

SCANFAX

October 2004

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— Chicago Section —

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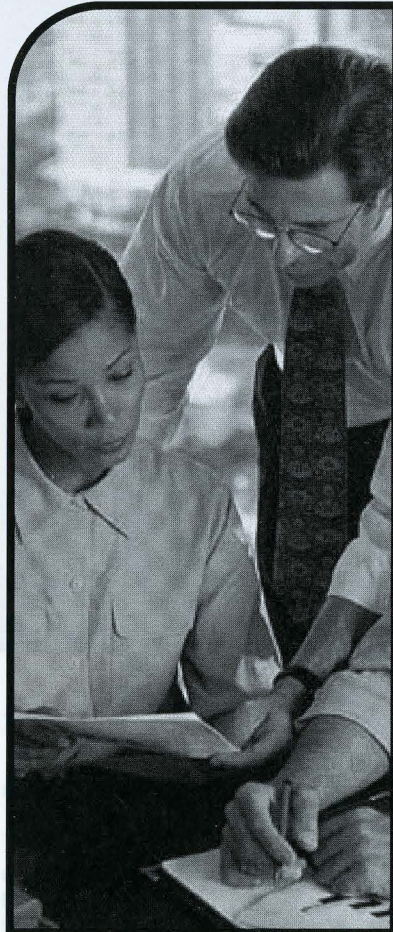
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Chicago Section Executive Committee Meeting
Tuesday, October 12, 2004, 7:00 p.m.
DeVry DuPage, Room TBA, 1221 N. Swift Rd., Addison, IL
No Registration Needed

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Tough form of silicon will take computers where they have never gone before

By Paul Zukowski

Sometimes material science will throw a curve, like a substance that can work as a brake pad for Air Force jets and also make radiation-resistant semiconductor circuits. Such a material is silicon carbide (SiC), which is nearly as hard as diamonds and resists heat so well that it is used to protect the space shuttles on re-entry to the atmosphere. It also is a semiconductor like silicon. But unlike silicon, silicon carbide does not become less reliable and less efficient when exposed to high temperatures or radiation.

The electrical properties of silicon carbide are the most interesting to IEEE members, of course, but the same properties that make it extremely durable are also advantageous in many computer chip applications where regular silicon is too delicate. Silicon carbide bubbled up in the national news over the summer thanks to an article in the influential journal, *Nature*. The article examined why silicon carbide is a highly desirable material for high-power electronic devices, and how the problem of producing large, pure wafers of the carbide could be solved.

In the article, Japanese researchers at Toyota Central R&D Laboratories Inc. explained how they discovered how to build silicon carbide wafers with a

multiple-step process where the crystal is grown in several stages. As a result, the nanoscale defects that had limited silicon carbide crystals from being good semiconductors before are minimized.

The Toyota researchers reported building near-perfect wafers up to 3 inches in diameter. Since the semiconductor industry today uses silicon wafers of up to 12 inches in diameter, silicon carbide wafers would need much refinement to catch up in size. But in some applications where durability is more important, applications could begin in the near future.

Computing devices built with the rugged silicon carbide would not require cooling and other protections that add size, weight and cost to traditional silicon electronics in power systems, jet engines, rockets, wireless transmitters and other equipment exposed to harsh environments.

And because the new technique developed by the Toyota researchers produces a silicon carbide with fewer flaws than ever before, more reliable and more complex electronics can be built with it. This opens up possibilities for commercial adoption of the material that had frustrated electrical engineers for decades.

Silicon carbide doesn't become liquid under high heat, so it can't sustain the same process as regular silicon to be formed into crystalline ingots that are sliced into nearly flaw-free wafers. Instead, silicon carbide crystals were formed by the condensing a supersaturated vapor. This process was developed in the 1970s and was prone to leaving many tiny structural defects in the resultant crystals, rendering them unfit for use in complex applications like microprocessors or memory chips.

The new process being used to manufacture defect-free SiC single crystals is called 'repeated a-face growth.' It enables the gas-phase growth of single SiC crystals of centimeter dimensions, with very low dislocation density. The process may be also adapted for crystals of other difficult semiconductors such as gallium nitride.

This defect in the production of silicon carbide-based electronics meant that they are mainly used as simple diodes in niche products such as power systems.

Yet the search went on for a way to use rugged silicon carbide in computer circuits

because of the huge handicap traditional silicon-based computers had when exposed to extreme environmental conditions such as in space or in an automobile engine compartments. They must be protected and/or cooled, and that added weight. When electronics were needed in high-temperature environments, significant cooling was required. Very often the size of the cooling systems far exceeded the size of the device.

Once integrated circuits can be made of silicon carbide, whole new areas for computing devices will open up. Silicon carbide transistors could cut in half the size, weight, and cost of components, according to SemiSouth Laboratories Inc., Miss., a leading U.S. developer of SiC electronics. The company has funding from the Missile Defense Agency to develop silicon carbide transistors.

According to SemiSouth, which is based on intellectual property from the Mississippi State University, a transistor based on SiC can produce 10 to 100 times the power of a silicon-based transistor, and transmit at up to 3 GHz and possibly as high as 10 GHz. Such a transistor would boost performance by 25-30% when measured in terms of voltage gain, power gain, and power loss in switching.

Another application based on silicon carbide's heat resistance would be to make power supplies on a chip, greatly reducing their size and cost.

In other developments, researchers at SiCLAB, the silicon carbide lab of Rutgers University in New Jersey, have demonstrat-

ed 1.79kV 6.6A silicon carbide merged-PiN-Schottky (MPS) diodes. MPS diodes are claimed to combine the advantages of SiC PiN diodes, which have low reverse leakage and high forward voltage, with those of SiC Schottky barrier diodes which are leaky, but have lower on-state losses.

The lab is supported by United Silicon Carbide, also of New Jersey, and has reported many SiC devices including bipolar transistors and power Fets, according to Electronic Weekly.

Finally, Cree has added four silicon carbide Schottky diodes to its power device product line: a 300V diode, in 10A and 20A versions; and a 1,200V device, also in 10 and 20A versions. All are offered in industry standard TO-220 and TO-247 packages. Target applications for the 300V devices are output rectifiers and power factor correction in power supplies.

Meanwhile, silicon carbide is also being tested in the braking system of U.S. Air Force's F-16 fighter planes. SiC does not absorb the heat from the friction caused during braking, it dissipates it into the surrounding air.

Because of all the useful electronic, thermophysical and mechanical properties of silicon carbide, it can operate in high-temperature and high-power applications not open to silicon. Now that progress is being reported in the manufacturing of defect-free SiC wafers, the balance could soon tip to replace silicon in next-generation electronic devices. ■

Paul Zukowski is a freelance writer in Madison, Wis., who often writes on technical topics.

EMPLOYMENT OPPORTUNITY

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Greetings from the Chairman

By Norm Phoenix

What an honor it is to be Chairman of the Chicago Section. With our membership around 6000, we are one of the largest sections in IEEE. We have a monthly news letter that equals the quality of a small magazine. Collectively, our 2 subsections and 14 chapters hold over 70 meetings a year. Our Executive Committee has volunteers involved with our concerns in areas such as professional activities, unemployment, and student programs. It is a tremendous responsibility I have stepped into.

I believe our major strength and the main benefit that we provide our members at the section level is the technical meetings.

Between our subsections, chapters, and affinity groups; there are usually four or more luncheon or evening meetings per month on a variety of topics. Our Membership Chairman, Jack Sherman, has been doing an excellent job helping new Chapters form and finding volunteers to revitalize chapters that have become stagnant. But we still have a long way to go. I feel my most important task as Chairman will be to support that effort. Some of the Chapters that most need volunteers are the Computer, DTE, Components Packaging & Manufacturing, Consumer Electronics/Signal Processing, Magnetics/Nuclear & Plasma Science, and Dielectrics & Electrical Insulation. If you are interested in any of those areas and

would like to get involved in IEEE, let us know. Help me meet my most important task.

Congratulations to ITT Technical Institute in Mt. Prospect on becoming our newest Student Branch in the Chicago Section. We now have 6 student branches in our section. See John Zulaski's article titled Building a Stronger Link Between Student Branches and the Chicago Section elsewhere in this issue.

The Chicago Section Executive Committee would like to thank Carol Davids for creating a truly outstanding website. If you have not yet seen our Chicago Section Web Page, be sure to take a look at ewh.ieee.org/r4/chicago. ■

Building a Stronger Link Between Student Branches and the Chicago Section

By John Zulaski • Student Activities Coordinator, Chicago Section of IEEE

Chicago Section support of local Student Branches.

In my role of Student Activities Coordinator for the Chicago Section, I have the duty to assist local Student Branch leadership in developing programs for their members. In the past year, the Chicago Section has provided contact information for speakers, suggestions for companies willing to give tours of their facilities, and found a mentor for one of the Student Branches. Also the Chicago Section has funded a robot competition, several university engineering project competitions and student attendance at the 110-year anniversary dinner celebration of the first Chicago Section meeting. Not a bad days work, but we can do better.

What do Student Branches need?

In my discussions with Student Branch leaders, I have determined that their

biggest problems are lining up speakers for their meetings, finding companies of interest who are willing to provide tours of their facilities and funding of various branch projects. To address these issues, a student resource page is being added to the Chicago Section web-site. (ewh.ieee.org/r4/chicago/whatsnew.htm) This web-site addition will hopefully serve as a much-needed bridge between local Student Branches, the Chicago Section membership, and the local business community.

Here is how it will work.

Student Branch leaders seeking assistance will fill out one of the templates on the web-site to provide me the background information needed to fulfill the request. The Student Activities Coordinator will respond with the names of contacts that best fit the need and the student leader

will then make the final arrangements. I suggest that you give the web-site a try to get an even better feel for the process.

Your help is needed.

In order to speed up the response time, it would be good to have a backlog of individuals and companies willing to help. If you are willing to donate your time as a speaker or know of someone who might be a good candidate, send me the background on areas of expertise and how to make contact. (www.jazulaski@prodigy.net). If your company is interested in providing facility tours, send me information as to what the students will see and who to contact to make tour arrangements. (www.jazulaski@prodigy.net) Know that you will be making a significant contribution to your Chicago Section and to the local Student Branches. ■

Lunch Meeting

Chicago Chapter of the IEEE Power Engineering Society

Improved Power Quality with Real Time Reactive Power Compensation Systems

Wednesday, October 13, 2004

Larry Guzy
Elspec North America

About the Topic:

Advances in the field of power electronics have led to the development of a new class of power factor correction equipment which uses thyristors to control current flow and correct the power factor without creating electrical voltage transients due to the switching. Unique to some products is the speed at which reactive power compensation occurs with control algorithms and microprocessors performing analysis, calculation and correction within 1/4 cycle (max 1 cyc). Switching at these speeds enables these devices to minimize flicker associated with dynamic loads such as welding or the start-up of large electric motors.

About the Speaker:

Larry Guzy is presently a Marketing and Sales Engineer with Elspec North America (ENA). A Member of the Morse Group of Companies, ENA specializes in power quality solutions featuring Elspec reactive power compensation systems. Prior to joining ENA, Mr. Guzy was a sales engi-

neer for Capstone Turbine Corporation and represented Capstone at a series of U.S. Department of Energy seminars on micro turbines in several regional U.S. markets. Earlier work in Edison's Power Quality department provided a view of electrical power quality from both the customer and utility perspectives.

Larry received a BSEE from the University of Illinois at Urbana-Champaign and a Master of Business Administration from the Lake Forest Graduate School of Business. He participates in a number of industry organizations and trade groups including the IEEE and Midwest Cogeneration Association and as a volunteer on the IEEE Emerald Book working group.

Location:

Chicago Bar Association, 321 South Plymouth Court, Chicago, IL (near the intersection of Jackson and Dearborn)

Time:

11:30 a.m. Social
12:00 p.m. Lunch (optional)
12:10 p.m. Presentation
1:00 p.m. Adjourn

Reservations:

Lunch tickets can be purchased in the lobby bookstore (\$11.00). Please call the IEEE Business Office by noon on Monday 11 October 2004 at (312) 253-4333 or (800) 898-IEEE to make your reservation.

Continuing Education

IEEE technical meetings may be acceptable as continuing education where required for maintenance of professional engineering licensure. Refer to the individual state's requirements for details.

For more information, please visit the Chicago Chapter IEEE PES web site: <http://peschicago.org>

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The ideal candidate will have a minimum of a BSEE and at least 5 years of related experience with regulatory agency approvals especially in wireless and telecom. This position requires a working knowledge of RF communications systems, analog and digital circuitry.

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Evening Meeting

IEEE Communication/Computer Society Chicago Chapters
(Joint with IEEE Fox Valley Subsection)

Emissions Measurements Using Grid Array of Near Field Probes

Wednesday, October 13, 2004

Doug McKinnon
EMSCAN

About the Topic:

Emscan technology applies a grid array of small H-field probes embedded in an 8 layer circuit board covered by a protective surface upon which the PCB to be tested is placed. The array of antennae and electronic switching achieve high-speed measurement of the current flows on populated printed circuit boards.

The user can visualize real time emission hot spots in either a spectral or spatial format and utilize the information to identify problem areas and possible solutions. This presentation will include a demonstration of the technology.

Location:

Elite Electronic Engineering, Inc
1516 Centre Circle
Downers Grove, IL 60515

Time:

6:30 p.m. Social Hour
7:00 p.m. Meeting Start

RSVP:

Steve Laya (Elite Electronic Engineering)
Phone: 630-495-9770 x119

For More Information:

IEEE EMC Society:
www.ewh.ieee.org/soc/emcs/chicago/

Evening Meeting

IEEE – IAS/IES Dinner Presentation

Tour of Underwriters Laboratories, Inc.

Wednesday, October 20, 2004

About the Topic:

UL acts as a third party, evaluating thousands of different types of products, components, materials and systems. These include electrical and electronic equipment, mechanical products, building materials, construction systems, fire protection equipment, alarm systems and chemicals to name a few. Today, UL's services extend to helping companies achieve global acceptance, whether for an electrical device, a programmable system, or an organization's quality process. The UL tour will visit the following laboratories: Communications, Electronics & Security Technologies, Hazardous Location Equipment, Power Distribution & Industrial Control Equipment, Distributed Generation, and Appliances HVAC & Components.

About the Speaker:

Tim Zgonena is a Principal Engineer at UL with over 14 years of experience in the development and application of UL certi-

fication. He is currently involved in the UL certification requirements for Distributed Generation equipment including engine generators, photovoltaic modules, wind turbines, and the inverter equipment. Tim earned his BSEET at Bradley University.

Location:

Underwriters Laboratories, Inc.
333 Pfingsten Road
Northbrook, Illinois 60062

Time:

5:00 p.m. Social Hour
5:45 p.m. Dinner
7:30 p.m. Presentation

Directions:

UL is located on Pfingsten Road between Lake Cook Road and Dundee Road. The main entrance is located just before or after the stoplight for Maria Drive (depending on which direction you are coming from). After turning into the main entrance, proceed to visitor parking for

the main building on the left. For more detailed directions please visit our website at www.iaschicago.com.

Cost:

Your cost includes the tour and buffet dinner with various selections. Cost is \$25 IEEE Member and \$30 non-member. Parking is included at no charge.

Reservations:

Please call the IEEE Business Office at (800) 898-IEEE or (312)-253-4333 with your reservation. Please note any special meal requests at the time of the reservation. You can also make your reservation online at www.iaschicago.com.

For More Information:

Visit IEEE Chicago Section IAS/IES website at www.iaschicago.com.

Note: For P.E. licenses that require continuing education for renewal, attendance at IEEE Technical Meetings is acceptable as one Professional Development Hour (PDH) per meeting.

Evening Meeting

IEEE Fox Valley Subsection, IEEE Communication Society and ITT-Rice Campus

From Sandbox to Playground: Virtual Environment and Quality of Service in the Grids

Wednesday, October 27, 2004

Kate Heahey

Argonne National Laboratory

About the Topic:

Grid computing, defined as flexible, secure, coordinated resource sharing within virtual organizations (VOs), is becoming increasingly more widespread. This mode of computing seeks to create a model in which VOs authorize the sharing of software and hardware resources in well-defined ways (for example by determining the quality of service (QoS) with which a service will be delivered) and according to potentially dynamic policies. To fulfill its promise such a model requires abstractions and protocols expressing the negotiation for the QoS associated with a service as well as support for the creation and management of environments satisfying the client's as well as the provider's protection and enforcement needs.

In this talk, I will first describe an agreement-based model of resource management in the Grid as outlined by the WS-Agreement specification of the Global Grid Forum. I will then describe how it can be applied to the creation and management of dynamic virtual environments in the Grid, and finally how such environments can be combined to form virtual playgrounds. I will discuss the issues and challenges related to implementing those abstractions in the Globus Toolkit 3 and show a quantitative and qualitative comparison across different currently existing

technologies that can be used to implement such abstractions: Unix accounts, sandboxes and virtual machines. The talk will conclude with a discussion of how the use of these new protocols and technologies can influence the development of computational Grids.

About the Speaker:

Kate Keahey is an Assistant Computer Scientist in the Distributed Systems Laboratory in the Mathematics and Computer Science Division at Argonne National Laboratory. She received a Ph.D. in Computer Science from Indiana University where she was working on extensions to the CORBA system, adapting this infrastructure to work with parallel applications. After graduating, Dr Keahey worked at the Los Alamos National Laboratory on component architectures for high-performance applications. At that time, she became a founding member of the Common Component Architecture (CCA) Forum, seeking to define a standard for high-performance component frameworks. After moving to Argonne National Laboratory in 2001, her work focused on issues related to Grid computing, in particular enforcement, resource management, and quality of service in the Grids. She is an active member of the Global Grid Forum, chairing the Grid Economic Services Architecture working group, and actively participating in the work of other working groups, primarily in the area of resource management.

Meeting Location:

ITT's Rice Campus, 201 East Loop Road, Wheaton, Illinois. Take Rt.56/Butterfield Rd. to first stoplight east of intersection of Butterfield & Naperville roads. Turn north onto East Loop Road (Philip's 66 Gas Station on the corners); the campus will be on your right about a block north of Butterfield Road. More detailed directions and a map are available at www.rice.iit.edu/directions.html

Dinner Location:

Bakers Square
270 E. Northwest Hwy. (at the corner of North Court St.), just south of the library

Time:

6:00 p.m. Networking Time
7:00 p.m. Presentation

Reservations:

Not required.

Sponsorships:

IEEE's Fox Valley Subsection, IEEE Communication Society, and Illinois Institute of Technology's Center for Professional Development (Rice Campus).

Continuing Education:

Professional Engineers: this meeting qualifies for Professional Development Hours

Information:

The Fox Valley subsection web page is at www.ieee.org/foxvalley/

**Support all of these fine businesses
that support SCANFAX.**

Please Help us Organize a New Life Member Chapter for Our Chicago Section!

Are you a Life Fellow, a Life Senior Member, a Life Member, or a Life Associate Member? Then please join our local IEEE members (ten as of August 25th, our publishing deadline for the October 2004 issue of SCANFAX) to establish a local IEEE Life Member Chapter. Our initial intent is to organize periodic daytime and/or lunchtime meetings in various locations in the greater Chicago area that you can reach conveniently. Our meetings will have some technical contents that will not bore our non-technical attendees. But another primary intent will be to stress the idea of getting together as professional

colleagues. Of course, we should invite spouses and friends to attend as welcome guests. If practical, some of our meetings may be joint with our other local Chapters, our Fox Valley Sub-Section, or with our Student Branches.

We can also serve as the Section's essential resource for our local Student Chapters: we are really needed as mentors with lots of industry experience, as well as occasional guest judges for their school-sponsored technical contests. Just look at our Chicago Section Web site (ewh.ieee.org/r4/chicago) under Recent Events in February 2004 for some recent examples - several clever

entries will remind you of some famous "Rube Goldberg Projects!"

We can also offer our members the opportunity to participate in the annual Engineers Week events that the Chicago Section has been sponsoring:

- The Engineers Week Luncheon at the Union League Club organized by the Western Society of Engineers.
- The Engineers Week talks and exhibits at IIT-West Support for our annual Future Cities Project (also usually in February).

Several of our members have been invited to become members of IEEE's college accreditation teams, an important part of the ABET activities.

If you are interested in forming such a Life Member Chapter please send me an e-mail message at j.feitler@ieee.org, or tell our local IEEE Office at 1-800-898-IEEE (1-800-898-4333). According to IEEE's Web page, we need a list of interested Life Members to start an officially recognized Chicago Chapter. Please be sure to tell me your e-mail address and your preferred telephone number so we can keep in touch with each other in a hurry. Furthermore, we plan no conventional mail campaign in order to keep within our Chicago Section's budget allocation.

Look forward to hearing from you folks very soon. Then we can get started, arrange for some initial meetings, and then elect our incoming Chapter Officers. Please note that any Life Associate Member is eligible to serve as a "non-elected" Chapter Officer (such as an appointed Committee Chair); any IEEE Member at a higher Life membership grade can become an "elected" Chapter Officer.

Sincerely yours,
Joe Feitler • j.feitler@ieee.org
Life Senior Member and
"Chapter Organzier"

Free Medical Device Review

For New Medical EMC Requirements



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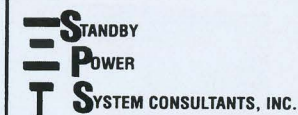
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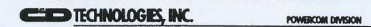
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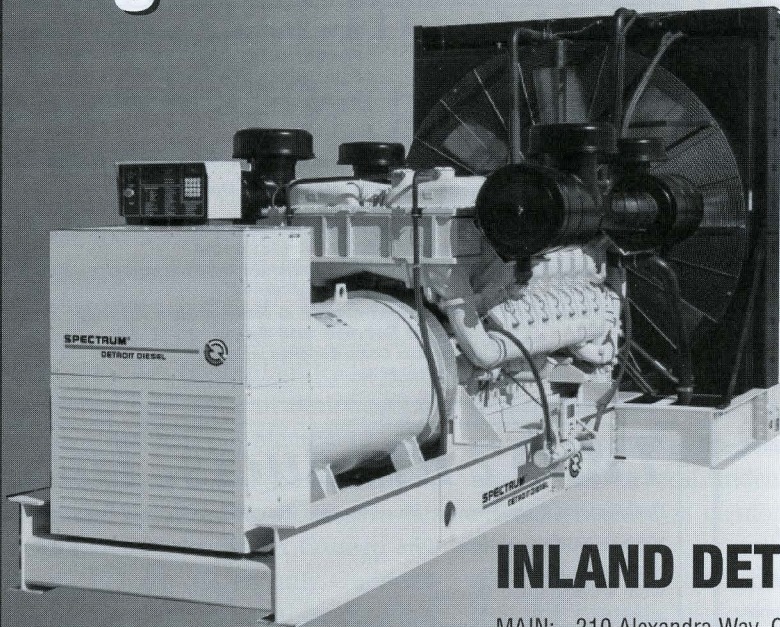
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