EDA Tool Options for Advanced High Speed and Wireless Design

This month's tutorial provides a review of EDA tools available for the design, simulation and analysis of advanced engineering projects

Last month's tutorial reviewed software options for high speed design. While that article provided a broad look at EDA tool opt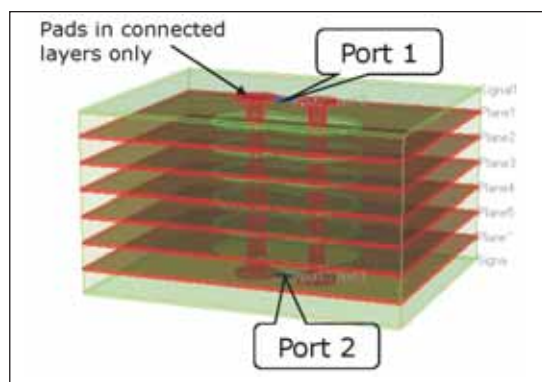ions, this month's article looks at recently announced tools and enhancements that enable engineers to handle specialized, difficult or large and complex design tasks.

Simberian: High Speed Layout Synthesis

Simberian Inc. (www.simberian.com) offers Simbeor, a 3D electromagnetic software package targeted primarily for the analysis of high speed circuits, in combination with popular printed circuit board design tools.

The newest release of Simbeor provides the ability to synthesize minimal-reflection transmission line elements and via-hole geometries. Unlike the typical—and very time-consuming—method of inputting a standard layout and allowing the EM analysis tool to perform optimization, Simberian has developed appropriate design equations that include such considerations as intermediate metal layers and other physical structures that affect broadband performance. Users' can simply input the desired parameters to obtain a high performance structure for this key portion of the circuit layout.

The latest version also includes a synthesis wizard for either single or differential lines in a signal or plane layer of a PCB stackup. New Debye and complex multi-pole models for dielectrics provide improved accuracy. The software can also do fast linear analysis of a signal channel, using a combination of its

Simbeor 2008 from Simberian can synthesize low loss, minimal-reflection via hole geometries for high speed (tens of GHz) layouts.

internally-generated 3D full-wave models of lines, discontinuities and via holes, plus imported Touchstone models. The company offers a limited-capability free version for evaluation by prospective customers.

AWR: Filter Synthesis Technology

AWR® (www.awrcorp.com) has recently announced that its Microwave Office high-frequency design suite fully exploits high performance filter design synthesis capabilities recently released from its partner Nuhertz Technologies®, whose filter synthesis and analysis software, Nuhertz Filter, can be seamlessly integrated within Microwave Office software. The new technique, called "delay equalization with off-axis quadruplet and real zeros" reduces from hours to seconds the computation time required to obtain flat group delay response in quadruplet zeros delay equalized lumped element filters.

Obtaining flat group delay response to

ensure that all frequencies arrive at the same time within a filter's passband is a critical aspect of good filter design and is essential in order to obtain distortion-free performance. Controlling group delay efficiently has been a major challenge for industry and academia for decades, and many advancements and algorithms have been developed to more efficiently control group delay in band-pass filters by cross-coupling resonators.

Agilent: Prototype PC Board Collaboration

Agilent Technologies (www.agilent.com) and T-Tech (www.t-tech.com) have announced a joint agreement to offer a solution for fast RF printed circuit board (PCB) design, verification and fabrication. The collaboration combines Agilent's Genesys RF and microwave circuit design and verification software with T-Tech's Quick Circuit System for PCB prototyping. The combination is expected to represent the industry's first complete PCB design, verification and prototyping solution.

Agilent's Genesys is an integrated EDA software platform for RF and microwave designers and workgroups. From initial system architecture through final documentation, Genesys provides state-of-the-art performance in a single, easy-to-use design environment that is fast, powerful and accurate.
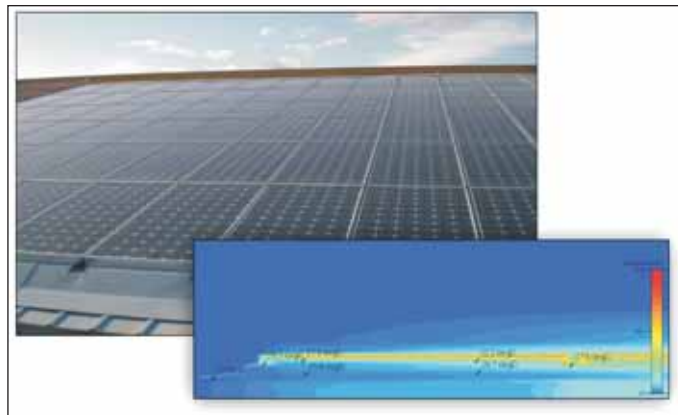
T-Tech's Quick Circuit System is a rapid-prototyping solution used in the fabrication phase of circuit board prototypes. By bringing prototyping methods in-house, it enables engineering teams to save both time and money. The Quick Circuit can drill, mill and route traces and spaces as fine as 0.100 mm/.004 inches, making it ideal for producing analog, digital or RF/microwave prototypes.

Flomerics: Thermal Analysis

The importance of the operating environment—micro and macro scale—has become increasingly important for all wireless, microwave, high speed digital and optical equipment. The highest performance systems require attention to all aspects of their operation. Flomerics (www.flomerics.com) offers thermal and fluid flow design tools to aid in these analyses.

For example, Schueco, a leading producer of photovoltaic panels, recently used Flomerics' Flovent computational fluid dynamics (CFD) software to redesign its products to improve their thermal performance so that 15% to 20% more panels can be used in a given space (see photo). Photovoltaic panels present a major thermal design challenge since every degree Centigrade of temperature rise reduces the power produced by 0.5%. "The CFD results helped us understand exactly how the panels were being heated and guided us as we made major improvements to the design," said Hamid Batoul, Technical Director of Solar Department, Schueco International, Paris, France.

Batoul uses Flovent to model complete solar systems.

Thermal and fluid flow (airflow) analysis allowed one company to identify and implement design changes to increase the efficiency of solar panel installations.

Flovent simulates the absorption and reflection of solar energy by the panels, the transfer of heat to aluminum profiles and the surrounding air, etc. In particular, examining the flow of air under the photovoltaic panels showed that the size of the passageway was constricting the flow of air. Increasing the depth of the profile that supports the photovoltaic panels and re-running the simulation demonstrated that the increased airflow reduced the temperature of the photovoltaic panels.

CST: Parallel Computation for Large Problems

Computer Simulation Technology (www.cst.com) offers a major performance enhancement for the CST MICROWAVE STUDIO® time domain solver. A parallelization based on the Message Passing Interface (MPI) has been implemented in version 2009 which enables users to solve extremely large problems by employing computer clusters, thus extending the boundaries of 3D EM simulation.

Design engineers involved in the simulation of very complex and detail rich structures, such as multilayered PCB boards or electrically large structures, will benefit most from CST's latest development. By decomposing the calculation domain into several parts and distributing these parts to computers in a cluster, the simulation of models with many hundreds of millions of mesh nodes becomes feasible. CST is working to ensure that the latest hardware developments are available to its customer base at all required levels: for workstations, through its collaboration with Intel®, and GPU hardware acceleration is offered through the partnership with Acceleware. Memory limitations on GPU accelerator cards make cluster computing of particular interest when model sizes exceed 96 million mesh nodes. The CST MWS MPI based parallelization runs on homogenous Windows or Linux clusters.