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EDA COMPANIES TOUT RF DESIGN, LINKS TO TEST

FROM RF/MICROWAVE-CIRCUIT-DESIGN TOOLS TO ELECTROMAGNETIC SIMULATION, EDA COMPANIES WORK WITH INSTRUMENT VENDORS TO GET HIGH-PERFORMANCE, HIGH-QUALITY PRODUCTS TO MARKET.

EDA companies are introducing tools targeting RF/microwave design and simulation, often working to ensure that their software tools play well with instruments. Test-equipment makers in turn frequently cooperate with EDA providers to ensure that engineers will be able to design and characterize these new devices and systems. The efforts of these diverse companies came into focus at the IMS (International Microwave Symposium), which took place June 7 to 12 in Boston.

On the design side, IMS newcomer Synopsys Inc was on hand to preview its Galaxy Custom Designer 2009.06 release, which it introduced last month. The 2009.06 release adds new capabilities, including high-capacity, high-performance schematic-driven layout designed for large analog blocks. Ed Lechner, director of product marketing for custom design at Synopsys, says that the product builds on the Custom Designer version the company released last September to increase productivity for custom designs in an open environment as process geometries shrink to 45 nm and below.

Custom Designer offers time-saving analysis setup, run, save, and recall features; it provides hierarchical mixed text and schematic representations; and it supports cross-probe and schematic annotation with simulation results. It forms the basis of a complete implementation, physical-verification, circuit-simulation, and analysis flow, integrating with HSpice, Custom Explorer, Cadabra, IC Validator, Star-RCXT, and CustomSim.

The product works with other Synopsys tools for analysis, modeling, and extraction (**Figure 1**). Lechner describes an RF flow using Custom Designer for schematic capture, HSpice RF for circuit simulation, Custom WaveView for analysis, Custom Designer for layout, IC Validator for design-rule checking, Star-RCXT for parasitic extraction, and CustomSim for verification. (For more on this product, see “Tool

targets increased productivity in analog environment,” *EDN*, this issue, pg 10).

In addition, Synopsys offers TCAD (technology-computer-aided design) for device modeling, as well as DesignWare IP (intellectual property), which includes blocks for complete FSK (frequency-shift-keying) radios, GPS (global-positioning-system) transceivers, mobile-TV tuners, and UWB (ultra-wideband) transceivers. The company also offers the Sentaurus device-simulation tool for multidimensional analysis and the Raphael interconnect-field solver.

FLEXIBLE SIMULATION CHOICES

Also exhibiting at the IMS, CST (Computer Simulation Technology) announced several new capabilities. First, the company now offers flexible simulation acceleration options such as multi-CPU processing, GPU (graphics-processing-unit) processing, cluster computing, and distributed computing. To protect customer investments and to facilitate the choice of the most effective acceleration approach for a given simulation model, CST has introduced a token pricing scheme that enables access to various simulation-acceleration options.

The company also presented a new CST Microwave Studio solver module for electrically large structures; the module supports engineers working on applications such as antenna



AWR's Microwave Office comes with Anritsu's new VectorStar Broadband ME7828A system, which operates over the 70-kHz to 110-GHz frequency range (courtesy Anritsu).

placement and radar cross-section simulation. The new module targets a range of simulation-model sizes beyond 100 wavelengths.

“Our customers appreciate our work exploring new regimes in electrical size,” says Bernhard Wagner, PhD, managing director of sales and marketing at CST. “The introduction of our integral-equation solver in 2006 fulfilled the needs of one customer segment, but we have noticed a strong tendency toward simulating even larger structures within our design environment.” CST is responding to this demand with the introduction of the asymptotic solver, which will be available in CST Studio Suite 2010, due for release in January 2010. CST also announced that the CST Microwave Studio frequency-domain solver will feature third-order and mixed elements with the 2010 release. Version 2010 will feature third-order elements alongside the already-available first- and second-order elements.

ADDING LINKS

Illustrating design companies’ efforts to work with test vendors, EDA-software provider AWR at IMS 2009 introduced AWR Connected for R&S (Rohde & Schwarz), which integrates the capabilities of R&S WinIQSIM2 simulation software within AWR’s VSS (Visual System Simulator) system-analysis software. The integration of R&S Win-

AT A GLANCE

▣ The recent IMS (International Microwave Symposium) highlighted the efforts of diverse companies to collaborate to ensure that their products can communicate.

▣ Computer Simulation Technology’s Microwave Studio solver module targets a range of simulation-model sizes beyond 100 wavelengths.

▣ AWR introduced products that work with instruments from both Rohde & Schwarz and Anritsu.

▣ Agilent is focusing on synchronization of LXI (LAN extensions for instrumentation) and new paradigms in data visualization and analysis.

▣ Tektronix and Mesuro teamed up to demonstrate open-loop, active-harmonic, load-pull-system measurements.

IQSIM2 gives VSS access to the range of digitally modulated signals, including those for 3GPP (Third Generation Partnership Project) LTE (long-term evolution), 3GPP FDD (frequency-division duplex)/HSPA (high-speed packet access)/HSPA+, and WiMax (worldwide interoperability for microwave access), which R&S WinIQSIM2 generates, thereby ensuring that engineers simulate their designs with the same signal as a device will encounter in service.

For cross-domain simulations, you can integrate hardware components into any simulation. The signals that an R&S instrument generates return to VSS so that designers can optimize the device under test in VSS to meet the performance goals of wireless-network standards. The cross-domain simulation works with R&S vector-signal generators, such as the SMU200A, which offers RF and baseband capabilities and supports MIMO (multiple-input/multiple-output) measurements.

The R&S liaison isn’t AWR’s first collaboration with an instrument maker. In January, AWR announced AWR Connected for Anritsu, which makes AWR’s Microwave Office high-frequency-design software a standard component of Anritsu’s VectorStar MS4640A vector-network analyzer. The VectorStar MS4640A system physically integrates a suite of design tools within its firm-

ware. Microwave Office also comes with Anritsu’s new VectorStar Broadband ME7828A system, which operates over the 70-kHz to 110-GHz frequency range. “Integration of Microwave Office software as a standard feature in the VectorStar MS4640A complements this unique instrument’s performance and brings an innovative paradigm to the world of microwave simulation and measurement,” says Sherry Hess, vice president of marketing at AWR.

Instruments and design tools have for some time been communicating with each other. In 2003, for example, AWR announced that its TestWave software would link Microwave Office and VSS with instruments having RS-232, IEEE-488, or LAN interfaces (Reference 1). About the same time, Agilent Technologies introduced its Connected Solutions platform, which allows the sharing of algorithms and data between Agilent instruments and its ADS (Advanced Design System) EDA tool.

NONLINEAR BEHAVIOR

At this year’s IMS, Agilent highlighted the ability of its instruments and its EDA software to tackle the modeling,



Figure 2 Darlene JS Solomon of Agilent Labs says that efficiency requirements are driving designers to operate active components in nonlinear regions, making S-parameter measurements insufficient for adequately characterizing devices (courtesy Agilent Technologies).

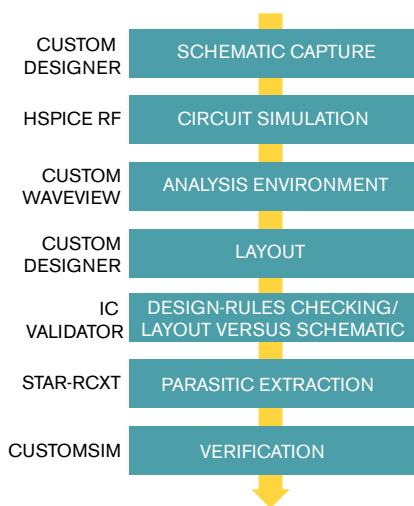


Figure 1 Galaxy Custom Designer works with other Synopsys tools to implement a complete RF-design flow that includes analysis, modeling, and extraction.



Figure 3 In conjunction with Maury Microwave, Agilent at IMS 2009 demonstrated the measurement and simulation of nonlinear component behavior, using an Agilent PNA-X nonlinear-vector-network analyzer and Maury Microwave tuners and software (courtesy Agilent Technologies).



Figure 4 Tektronix teamed up with Mesuro at IMS 2009 to demonstrate open-loop, active-harmonic, load-pull-system measurements using the Tektronix arbitrary-waveform generator and sampling oscilloscope plus the Mesuro MB 20 system.

design, simulation, and test of components exhibiting nonlinear behavior. According to Darlene JS Solomon, chief technology officer and vice president of Agilent Labs, efficiency requirements are driving designers to operate active components in nonlinear regions (**Figure 2**). These requirements make S-parameter measurements, which have been the fundamental microwave-measurement approach over the past 40 years, insufficient for adequately characterizing devices. Further, says Solomon, parameters such as the TOI (third-order intercept) and the 1-dB compression point only roughly describe nonlinear behavior. She calls X parameters, a superset of S parameters, a breakthrough approach for measuring large and small signals and outlines how Agilent's nonlinear vector-network analyzers and EDA software support X-parameter techniques.

Solomon notes that Agilent has been serving the RF/microwave industry for more than 60 years, having introduced a signal generator in 1943. In addition to X parameters and nonlinear measurements, two other areas of interest at Agilent are synchronization of LXI (LAN extensions for instrumentation) and new paradigms in data visualization and analysis.

"Increasingly, complex measurement and control problems require coordinated, integrated data acquisition and signal generation," she says. Designers can accomplish these tasks using the time-synchronization features in the LXI stan-

dard. Solomon cites LXI applications ranging from flight-test instrumentation to cellular-backhaul measurements. Regarding data visualization and analysis, she says, "Until recently, test-and-measurement systems have focused on getting the best data. Now, [customers] must be able to effectively use complex data sets to make decisions as quickly as possible."

On the show floor, Agilent was one of many companies exhibiting test equipment (**Reference 2**). Among the demonstrations at Agilent's booth was, in conjunction with Maury Microwave, a nonlinear arbitrary-load X-parameter-measurement capability (**Figure 3**).

Tektronix and Mesuro were also focusing on nonlinear measurements. The two companies teamed up to demonstrate open-loop, active-harmonic, load-pull-system measurements using the Tektronix AWG7122B arbitrary-waveform generator and DSA8200 sampling

oscilloscope plus the Mesuro MB 20 system (**Figure 4**).

In related news, IMS exhibitor Cadence Design Systems Inc announced the week after the show that Kaben Wireless Silicon had achieved performance boosts while running top-level simulations using the Cadence Virtuoso Accelerated Parallel Simulator (**Reference 3**). Kaben, a provider of RFIC semiconductor IP for wireless communication, credited the Virtuoso Accelerated Parallel Simulator with enabling engineers to find and resolve design issues that they believe they would have otherwise missed.**EDN**

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