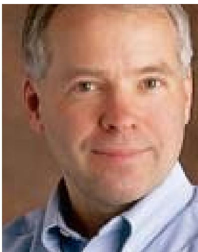

BY RICK NELSON, EDITOR-IN-CHIEF

External instruments here to stay

I recently commented on embedded instruments, noting that software that inserts testability structures into designs and that helps analyze test results to improve yield will become increasingly important as traditional instruments lose access to circuit nodes buried within deep-submicron ICs, multichip packages, and BGA-populated PCBs (printed-circuit boards). (See "Embedded instruments," *Test & Measurement World*, December 2007/January 2008, pg 7 www.tmworld.com/article/CA6514353).

Then, *EDN* Executive Editor Ron Wilson addressed the topic from a chip-centric point of view (see "As SOCs grow, test-and-measurement instruments move on-chip," *EDN*, Feb 21, 2008, pg 31, www.edn.com/article/CA6531583). In addition to citing lack of test-probe access, he notes that "As critical circuits reach gigahertz frequencies, it becomes physically impossible to get an accurate representation of signals off the die, even if you can probe the circuit." Nevertheless, he continues, manufacturing engineers must be able to develop low-cost test strategies, and designers must be able to create autocalibration routines that can compensate critical circuits for process, voltage, temperature, impedance, and noise variations while the chip is in use." He adds that "The only apparent option is to move the test-and-measurement instruments … onto the chip itself."

Companies pursuing embedded-instrument strategies include DAFCA, Cisco, ARM, Analog Devices, Rambus, STMicroelectronics, Vitesse, and ASE. Wilson details the technologies of several of these companies in his article. The methods by which embedded instruments communicate with the outside world, however, are just as important as the internal details of embedded-instrument technology.

Verigy's purchase of Inovys speaks to the importance of the external hardware/software combination in testing today's state-of-the-art chips.

Al Crouch, chief scientist at Inovys, now part of Verigy, addressed the migration of instruments into chips in an International Test Conference presentation last fall titled "The Need for Standard and Efficient Interconnection and Access of Embedded-Everything." In that talk, he noted that embedded instruments can serve in system-level test as well as chip-level test. A chip might work fine when you plug it into a $10,000 load board that connects to a $2 million ATE (automated-test-equipment) system, he said, but added that, when you pack it onto a 5×5-in. board with 10 other chips and connect it to a $35 power supply, it might turn out not to work so well—an issue that embedded-system-level test can address effectively.

Crouch also commented that the proliferation of embedded instruments presents its own problems involving the need to effectively communicate with them. He concluded that the IEEE P1687 internal JTAG initiative can provide an effective way for orderly, standardized embedded-instrument communication and control.

Whatever the interface standard, real external instruments and systems that gather test data and external software that performs yield-learning and other analysis tasks must supplant embedded instruments. Verigy's purchase of Inovys speaks to the importance of the external hardware/software combination in testing today's state-of-the-art chips.

Certainly, chip-test equipment is migrating from multimillion-dollar "big-iron" systems to something more cost-effective. The industry and media will address the pace of this evolution throughout the year. For instance, I'll be moderating a panel on this and other topics at the Third Annual GSC (Global Semiconductor Test Consortium) Conference, convening June 4 through 6 in San Diego, in partnership with the Design Automation Conference, convening the following week in Anaheim, CA. But whatever form the evolution takes, it would be a mistake to assume that embedded instruments will make external instruments go away. EDN

Contact me at rnelson@reedbusiness.com.

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