows 2000-based operating system, and users can employ either C++ or the Openstar Test Programming Language (OTPL) for their test programs. The first system in the series includes 250-MHz digital modules.

IxVPN Performance Validation Test Suite **Ixia**, [www.ixiacom.com](http://www.ixiacom.com)

Using Ixia's Gigabit Ethernet load modules, the IxVPN performance validation test suite generates and analyzes traffic on virtual private networks. You can test secure gateways by setting up tens of thousands of VPN "tunnels" and simulating traffic over protocol layers 4 through 7. Thus, you can verify the performance of gateways using complete top-to-bottom protocol-layer traffic. The test suite can validate tunnel capacity, tunnel setup rate, and tunnel attempt failures through real-time statistics and test logs. You can create custom tests by writing Tcl scripts.

Morphis Frame Grabber **Matrox Imaging**, [www.matroximaging.com](http://www.matroximaging.com)

The Matrox Morphis includes a hardware accelerator for JPEG2000 (the emerging standard for wavelet-based compression/decompression), making it suitable for applications with extensive archiving requirements. It combines ultra-fast channel switching among as many as 16 cameras. The Morphis captures from NTSC, PAL, RS-170, and CCIR video sources, and it supports simultaneous acquisition of two live video streams.

Sigma Series Oscilloscopes **LDS/Nicolet**, [www.niti.com](http://www.niti.com)

Consisting of the 12-bit Sigma 30, the 8-bit Sigma 60, and the mixed-mode Sigma 90, the Sigma Series of scopes gives you four or eight analog channels in a Windows-based scope. You can perform data analysis right on the scope with Windows-based software such as Excel or Matlab. You can also combine two single-ended channels into a differential channel, thus eliminating ground loops and the need for a separate differential amplifier. A 10.4-in. touch-screen display gives you access to all scope functions while providing easy-to-view signals.


The DuraPlus fine-pitch epoxy probe card can reduce cost of ownership while increasing bond yields. Designed to meet the needs of short product cycles, DuraPlus cards are available with pad-pitch capability to 35 µm (inline), 25x50 µm (2- or 3-row staggered), and 30x60 µm (4-row staggered). When combined with a nondestructive cleaning process, the DuraPlus helps reduce bond-pad damage, improve signal integrity, decrease cleaning cycles, and increase card life.
3000 Series PXI Test Suite for Wireless Test **Aeroflex**, [www.aeroflex.com](http://www.aeroflex.com)

The 3000 Series brings RF measurements to PXI. The modular test suite includes RF PXI modules that let you test wireless base station transmitters and receivers as well as handsets. The series consists of a 3-GHz RF synthesizer, a 2.5-GHz RF signal generator, a 3-GHz RF digitizer, and 2.5-GHz RF combiner. Software support includes libraries for testing base-station transmitters and receivers and mobile amplifiers, and for performing spectral analysis. The libraries let you develop custom test applications in any Windows-based programming language.

**ThermaCAM E4 Infrared Camera** **FLIR Systems**, [www.flirthermography.com](http://www.flirthermography.com)

The Model E4 supports a thermographic JPEG file format that allows comprehensive post-processing of images on the camera or on a PC. It includes three independently movable target spots—configurable in real-time or during post-processing. Ambient temperature compensation ensures ±2°C or ±2% accuracy from -20°C to +900°C under varying ambient temperature conditions; the 60-Hz scan speed allows true real-time video and minimizes target blur with relative motion of target vs. camera.


Housed in a PXI chassis, NI's 100-Msamples/s test platform can give you an arbitrary waveform generator, a digitizer, a digital I/O source, a switching module, and a timing and synchronization module. A synchronization and memory core, built into each module, provides synchronous measurements through shared clocks and triggers. Thus, you can synchronize measurements to stimulus signals, or you can program a fixed time between stimuli and measurements. You can use the platform in a wide variety of applications, including embedded systems, wireless products, and automotive electronics.

**TDS7000B Series Digital Oscilloscopes** **Tektronix**, [www.tektronix.com](http://www.tektronix.com)

With its 7-GHz analog bandwidth and 43-ps risetime, the top end of the TDS7000B Series captures and analyzes data streams running at 4.25 Gbits/s. That bandwidth preserves a signal's quality so the scope can perform measurements such as jitter analysis and power analysis. With a maximum 20-Gsamples/s digitizing rate, the TDS7704B scope can also capture real-time transient signals such as electrostatic discharge (ESD). The scope's open Windows operating system lets you load and run your own data-analysis software.

**Automatiq Test System** **Automatiq Measurement Systems**, [www.automatiqsystems.com](http://www.automatiqsystems.com)

The Automatiq system is a PC-based functional test system with an integrated suite of hardware and software tools that enable users to quickly capture test designs, build test fixtures, write test programs, and automatically run functional tests. The Automatiq Test System can replace one-of-a-kind, custom-built, rack-and-stack testers with an affordable desktop platform (from $8995, including software and test fixture kits).


The Dash 2EZ data recorder does more than just display waveforms. It contains programmable low-pass, high-pass, notch, and rms filters that let you isolate specific signal characteristics. CompactFlash memory cards store data and move those data to a PC for analysis. The AstroView X software lets you run FFTs on your data, or you can export your data into several formats. Each isolated analog channel can digitize at speeds up to 10 ksamples/s. An isolated DC-input module lets you connect most sensors, strain gages, and transducers.
SigmaSure 3.0 Software **SigmaQuest, www.sigmaquest.net**

SigmaSure is a suite of Web-architected software applications for the comprehensive real-time capture, aggregation, and analysis of test and process data across globally dispersed organizations throughout a product lifecycle. It employs its vendor's "any data, any tester, anywhere" technology, which supports data gathering from any location regardless of existing hardware and software.

**eM-Repair Data Collection and Analysis Software Tecnomatix Unicam, www.tecnomatix.com**

Designed to turn inspection and test data into intelligent repair and analysis information, eM-Repair is a shop-floor data collection and analysis software tool that empowers electronics manufacturers to improve yields and reduce defects in real time. It provides an advanced visual method for collecting circuit-board assembly data, replacing traditional data-collection methods that relied on written notes or manual keyboard entry.

**TeraRouting Tester 3.0 Spirent Communications, www.spirentcom.com**

Running on Spirent's SmartBits data generator/analyzer, the TeraRouting 3.0 application turns the SmartBits unit into a functional and performance tester for terabit routers. The SmartBits tester simulates other routers in a network. Thus, it performs router tests under extreme conditions and produces real-time and final test reports. Using Excel, you can track the router's performance throughout a test, then produce reports such as a frame-rate graph following a test. Because router testing requires protocols, the software adds protocols such as multiprotocol label switching (MPLS) and virtual private network (VPN).

**SafeTest Protection Technologies Teradyne Assembly Test Division, www.teradyne.com**

SafeTest protection technologies enable Teradyne's TestStation in-circuit test system to perform safe, reliable test of today's new low-voltage devices, whose smaller sizes and lower maximum voltage thresholds make them vulnerable to over-voltage and over-current during powered-up testing. SafeTest addresses this vulnerability by providing real-time back-drive current measurement and by giving users the ability to set programmable limits for back-drive current level and duration.

**Fusion HFi SOC Test System LTX, www.ltx.com**

Fusion HFi leverages LTX's patented scalable, single-platform Fusion architecture, enabling compatibility with current Fusion Systems' hardware, software, and load boards. Fusion HFi offers 2.5-Gbits/s digital channels on a standard pin. Custom IC development reduces component count by 85%, while new packaging and a modular thermal-management system lowers board and interconnect count by more than 50%.

**Handyscope-HS3 Multifunctional Measuring Instrument TiePie Engineering, www.tiepie.nl**

"Handyscope" is an appropriate name for this instrument, a digitizer with software that can operate as a two-channel DMM, scope, spectrum analyzer, or transient recorder. The Handyscope can store up to 128 ksamples of data. Its function-generator output lets you produce test waveforms such as sines, triangles, and squares. The Handyscope connects to a PC though a USB 2.0 port and requires no external power supply. The Handyscope is available in five models with sampling rates from 5 Msamples/s to 100 Msamples/s, all with 12-bit resolution.

**GPS7500 Noise and Interference Generator Noise Com, www.noisecom.com**

The first single instrument to provide simultaneous jamming on L1 and L2 or L5 frequencies, the
GPS7500 provides a 164.5-dB on/off ratio based on Noise Com's digital-noise, arbitrary-waveform, and proprietary-switching technology. The GPS7500 can generate low-phase-noise, high-power out-of-band interference without obscuring signals in the GPS band, thereby isolating the test of the GPS receiver from undesirable phase-noise effects.

**DAQStreaming Data Recorder** [ADLINK Technology, www.adlinktech.com](http://www.adlinktech.com)

DAQStreaming is a high-speed data recorder that can stream data to its 36.7-Gbyte hard disk at a sustained rate of 40 Mbytes/s. It accomplishes this feat using industry-standard SCSI devices rather than proprietary methods. The recorder comes in analog and digital models. The DAQStreaming-A1 records analog signals at 20 Msamples/s (one channel), 10 Msamples/s (two channels), and 5 Msamples/s (four channels). The digital model, DAQStreaming-D1, can record 16 logic channels at 20 Msamples/s or 32 channels at 10 Msamples/s.

**SmarTest PG CTL Browser** [Agilent Technologies, www.agilent.com](http://www.agilent.com)

The SmarTest Program Generator CTL Browser is the industry's first tool to employ the proposed Core Test Language (CTL) standard (IEEE P1450.6) to automatically generate ATE test programs. This software tool links emerging EDA tools for core-based design to the Agilent 93000 SOC Series platform. CTL Browser provides an intuitive user interface and powerful CTL parser to streamline and automate test program creation for multi-core SOCs.

**Model 4530 RF Power Meter** [Boonton, www.boonton.com](http://www.boonton.com)

The Model 4530 RF power meter includes operating modes that save power readings into a memory buffer to facilitate high-speed production test of, for example, the power-control capabilities of cellular handsets. With traditional power meters, this test is performed by incrementing the transmitter power, taking a filtered measurement, and then querying the power meter to return the data to the host. In contrast, the 4530 can capture time-varying RF power at 20-MHz bandwidths in pseudo real time.

**MP1590A Network Performance Tester** [Anritsu, www.us.anritsu.com](http://www.us.anritsu.com)

With the MP1590A, you can get a grip on optical network performance at bit rates from 1.5 Mbits/s to 10.7 Gbits/s. A Poisson random-error insertion and a variable optical output power function let you make forward-error correction measurements on optical transmission equipment. The instrument also stresses optical networks by adding controlled jitter to a data stream. The instrument's 10.7-Gbits/s top speed lets you make ITU-T jitter measurements at the full 10-Gbits/s Ethernet physical data rate. An external trigger output lets an oscilloscope trigger on errors so you can view eye diagrams.

**FastScan ATPG Tool** [Mentor Graphics, www.mentor.com](http://www.mentor.com)

The new version of FastScan cuts test-pattern-generation time from weeks to days and, in some cases, from days to hours. New at-speed test capabilities improve defect detection for nanometer designs, while enhanced compression capabilities reduce the amount of test data required for these additional tests. FastScan also allows users to employ a DUT's internal PLL clocks, enabling accurate tests even at speeds in excess of the tester's operating frequency.