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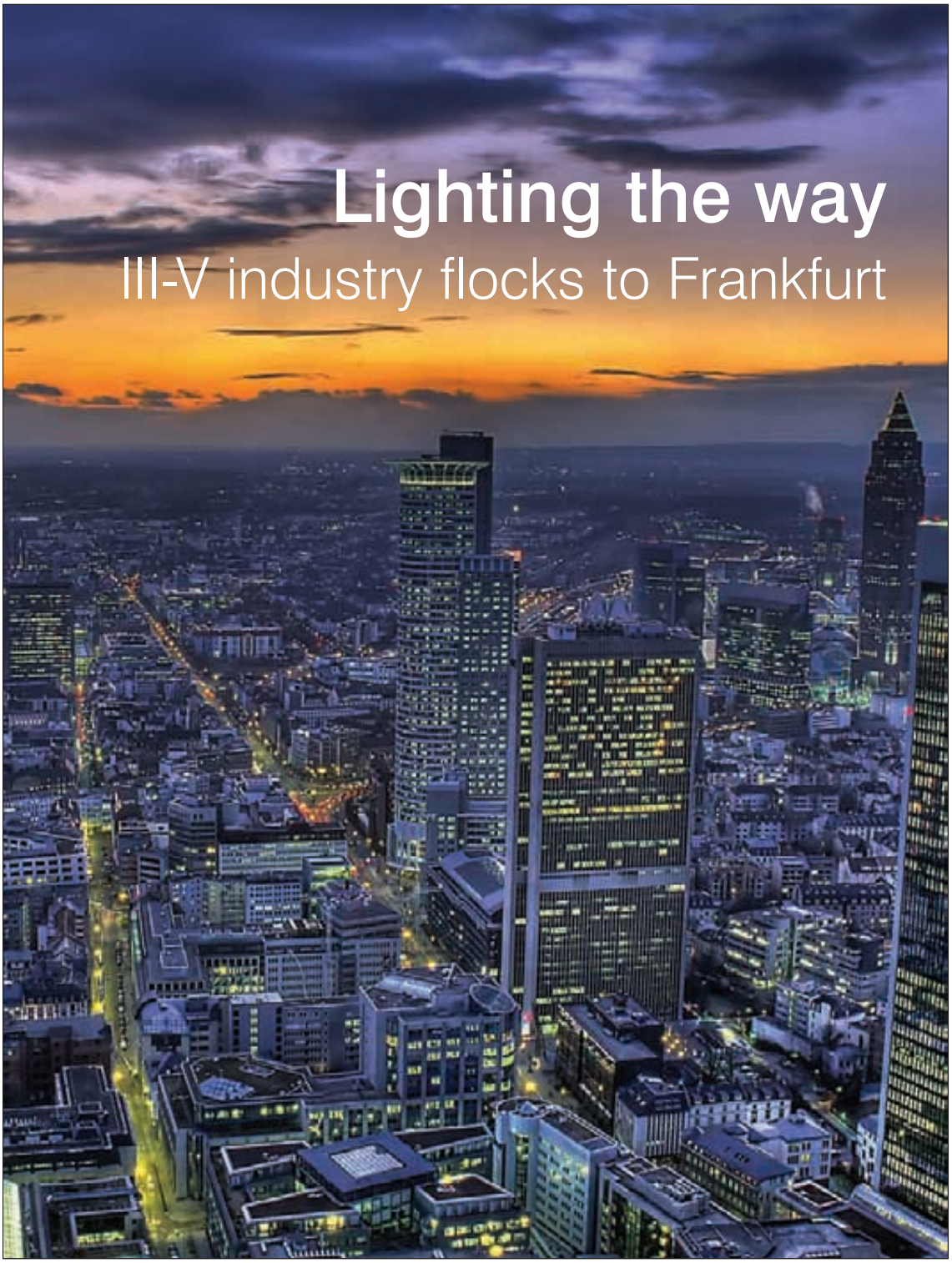
COMPOUND SEMICONDUCTOR

CONNECTING THE COMPOUND SEMICONDUCTOR COMMUNITY



Lighting the way

III-V industry flocks to Frankfurt

An Angel Business Communications publication

April / May 2011 Volume 17 Number 3

ALWAYS ONE STEP AHEAD

HIGHER PRODUCTIVITY // With almost 30 years of experience AIXTRON stands for proven engineering power and dedicated customer support: Our equipment serves a diverse range of customers to manufacture highest LED volumes at lowest cost.

BETTER PERFORMANCE // As the driving force in deposition equipment AIXTRON engineers powerful technology solutions: Our equipment is the best choice available to manufacture the brightest and most efficient LEDs.

SMARTER RESOURCES // AIXTRON's intelligent equipment concept enables optimized use of resources: The results are extremely low consumption of consumables, minimized maintenance requirements and optimized utilization of human resources.

AIXTRON started in 1983 and is today a leading provider of deposition equipment to the semiconductor industry. With our advanced solutions customers worldwide build components for electronic as well as opto-electronic applications. As pacemaker in our line of industry we are keeping always one step ahead.

AIXTRON

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Silicon foundations promise to drive a lighting revolution

EVEN if a new product with a radically different technology excels in all areas over the incumbent, it rarely sells well if it costs far more.

Such is the case today for the LED light bulb. Despite delivering up to twice the efficiency of the compact fluorescent, lasting for years and years and not containing mercury, sales are sluggish due to high prices.

However, the good news is that the price tag is heading south. If you live in the US and head down to your local Home Depot store, it's now possible to pick up an LED bulb with a good hue for a fraction under $18 (I'm talking about the EcoSmart A19 that is a 40W equivalent light source). Further price erosion can be expected over the next few years, and then around 2014 it's on the cards that prices will plummet to around $5.

The driver behind this step-change in affordability will be the start of high-volume production of LEDs on silicon substrates, an initiative that is likely to be led by the chipmaker Bridgelux. Recently this Californian outfit revealed that it had produced cool-white LEDs on 200 mm silicon with an efficacy of 135 lm/W at 350 mA, and warm-white versions producing 85 lm/W at the same drive current.

According to the company, the cost savings that promise to lead to a $5 LED bulb are not just the result of a switch to a cheaper substrate. Thanks to epi-growth on 200 mm silicon, the wafers that are grown in-house can be sent off to under-utilized 8-inch foundry lines, slashing device-processing costs.

Bridgelux's idea to grow nitride LEDs on silicon is not new – efforts in this direction have been underway for more than a decade. But the company has certainly ventured into new territory in growing high-quality, flat films of nitrides on 200 mm substrates.

The other major accomplishment of Bridgelux is the steps that it has taken to combat strong light absorption in the silicon substrate. Left unchecked, this would have prevented the company from realising R&D results that are in the ballpark of typical values in the lighting market today.

It will be interesting to see if Bridgelux wins the race to launch GaN-on-silicon LEDs in volume, or one of today's big LED makers pips it to the post. That wouldn't be surprising, given that most of the big LED manufacturers are running programmes to develop devices on silicon, and some are notoriously secretive and will not be providing progress updates.

From a consumer perspective, no one will care who triumphs in the end. Obviously, what they want is an affordable, high-quality LED bulb. And when that happens, some players within our industry, including material and tool suppliers, will be generating piles and piles of cash.

RichardStevenson PhD
Consultant Editor

BUILDING A BRIGHT FUTURE FOR LEDS.

Advances in LED technology and market growth require collaboration on a global scale. With more than 40 years of experience in guiding revolutionary advances in semiconductor technology, SEMI® is also helping move the global LED industry forward with standards, public policy, market research, and events that bring the industry together and light the path to the future.

LEDs are illuminating the world, and SEMI is illuminating the world of LEDs. *Learn more about our LED initiatives, products, and events at*

www.semi.org/led

Events

Showcase your technologies for LED manufacturing and connect with companies and people across the LED supply chain at these upcoming SEMI expositions:

LED Manufacturing Pavilion and Forum
March 15–17
SEMICON China 2011
SNIEC, Shanghai

Extreme Electronics: LED Manufacturing
July 12–14
SEMICON West 2011
Moscone Center, San Francisco

LED Manufacturing Pavilion
September 7–9
SEMICON Taiwan 2011
Taipei World Trade Center, Taiwan

Membership/Standards/Public Policy

Join SEMI and help us illuminate the world of LEDs. SEMI supports LED programs in Standards, Public Policy, EHS, and market statistics

Learn more at: **www.semi.org/led**

Information

The SEMI Global Opto/LED Fab Watch database tracks investments and activity in more than 200 LED fabs worldwide.

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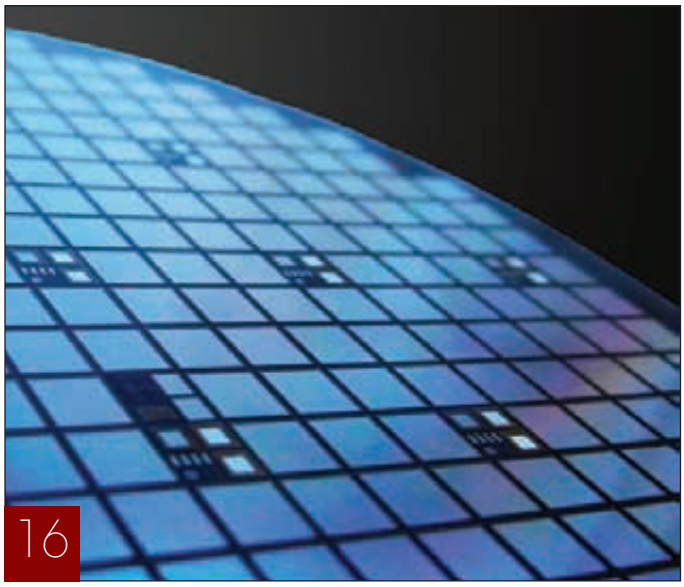
industry & technology



news

2011 IEEE
Compound Semiconductor IC Symposium

INTEGRATED CIRCUITS IN GaAs, InP, SiGe, GaN and OTHER COMPOUND SEMICONDUCTORS

October 16–19, 2011
Hilton Waikoloa Village on Hawaii's Big Island, HI, USA

Sponsored by the IEEE Electron Devices Society
Technically co-sponsored by the Solid State Circuits Society
and the Microwave Theory & Techniques Society

2011 CSIC Symposium

From its beginning in 1978 as the GaAs IC symposium, CSICS has evolved to become the preeminent international forum for developments in compound semiconductor integrated circuits, embracing GaAs, InP, GaN, SiGe, and more recently, CMOS technology. Coverage includes all aspects of the technology, from materials issues and device fabrication, through IC design and testing, high volume manufacturing, and system applications. The IEEE Compound Semiconductor IC Symposium (CSICS) provides the ideal forum to present your latest results in high-speed digital, analog, microwave/millimeter wave, mixed mode, and optoelectronic integrated circuits. First-time papers concerned with the utilization and application of InP, GaAs, SiGe, GaN and other compound semiconductors in military and commercial products are invited.

Symposium Highlights

High quality technical papers will be selected from worldwide submissions for oral presentation and publication in the Symposium Digest. Invited papers and panel sessions on topics of current importance to the Compound Semiconductor IC community will complete the program. Extended versions of selected papers from the Symposium will be published in a special issue of the *IEEE Journal of Solid State Circuits*.

Compound Semiconductor Primer Course & Short Course

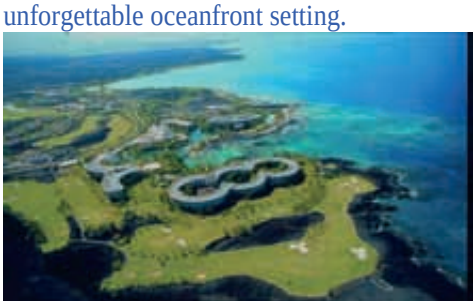
The Symposium will again offer the popular primer course, "Basics of Compound Semiconductor ICs," which is an introductory-level class intended for those wishing to obtain a broad overview of RFIC and High-Speed Analog-Mixed Signal technology. The Sunday evening course will cover Si/SiGe, GaAs, InP and GaN materials and processes, BJT/HBT, HEMT & FET device operation, and both analog/microwave and digital ICs. The Course will be tailored to provide the specific background needed for participants to understand and appreciate the papers presented in the Symposium Technical Program.

2011 Compound Semiconductor IC Symposium Exhibition

As in past years, the Symposium will sponsor an exhibition of products from various vendors of materials, IC products, processing equipment, test equipment, CAD tools, and foundry services specifically addressing the Compound Semiconductor industry. Numerous vendors will be on-hand to discuss their products and to answer questions. Inquiries concerning the exhibits should be addressed to: **Jim Carroll,** AWR Corporation, Tel: +1 469-248-5462, Email: jim.carroll@awrcorp.com

Conference Venue

Join CSICS attendees as we "Explore the Spirit of Aloha" at **Hilton Waikoloa Village**. Located on the Kohala Coast of the Big Island of Hawaii in the midst of Waikoloa Beach Resort, the extraordinary property offers an unforgettable experience shrouded in breathtaking gardens, rich wildlife, and tranquil waterways. Plan to come early or stay after the conference to immerse yourself in island culture and tradition at Hilton Waikoloa Village - a truly inspired destination, offering an authentic Hawaiian experience in an unforgettable oceanfront setting.



Symposium Chair: **Dan Scherrer,** Northrop Grumman, Ph: +1-310-812-5892, Email: Dan.Scherrer@ngc.com

For more information please visit the website at www.csics.org

LED bulbs could plummet to $5 by 2014

BRIDGELUX, a developer and manufacturer of LED lighting technologies has achieved a major breakthrough with the demonstration of 135 Lumens per Watt GaN-on-silicon based LED Technology. The firm says this represents the industry's first commercial grade performance for a silicon-based LED. When grown at scale, most LED epitaxial wafers use sapphire or silicon carbide substrates as the starting material. But large diameter sapphire and silicon carbide substrates are costly, difficult to process, and not widely available.

As a result, production costs have inhibited the widespread adoption of LED lighting in homes and commercial buildings. But growing GaN on larger, low-cost silicon wafers that are compatible with modern semiconductor manufacturing can deliver a 75% improvement in cost over current approaches.

The 135 Lumen per Watt performance was achieved at a CCT of 4730K using a single 1.5mm power LED operated at 350mA. These LEDs have extremely low operating voltages, requiring just 2.90V at 350mA and < 3.25V at 1 Amp. The low forward voltage and excellent thermal resistance of the

devices make them ideally suited for high-performance, illumination-grade applications.

Optimisation of the epitaxy process on 8-inch silicon wafers will make LED manufacturing compatible with existing automated semiconductor lines.
The move to a silicon substrate will be a revolutionary step for the LED industry, and Bridgelux is well-positioned to take full advantage of the introduction of this technology. Over the past 5 years, Steve Lester, one of the industry's pioneers in LED Research and Development, has fostered a world-class team of Bridgelux materials scientists and chip design engineers dedicated to GaN-on-silicon R&D.

Concurrently, industry-wide research and development of GaN growth on silicon has increased rapidly. And as a result, the GaN on Silicon performance levels reported by Bridgelux today are comparable to state-of-the-art sapphire-based LEDs available 12-24 months ago. The company anticipates the delivery of its first commercially available GaN-on-silicon products over the course of the next two to three years. Bridgelux, which maintains an asset-light operating model, will leverage its strong R&D and Intellectual Property position in LED epitaxy to jointly manufacture silicon based LEDs. The company is currently in discussions with a number of established semiconductor companies regarding the utilisation of the many fully depreciated 8-inch semiconductor fabrication operations available around the globe.

"Bridgelux's achievement is a reflection of the strength of our leadership in silicon materials and epitaxial process technology," said Bill Watkins, Bridgelux CEO.

Oxford Instruments expansion strengthens company offering

OXFORD INSTRUMENTS has increased production capacity by approximately 50%, resulting in more efficient manufacturing processes for repeat products and in supplying equipment to the fast growing HBLED production market. Investment in a number of key areas of the business has resulted in faster and more streamlined manufacturing, superior research facilities and more comprehensive customer support.

"Our workforce has grown by over 30% in the past 12 months enabling us to react quickly to our significantly increased order book, and to provide faster product and process development for our customers", comments Andy Matthews, MD of Oxford Instruments Plasma Technology. "As a leader in high technology equipment manufacture, we have responded to the demands of our industry to ensure we are as competitive as possible, and to retain our reputation for producing world class products and creating long term relationships with our customers based on trust and respect," he continues.

The company has incorporated parallel build and test bays in manufacturing for production of its etch, deposition and growth equipment, offering more flexibility to respond to customer requirements, and reducing manufacturing lead times. This has resulted in more efficient manufacturing processes for repeat products, in supplying equipment for instance to the fast growing HBLED production market.

These extensive changes have increased production capacity by approximately 50%. New R&D and applications laboratories have been built with expanded capabilities, and the company has appointed a number of additional process engineers. The applications laboratories house the company's range of etch, deposition and growth equipment, including PlasmaPro, FlexAL ALD and Nanofab nanoscale growth tools manufactured at the Bristol, UK facility, where customer samples are run, and new processes developed.

Dedicated engineering and software development suites, and a specialist training department have also been created at the new centre in order to maximise the company's overall capacity in delivering the appropriate tools and support for its customer's needs.

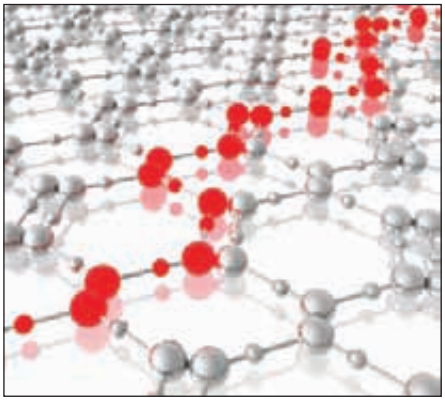
"This major investment in both staff and facilities supports our ability to meet the needs of our diverse customer base", says Dan Ayres, General Manager at Oxford Instruments Plasma Technology, "alongside our global team and supply base we're able to continually improve our quality and delivery performance whilst innovating our product and process offering."

TU Eindhoven selects Aixtron MOCVD system for nanowires

AIXTRON SE has a new MOCVD reactor order from existing customer, the University of Technology (TU) Eindhoven in the Netherlands. The contract is for one Close Coupled Showerhead (CCS) system in a three x 2-inch wafer configuration which will be used for the growth of GaAs- and InP-based nanowire structures as well as for nitrides and silicon compounds.

TU Eindhoven placed the order in the fourth quarter of 2010. After delivery of the system in the third quarter of 2011, the local Aixtron SE support team will install and commission the new reactor in the state-of-the-art clean-room facility within the COBRA Research Institute at TU Eindhoven.

Erik Bakkers of TU Eindhoven's Photonics of Semiconductor Nanostructures Department, comments, "The new reactor will be used for fundamental research purposes and in particular to synthesize complex semiconducting nanowire heterostructures to be used as active elements in solar cells, (bio)chemical sensors, thermoelectrics and in quantum information devices. For these applications, the electronic (mobility) and optical quality (linewidth and intensity) of the wires must be excellent. I believe that all requirements will be perfectly met within the capabilities of the Aixtron CCS MOCVD system."



"This versatile MOCVD system will be the workhorse of our group providing Dutch research institutes with nanowires and other relevant materials. The CCS system will enable us to achieve control of nanowire properties and enable the manufacture of nanowires from new combinations of materials," he concluded.

TU Eindhoven's nanowire group began operations back in January of 2010 and since then has been setting up a national nanowire growth facility. The COBRA Research Institute at Eindhoven University of Technology is the National Centre of the Netherlands for Research on III-V semiconductors and optoelectronic devices and systems. COBRA employs more than 100 scientists and technicians.

Cree and Osram sign patent cross license agreement

THE AGREEMENT underscores each company's commitment to speeding the adoption of LED lighting while respecting the value and importance of each company's intellectual property.

The cross-license agreement covers patents from both parties in the fields of blue LED chip technology, white LEDs and phosphors, packaging, LED luminaires and lamps, and LED lighting control systems.

"Cree is committed to revolutionizing lighting. Over the last two decades, we have developed innovative, energy efficient LED lighting technology and have protected this technology under international intellectual property laws," said Chuck Swoboda, Cree chairman and CEO. "This agreement can enable our customers to accelerate the LED lighting revolution."

Cree recently announced a similar broad cross-license agreement with Philips and has existing patent agreements with Nichia and Toyoda Gosei regarding LED technology.

VPEC, Kopin and, IQE perform 80% of RF epitaxy

MOBILE PHONE RF system consists mainly of transceiver, power amplifier (PA) and front-end module (FEM). The RF system of a general mobile phone is simply inclusive of a transceiver and a PA. FEMs can be assembled in the form of integrated circuit or by discrete components.

To the contrary, the RF system of multi-band mobile phone which includes all 3G, quasi-4G and smart phone is exceedingly complicated now that the RF system needs several bands of transceivers and PAs.

Generally, the transceivers of mobile phone excluding Nokia are provided by baseband vendors. Most of Nokia's baseband are jointly developed with Texas Instruments, and its transceivers are jointly developed with ST-Ericsson.

Since the multi-band mobile phone in need of several PAs, the RF system of multi-band mobile phone costs as high as $9 while that of ordinary cell phone only costs $1 to $2. The latest Samsung Galaxy S 4G is a quasi-4G mobile phone with the comparably sophisticated RF system including four key components.

The mushrooming of smart phone, 3G phone and quasi 4G phone greatly enlarges the market size of mobile phone RF system. Mobile phone RF components are as usual made of GaAs , rather than silicon.

According to the report, only a small number

of OEMs around the world are experts in this field. The report describes the majority of companies involved in the RF field.

It says that in the epitaxy sector, the three leaders VPEC, Kopin and, IQE, enjoy over 80% of the world's market share. In the GaAs wafer foundry sector, the leading OEMs include Taiwan-based WIN Semiconductors and AWSC as well as USA-based TriQuint, the three of which enjoy over 85% of the market share. The RF IC design companies cover RFMD, Skyworks, TriQuint, Anadigics, and Avago.

Standard 'SiC Defect Catalogue'

A MEETING of the SEMI standards European Compound Semiconductor Technical Committee was held in Frankfurt, Germany, the day before the CSEurope Conference. The lessons learned from the history of GaAs, where two different flat options still are in use today because standards were not introduced in time to prevent this, were emphasised.

Standardisation is an open, transparent and global process, which is driven by volunteers worldwide for the benefit of the semiconductor industry. At the main committee meeting a ballot review on the new proposed standard 'SiC Defect Catalogue' was performed and the document was approved for publication as a new standard. In addition to this a ballot review on the 5-year review of SEMI M54-0404 'Guide for Semi-insulating (SI) GaAs Material Parameters' was carried out and the standard was re-approved without change.

The status of the other active task forces in this committee, which are addressing Carbon in GaAs and Determination of Etch Pit density in GaAs & InP, was reported.

RFMD and Atmel to advance ZigBee products

RF MICRO DEVICES, a designer and manufacturer of high-performance radio frequency components and compound semiconductor technologies, has teamed up with Atmel Corporation to deliver ZigBee solutions for a broad range of smart energy applications. RFMD's new RF6575 ZigBee FEM has been combined with the Atmel ATmega128RFA1 single-chip solution to create the ATmega128RFA1 reference design. This high-performance solution provides public utilities and consumers more control over how they monitor and save energy. The solution is targeted at portable battery-powered equipment, smart energy advanced metering infrastructure, high performance ZigBee, and Home Area Network (HAN) applications in the 2.4GHz to 2.5GHz ISM Band. Working together, RFMD and Atmel are addressing the need for aggressive size reductions in IEEE 802.15.4 designs with a reduced solution footprint and minimised component count.

Bob Van Buskirk, president of RFMD's Multi-Market Products Group said, "RFMD and Atmel are leveraging each other's expertise to deliver high-performance, highly-integrated solutions that reduce design cycle times, lower customer costs, and accelerate product time-to-market. Large-scale smart energy projects are forecasted to grow rapidly, with particularly strong demand anticipated in low-power wireless technologies like ZigBee."

"As the smart energy market continues to grow worldwide, Atmel is excited to collaborate with companies such as RFMD to enable more battery-powered smart energy systems," said Magnus Pedersen, director of wireless solutions, Atmel Corporation. "The RFMD front-end module combined with the Atmel ATmega128RFA1 single-chip solution offers smart energy providers better battery life with their lower power consumption designs without comprising performance."

RFMD's highly integrated RF6575 features a 2.4GHz to 2.5GHz +22dBm power amplifier, Tx harmonic output filter, double-pole double–throw (DPDT) diversity switch, and a low-noise amplifier. The RF6575 is housed in a 3.5 x 3.5 x 0.5mm package that and greatly reduces discrete component requirements while minimising footprint and assembly costs. The transceiver interface is a single-port bi-directional Rx/Tx.

RFMD's ZigBee FEMs enables customers to accelerate new ZigBee products to market while reducing component count, size, cost, and power consumption. RFMD's RF6575 single-chip ZigBee FEM is specifically optimised for Smart Energy applications including smart meters, energy usage control, or "demand response," and HAN devices.

Other RFMD ZigBee FEMs are designed for industrial applications and wireless sensing and control applications, specifically those requiring low power consumption, high performance and reliability as a essential aspect of their device.

SolFocus and Bechtel to deliver renewable power in California

SOLFOCUS, Bechtel Power Corporation and developer Sol Orchard, have announced that a one megawatt highbased CPV solar power plant was completed for Nichols Farms in Hanford, California.

This is the latest in a string of distributed generation projects that SolFocus has completed and continues CPV on the path to utility-scale generation. The SolFocus installation will produce 2,244 million kilowatt hours (kWh) in the first year, which is roughly 70 % of the processing facility electricity demand. The power plant, located on six acres adjacent to the pistachio processing facility, consists of 119 8.8 kilowatt SolFocus SF-1100S CPV systems. The plant, which utilises the SolFocus SF-1100S CPV systems, was designed and built by Bechtel, and is now connected to the regional electrical grid serviced by SoCal Edison.

"As an integrated grower, processor, and marketer of pistachios, I appreciate the value of harnessing natural resources in an efficient, sustainable manner," said Chuck Nichols, owner of Nichols Farms. "That's why I selected SolFocus CPV from a list of solar options. The high energy yield combined with the superior environmental footprint of the SolFocus systems made it an ideal choice for our facility which processes pistachios for farmers throughout the Central Valley of California." California's central valley region has significant solar resources and a wealth of agricultural business that can benefit from the implementation of innovative solar technology. The Nichols Farms project is delivering lower operating costs, and the impact of future increasing energy costs has been minimized.

"Helping to advance high-efficiency, large scale solar energy is a strategic interest for Bechtel," said Ian Copeland, President of Bechtel's Renewable Power division. "The SolFocus system provides a combination of high efficiency CPV with rapid installation capabilities that can deliver cost competitive power very quickly."

"This CPV agribusiness project with Nichols Farms is the first of its kind in North America," said Mark Crowley, CEO of SolFocus. "It demonstrates how SolFocus technology can easily accommodate a wide variety of energy demands that farms and other agricultural sites need. The CPV industry has announced several large projects that will have a significant impact in upcoming years. However, it is this type of distributed generation solar plant which can immediately impact sustainability across a broad range of applications. Chuck Nichols' visionary view of sustainable farming is to be commended."

"All of California is rich in renewable resources – sun, wind, geothermal, and biomass. Across the world, solar companies know about the powerful solar insolation in the Colorado and Mojave deserts. We're really pleased to see that this new and growing industry is investing in our Central Valley too," commented Michael Picker, Special Advisor to the Governor for Renewable Energy Facilities.

"As a Hanford native, I know how essential agriculture is to the local economy of the 30th District," said Assemblyman David Valadao. "By increasing energy and cost efficiency through the deployment of SolFocus CPV solar technology, Nichols Farms demonstrates the next generation of solar technology and sustainable agriculture. I am proud to witness the merger of renewable energy innovation and agribusiness here at Nichols Farms."

Solar project developer Sol Orchard introduced the concept to Nichols Farms, and developed the project from concept to completion. "This is the third project we have developed utilizing SolFocus technology," commented Sol Orchard President Jeff Brothers. The high energy yield and reliable products allow us to move forward on projects quickly and with good financial results. Bringing Bechtel in as the contractor gave us assurance that when the switch was flipped, we'd have a robust power plant capable of delivering on all of its expectations."

SolFocus CPV technology employs a system of patented reflective optics to concentrate sunlight 650 times onto small, highly efficient III-V based solar cells.

Globalfoundries and imec to advance on silicon technology

GLOBALFOUNDRIES, a leading semiconductor foundry, has signed a strategic long-term partnership on sub-22nm CMOS scaling and GaN-on-silicon technology with the nanoelectronics R&D centre imec.

Globalfoundries has joined the imec GaN research program, which aims at high-performance, cost-effective GaN devices on silicon. This program brings together leading IDMs, foundries, compound semiconductor companies, equipment suppliers and substrate suppliers to develop 8 inch GaN technology on silicon.

"Partnering with Globalfoundries is very important for imec and our partners since it strengthens our collaboration with foundries and thus also the ecosystem we offer in our programs to IDMs and the fabless and fablite community," said Luc Van den hove, President and CEO of imec.

"We expect this partnership to give a further boost to our research programs over the coming years."

"Globalfoundries has long embraced a collaborative approach to R&D innovation based on a model of shared objectives and shared investments with partners around the world," said David Bennett, vice president of alliances at Globalfoundries. "The mission and capabilities of imec are highly complementary to our current collaborative R&D approach and will add another important dimension to our technology pipeline."

Q-Cells mass produced solar cell achieves new record of 13.4% efficiency

Q-CELLS SE, a leading photovoltaics company, says it has achieved a world efficiency record for mass-produced CIGS thin-film solar modules manufactured via monolithic integration. The Fraunhofer Institute for Solar Energy Systems (ISE) has confirmed an efficiency of 14.7 % (aperture area) for a Q-Cells Q.SMART UF solar module manufactured by Q-Cells' 100 % subsidiary Solibro GmbH.

The record efficiency, measured in February 2011 by Fraunhofer ISE in Freiburg, Germany, confirmed a power output of 100.3 Watt peak (Wp) under standard test conditions.

The Q-Cells Q.SMART UF solar module, with an area of 0.75 m^2, reaches a total area efficiency of 13.4 %. Moreover, with an aperture area of 0.684 m^2, the module's aperture area efficiency is 14.7 %. Q-Cells says its CIGS thin film technology now holds the world record for monolithically integrated photovoltaic modules based on the record efficiency table compiled by Progress in Photovoltaics.

"In June 2010, Q-Cells achieved the previous efficiency world record of 13 % with the same type of CIGS solar module out of series production", noted Gerhard Rauter, COO of Q-Cells. "With this new record, 13.4 %, Q-Cells proves one more time its technological leadership in the photovoltaic sector."

Q-Cells' CIGS thin film modules are currently taking part in a number of reference installations and are exhibiting stable and outstanding energy yields (KWh/KWp). Even after one year of operation Q.SMART systems in different European regions of irradiation show improved performances. The Q.SMART UF achieved currently among the top performers in a benchmark at the test field of "Desert Knowledge Australia Solar centre", a peak performance under extreme climate conditions. Q-Cells claims that so far, the Q.SMART UF is the highest-performing solar module under these conditions.

The Q.SMART UF is the unframed CIGS solar module from Q-Cells. It stands out for its performance and high quality. Due to its homogenous black surface it is a perfect fit on visual aesthetics and building integrated installations and suitable for private and small to medium-sized commercial and industrial rooftop and in-roof installations. The unframed modules stand out for their efficient self-cleaning, making them perfect for flat roofs and façade solutions. The solar modules are designed for good response to temperature and low light, ensuring high energy yields. This is supported by the positive sorting +5/-0 watts, allowing deviations only to higher than expected levels.

Agilent ships latest platform for RF and microwave design and simulation

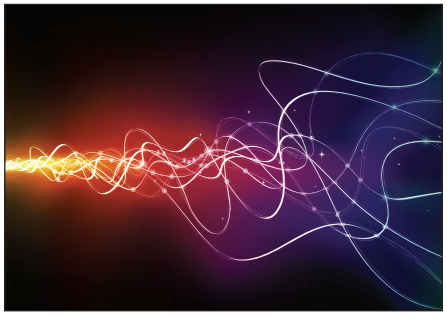
AGILENT TECHNOLOGIES is shipping the latest release of its flagship RF and microwave design and simulation platform, Advanced Design System 2011 (ADS 2011). Agilent also said that its work with GaAs/GaN and RF SiGe/BiCMOS/CMOS foundries and relevant SMD component vendors has resulted in their support for ADS 2011. During the past six months, the majority of existing ADS process design kits and libraries have been upgraded and verified on early access releases. These upgraded kits and libraries will be made publicly available to foundry and component vendor customers in the coming days, enabling them to take advantage of new capabilities in ADS 2011.

The new kits are backwardly compatible so that users need only download and install the desired kit, independent of which ADS release they are using. Agilent advises that requests for specific kits should be directed to the appropriate component vendor or foundry. ADS 2011 provides engineers with a multi-technology design environment for designing individual RF and microwave integrated circuits with different technologies (e.g., GaAs, SiGe and GaN). It features electromagnetic technologies for faster, more accurate simulations; a use model that makes electromagnetic simulation easy for all engineers; layout improvements for easier physical design; and dozens of improvements designed to enhance the platform's functionality and usability. With the ADS 2011, design verification no longer needs to stop at the boundary of a single integrated circuit's or module's technology.

Optoelectronics industry is one to watch

DESPITE flattening revenue growth at Oclaro and Cree, the Strategy Analytics GaAs and Compound Semiconductors Service (GaAs) sees continued growth in the optoelectronics segment of the compound semiconductor industry.

This is mainly due to January announcements of new products, equipment orders and capacity expansion.



The recently published report, "Compound Semiconductor Industry Review January 2011: Optoelectronics, Materials and Equipment," captures January 2011 product, technology, contract and financial announcements for optoelectronic companies such as Aixtron, Bridgelux, Cree, KLA-Tencor, Emcore, JDSU, Oclaro, Agilent and IQE.

"Strong activity at the front-end of the optoelectronic supply chain should sustain continued growth for this segment in 2011," noted Eric Higham, Director of the Strategy Analytics GaAs and Compound Semiconductor Technologies Service. "Demand for solar energy is increasing strongly. LED use is quickly expanding into a broadening range of consumer applications."

Asif Anwar, Director in the Strategy Analytics Strategic Technologies Practice, added, "The January product, equipment and capacity announcements show strength in the optoelectronics portion of the compound semiconductor industry."

The report summarises January 2011 financial, product, contract and employment announcements from major optoelectronic material, device and equipment suppliers. It categorises these announcements by material and equipment, laser, LED and compound photovoltaic activity.

IQE appoints Trevor Martin as director of global GaN strategy

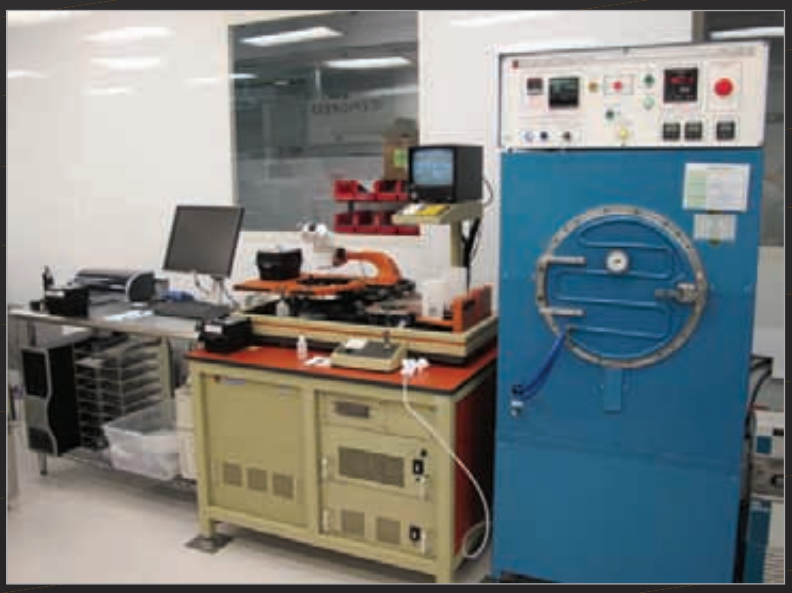
WITH over 25 years' experience in advanced compound semiconductor materials, Martin joins IQE from QinetiQ, where he was responsible for their overall epitaxial capabilities and the development of GaN technology. Martin will be responsible for enhancing and delivering IQE's GaN strategy across the Group and will be based at the company's headquarters in Cardiff, UK.

GaN is becoming an increasingly important material system across a diverse range of markets encompassing defense, industrial and consumer applications, from high efficiency power switching, high power radio frequency to advanced optoelectronics in the form of lasers and LED's. Opportunities for GaN materials will be driven by technology "megatrends" such as efficient power generation and transmission, efficient energy usage such as solid state lighting, electric vehicles, and improved wireless infrastructure.

Martin's experience in advanced compound semiconductor materials prepares him as he joins IQE from QinetiQ, Malvern, UK where he was responsible for their overall epitaxial capabilities and the development of GaN technology. Trevor Martin received his PhD from the University of Glasgow for work on MBE growth on InP and has been involved in the development of a number of key semiconductor technologies prior to his work in GaN, these include the on-wafer integration of optical devices and the development of antimony based devices. He has also had extensive involvement in large multinational collaborative programs, has served on numerous academic steering and review panels, has co-authored over 150 papers, and is co-inventor on a number of patents.

SemiSouth starts battling with silicon chipmakers

Silicon is the entrenched electronic technology in solar cell inverters, hybrid electric vehicles, aircraft landing gear, deep-drilling tools and audiophile amplifiers. But its vice-like grip on these markets looks set to slip as SemiSouth ramps production of its high-voltage SiC diodes and transistors that will underpin improvements in efficiency, reliability and linearity. **Richard Stevenson reports.**



SemiSouth has a well equipped, 10,000 square foot cleanroom at its headquarters in Starkville, Mississippi

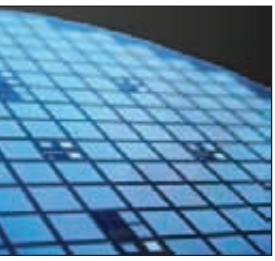
This year's headlines have been dominated by political uprising across the Middle East. While the promise of far greater democracy in this region will be seen as good news by many, these onlookers will not get any pleasure at seeing the cost of black gold shoot past $100 a barrel on the back of greater uncertainty of oil supply.

The rising cost of oil, which is tending to drive up all energy costs, is taking place against a backdrop of increasingly vocal calls to reduce the burning of fossil fuels and ultimately cut carbon dioxide emissions.

Ways to do this, which are achievable on an individual, corporate and national level, are to generate more electricity from renewable sources and to switch to systems that use electricity more efficiently. Oil is still essential for transportation, but extracting this commodity efficiently will also help to cut global energy expenditure.

One company that can help with all these efforts is the Starkville-based SiC electronics pioneer SemiSouth Laboratories, which spun out of Mississippi State University in 2000. This start-up has developed high-voltage diodes and junction field effect transistors (JFETs) that are superior to silicon incumbents in many ways: They switch more efficiently at higher frequencies, which improves DC to AC conversion; they can perform at higher operating temperatures, which reduces the need for cooling; and they are capable of withstanding far higher levels of radiation, enabling them to provide power management in harsh environments.

SemiSouth's European Director of Sales, Dieter Liesabeths, who is based in Munich, Germany, describes the company's product range as a mix of SiC diodes and JFETs operating at 1200 V and 1700 V. The diodes are available in a range of popular packages covering the 5-60 A range, and customers can also buy normally-on and normally-off JFETs with on-resistances down to 45 mΩ. The revenue generated by these products is not clear, because SemiSouth, like most privately owned companies, does not talk publicly about its sales figures. But Liesabeths did reveal that this year's income from sales should triple that generated in 2010, and a similar year-on-year percentage gain is expected in 2012.



SemiSouth has recently switched device manufacture from 3-inch to 4-inch SiC

Capacity build out

To increase its capacity and cater for the expected hike in orders, SemiSouth switched its production from 3-inch to 4-inch wafers this March. In this respect, the company is anything but a trailblazer – many of its rivals upgraded to the larger platform two or three years ago.

"We were very conservative," admits Jeff Casady, SemiSouth's Chief Technology Officer and Vice President of Business Development. "We wanted to wait to make sure that there were no quality issues [with 4-inch SiC]. Now the quality is very good, and some of our suppliers tell us that 4-inch is even better than 3-inch."

The company's capacity expansion is also driven by a $12-15 million investment in a variety of new fab tools. Some money is coming from existing investors, such as Schneider Electric Ventures, Delta Capital Management and Southern Appalachian Fund. However, SemiSouth has also benefited from a significant cash-injection by NASDAQ-listed, California-based firm Power Integrations. This West-coast firm is a manufacturer of chips for AC-DC power supplies deployed in computers, mobile-phone chargers, consumer electronics and LED lights.

SemiSouth's fab upgrade includes the installation of an Aixtron AIX 2800G4 WW system that will more than double the company's epi-capacity. This reactor, which is due to arrive this June, will initially churn out 4-inch wafers. However, it can also accommodate six pieces of 6-inch SiC, a size that SemiSouth plans to adopt in a few years. Transitioning to this larger wafer size should be relatively painless, because the existing line can already accommodate 6-inch material.

To aid the capacity increase, the Starkville start-up is aiming to increase its headcount this year from 80 to 100, with the majority of new hires working in the cleanroom. This 10,000-ft^2 facility should be able to churn out enough material to fulfil SemiSouth's order book until the end of 2013. If sales are still rising, a 'mirror' fab could then be built on the same site.

Multiple markets

Today the solar inverter represents the biggest market for SemiSouth. Its diodes are already being used in this application and customers are starting to launch products that also incorporate the company's JFET. For the designers of solar inverters, the attraction of turning to these wide bandgap devices is the opportunity to develop superior architectures.

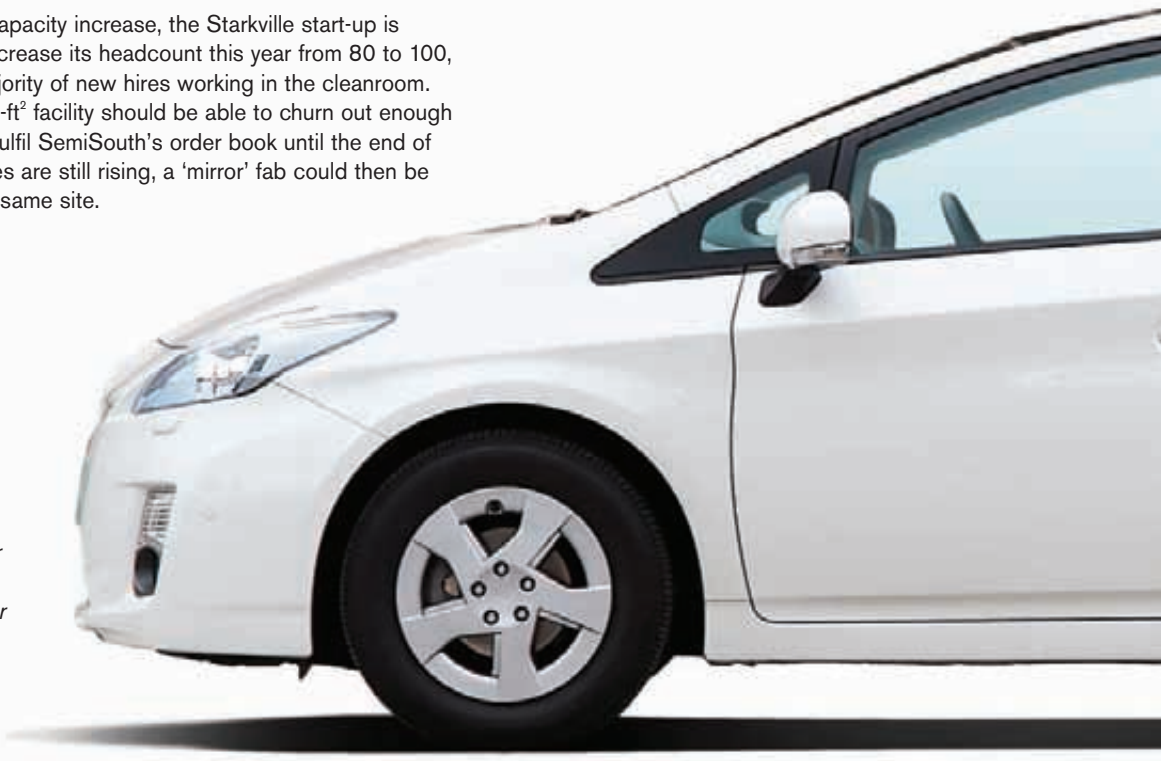
"If you push the efficiency up, you reduce the heat sink, and if you push the frequency up, you reduce the 'magnetics' and capacitors," explains Casady. "SiC allows you to do both of those things."

Thanks to these benefits, inverters sporting SemiSouth's devices have a very low bill of materials, even though the cost of the SiC components in the system is higher than the silicon ones that have been superseded. Lower shipping costs result, which stem from substantial reductions in the weight of the system.

SemiSouth's products are suitable for other renewable energy markets, such as wind energy. However, that particular application requires modules handling powers of around a megawatt, far more than that associated with the solar inverters, which span the 1-30 kW range.

To go to higher powers requires manufacture of larger die. "We're working on those products," says Casady. "You can get to megawatts now if you need to, but it's very expensive because the die is so large."

SemiSouth also hopes to make an impact on the hybrid electric vehicle market. In this market, just like solar, one



SiC devices are attractive alternatives to silicon for power conversion in hybrid electric vehicles. By operating at higher temperatures, SiC electronics places far less demand on the cooling system within the car

attraction of turning to SiC electronics is that it cuts the weight of the inverter, which in this case converts the DC output from the battery to the AC form that drives the motor. However, here this weight saving is relatively small – instead, the biggest advantage of the wide bandgap semiconductor is that it is capable of operating at far, far higher temperatures.

By running the electronics at 175 °C or more, water-cooling demands are slashed, allowing the inverter to hook into the engine's water-cooling system, rather than needing it own dedicated one. Three major benefits result for the automobile: lower manufacturing costs; higher miles per gallon; and more space under the hood. Despite the strong appeal of SiC electronics for hybrid electric vehicles and SemiSouth's longstanding interest in this application, silicon still has a stranglehold on this market.

"We have a lot of potential OEMs, people working on research projects," explains Liesabeths. "But silicon carbide is still a new technology and the car industry is very, very conservative."

According to Casady, many players in this market are keeping a close eye on how SiC fairs in the solar industry. If it has success there, carmakers will feel more confident of deploying this new technology.

Reaching new highs…

SiC transistors and diodes are also attractive alternatives to silicon for satellite power management. "If you can eliminate the heat sink – and if you can run more efficiently and require a smaller power source – you can save a lot in weight," explains Casady. Reducing weight is critical, because propelling an object from the Earth into space takes so much energy. Once SiC is in orbit, it can offer another big advantage over silicon – tremendous resistance to the high levels of radiation that are found in that environment. Aerospace also offers opportunities for SemiSouth. One way to reduce the weight on the plane is to move landing gear up and down with electric actuators, rather than hydraulics, but this requires 1200 V components handling high powers and operating at high temperatures. SiC excels in all these areas, while delivering high efficiencies.

In addition, this wide bandgap semiconductor is an ideal candidate for lightening and circuit protection on-board aircraft. "Silicon carbide is so robust that it can tolerate abuse where silicon components would just be destroyed," says Casady. "So there is a lot of interest in using silicon carbide for solid-state circuit breakers."

… and plunging new depths

SemiSouth can also help to improve oil extraction efficiency. "If you talk to the oil companies, it's getting harder and harder to find oil," says Casady. "So they want to go deeper and deeper, and that requires higher and higher temperatures". Searching and extracting oil at such depths is very expensive, and if anything goes wrong, it takes a long time to rectifying. What are needed are systems that can operate reliably at very high temperatures.

"Our die can survive very high temperatures, maybe even up to 500°C," says Casady. Realizing such high-temperature capability is only possible, however, if die are housed in packages that can also operate in this regime.

Audio component manufacturer First Watt has used SemiSouth's JFETs to make the J2, a stereo amplifier that delivers 25W into an 8 ohm load. The amplifier's designer, Nelson Pass, selected the SiC JFET for its high linearity: " Compared with MOSFETs, they exhibit a fraction of the distortion." According to him, the audio press are impressed with the J2: "There are great reviews in Tone Magazine and 6Moons.com, and Stereo Sound has awarded it 'best-value' component."

To ensure that this is the case, SemiSouth has teamed up with Micross, a US firm with expertise in packaging electronics products for operation in harsh environments.

"It's a non-exclusive partnership, but one that we are both very excited about," says Casady. "They have all the military and aerospace quality certification needed to sell into those markets, and it's the same things that the down-hole market values: A very reliable product operating in an extremely high-temperature environment."

Audio manufacturers are also interested in SemiSouth's products. This market is markedly different from the rest, placing very little value on the energy savings that this company's products can help to realize. Instead, the audio community prizes very high levels of linearity, a characteristic strongly associated with SemiSouth's JFET.

Casady admits that interest from the audio community came as a "really pleasant surprise". According to him, hi-fi manufacturers are using these components to build amplifiers with a sound quality that had never been realized with solid-state electronics. Efforts have been led by First Watt, a firm founded by audio engineer Nelson Pass, who is better known in audio circles for his founding of Pass Labs. Other hi-fi manufacturers, which cannot be named due to confidentiality agreements, are following in his footsteps, and are either evaluating SemiSouth's transistors or starting to use them for low-volume production. In addition to the manufacture of SiC diodes and JFETs, SemiSouth is offering epitaxial services. "It's not a regular thing for us," admits Casady. "It tends to come as a spot capacity issue, and it seems to be pretty popular."

SiC rivals

The mix of products and services offered by SemiSouth, along with the many markets that the company serves, should give this company a great chance of substantial commercial success over the next few years. But exactly how well it fares may depend on whether it wins the high-volume orders, or loses out to one of its SiC rivals.

Arguably, SemiSouth's greatest opposition will come from another US SiC specialist, Cree. This company has the advantages of making its own substrates and the opportunity to self-fund extensive SiC development programmes, thanks to its profitable LED business. However, SemiSouth is confident that Cree and other SiC developers will not overshadow it. Liesabeths points out that his company has a significant head start, being the first to launch a SiC transistor. And he says that SemiSouth's products deliver better energy efficiencies, have lower switching energies and are more cost-effective than those of competitors.

Liesabeths also argues that as a small company, SemiSouth can react faster to market demands: "With big companies, [SiC] is a niche product, not the main focus. We are one hundred percent focussed on this area, while our competitors have other areas that they also have to look at."

If SemiSouth doesn't get distracted – and there is no reason why it will – it should be a major player in the SiC market, which is destined for growth throughout this decade.

Audio manufacturers are also interested in SemiSouth's products. This market is markedly different from the rest, placing very little value on the energy savings that this company's products can help to realize. Instead, the audio community prizes very high levels of linearity, a characteristic strongly associated with SemiSouth's JFET

Welcome

We are delighted to invite you to submit an abstract to the 9th International Conference on Nitride Semiconductors (ICNS-9) which will be held at the Scottish Exhibition and Conference Centre (SECC), Glasgow, UK from 10th - 15th July 2011. Scotland's scientists have been pioneers, their inventions and innovations transforming people's lives around the world. Today, Scotland recognises the vital importance of international collaboration in modern science, and it's scientists are at the heart of many strategic alliances. ICNS-9 will continue a series of conferences that is the premier forum for reporting research results in group III-nitride semiconductors. Sessions will focus on topics including: Bulk Crystal Growth Epitaxial Growth Nitride Semiconductor Nanostructures Material Characterisation & Understanding Theory & Simulation Optical & Electronic Devices (LEDs, Lasers, Transistors etc.). Research and applications involving nitrides remain vibrant and productive and we anticipate another successful ICNS Conference with a large number of academic and industrial attendees. We aim to provide the principal forum in 2011 for researchers, engineers and industrialists to share pioneering results and ideas in the field of III-nitride semiconductors.

Important Dates

27th April 2011	Notification of Abstract Acceptance to delegates
18th May 2011	End of Early Registration Deadline
26th May 2011	Late News Submission Deadline
10th - 15th July 2011	**ICNS-9 2011**

Further Information

For further information on the Conference and Exhibition visit the website at: www.icns9.org and sign-up to join the mailing list. You can also contact the Secretariat at: **Congrex UK Ltd**, 4B 50 Speirs Wharf, Port Dundas, Glasgow G4 9TH

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Positive vibes abound at CS Europe

Greater levels of GaAs integration in tomorrow's smartphones, initial deployment of green nitride lasers in mobile pico-projectors and the insertion of high-modulation InP lasers and novel memories to slash power consumption in next-generation supercomputers were all on the agenda at CS Europe. **Richard Stevenson reports.**

It's easy to get your head stuck down in a project and never look up. After all, the pressure to hit deadlines, meet targets and help your company to keep pace with the competition can take up all the time you have. But if you never break out from that cocoon, you will never see the bigger picture – how your efforts form part of the growing success story of the compound semiconductor industry.

This wider view was one of the hallmarks of the plenary talk given by legendary MBE pioneer Klaus Ploog to the 150 delegates that flocked to the inaugural CS Europe conference, which was held on 22 March in Frankfurt, Germany.

Ploog, who is a former Director of the Paul Drude Institute for Solid State Physics, kicked-off the meeting by looking back at the very beginnings of compound semiconductor technology – in 1952, the German researcher Von Welker, wrote a paper discussing these materials as promising ones for making Hall sensors. Ploog then gave a rapid review of the fundamental properties of the compounds, before moving on to first discuss some of the challenges associated with nitride light emitters and then the opportunities that III-V devices have to cut the power consumption in next-generation supercomputers.

Although Ploog believes that there are three big challenges facing white LEDs for solid-state lighting – how to further increase efficiency, improve colour rendering, and cut costs – he did not dwell on these issues, preferring instead to focus on a problem known as the 'green-gap', the very low efficiency of LEDs in the green region of the visible spectrum. He explained that the InGaN material system can yield devices with wall-plug efficiencies of above 20 percent in the blue, but at 530 nm this efficiency is only 10 percent and falling fast. The AlInGaP family of materials cannot help. Although they can be used to make red LEDs with efficiencies in excess of 40 percent, this III-V alloy switches from a direct to an indirect bandgap as its wavelength is shifted to the green, causing its emission efficiency to plummet.

According to Ploog, pushing the emission of blue LEDs to longer wavelength is the most promising approach to making a green emitter. This requires an increase in the indium content of the InGaN quantum wells, which lie at the heart of the device, from a few percent up to more than 40 percent.

Producing such a material is tough, says Ploog, for three reasons: InN suffers from thermal instability; there is a high degree of lattice mismatch between nitride layers in a long-wavelength green LED; and strong internal electric fields in an InGaN LED with a high indium content pull apart electrons and holes in the quantum well, hampering high radiative efficiency.

To overcome problems associated with the thermal instability of InN, the InGaN films can be grown at lower temperatures. However, alloy clustering and a high point-defect density can then degrade material quality. It is also possible to combat the strong internal electric fields with the formation of epilayers on a different nitride plane. "We did this more than 10 years ago, but no-one was interested," quipped Ploog.

He finished his discussion of visible LEDs by highlighting the problem of droop, the decline in nitride device efficiency at high current densities. Possible explanations for droop include electron leakage or overspill, Auger recombination, polarization mismatch in the active region, defects, carrier delocalization, junction heating and a lack of hole injection. "There are numerous explanations in the literature, and [the cause of droop] is still a big debate," said Ploog. He pointed out that some designs of LED were able to reduce droop, but none had abolished it.

Ploog also touched on some of the challenges facing developers of nitride VCSELs. Higher reflectivities and lower series resistances are needed in the mirrors, along with higher hole injection efficiencies.

The latter part of Ploog's talk focused on the role that III-Vs could have in scaling silicon CMOS. He began by pointing out that the current supercomputer champ, China's Tianhe-1A, needs 5 MW to churn out calculations a rate of 2.57 petaflops/s (2.57 quadrillion mathematical operations per second). The US Defense Advanced Research Projects Agency has a far faster machine in mind, and has been considering what technologies would be needed by 2015 to build a supercomputer capable of a quinitillian (10^{18}) flop/s. One alarming issue is that such a machine would consume a colossal 1.5 GW if it were built by simply scaling the Tianhe-1A. Such a power requirement – more than the output of a typical nuclear power station – is unacceptable. Fortunately, according to Ploog, the compounds have the potential to step in and help out in three different ways: lowering the operating voltage of processors, enabling novel memory and powering optical interconnects.

One of the great strengths of the III-Vs is that they can yield transistors operating at just 0.5 V. Electron mobilities are also far higher than those in silicon, but hole mobilities are relatively low, which is why germanium is the leading candidate for pMOS structures. Scaling the transistors to 10 nm so that they can maintain the march of Moore's Law may also require the development of FinFET-like structures to combat short-channel effects, according to Ploog.

He also outlined a promising opportunity for a rather esoteric class of materials, known as the chalcogenides, that could help to improve the energy efficiency of computer memory. The state of this material family that is based on germanium, antimony and tellurium can switch between a crystalline conductive phase an amorphous resistive one under current-induced heating. This enables the development of low-voltage, non-volatile, high-density memories capable of 10^{12} write/erase cycles per second.

Another family of materials – InP and related alloys – could also help to spur development of more efficient supercomputers, in this case by improving data transfer rates. According Ploog, Intel has a vision for a 1 terabit/s transmitter containing 25 silicon evanescent 'hybrid' lasers, each emitting at a different single wavelength, coupled to 25 modulators and multiplexed into one output fiber. The key building block to this structure is the 'hybrid' laser that features an InP laser diode, developed by John Bowers from the University of California, Santa Barbara, bonded to a silicon waveguide. "These lasers will always have to be made out of III-Vs, because we need high efficiency and low power consumption," explained Ploog.

Osram target picoprojectors

One of the themes of Ploog's presentation - improving light emission efficiencies of nitride devices in the green - was picked up in a talk by Marketing Engineer Alexander Bachmann from Osram Opto Semiconductors. His presentation outlined Osram's development of high-power blue and green lasers for picoprojectors and began by referencing a report by the market analyst Yole Développement, which claimed that the light source for picoprojectors would be a $100 million market by 2015. Initially LEDs will dominate, before lasers take over in 2016.

The reasons for the switch, according to Bachmann, relate to the superiority of laser-based scanning beam projection technology. This can deliver high-contrast, high-definition images that are always in focus and have a vast colour gamut (200 percent NTSC) from a very efficient, tiny laser-based source with a height below 6 mm.

Bachmann detailed the laser requirements for a projected image with a brightness in excess of 10 lumen: a 90 mW red chip emitting at 635-640 nm, a 50 mW green cousin emitting at 515-530 nm, and a 40 mW blue variant emitting at 440-460 nm. All three diodes must be "kink-free" and produce a good beam profile, added Bachmann.

He then went on to talk about the single-mode blue, 450 nm lasers Osram produces today that deliver 50 mW or more, have an efficiency of 0.9 W/A and a median lifetime of 5000 hours. According to him, next-generation variants will deliver 80 mW or more, median lifetime will increase to 7000 hours and wall plug efficiency will go up from 11 percent to 14 percent. Osram's engineers have also developed 500 mW kink-free monomode blue lasers in the lab, revealed Bachmann, with good beam quality and a peak wall-plug efficiency of more than 20 percent.

He concluded his presentation by discussing green lasers sources, which are less mature than their blue counterparts. Today, says Bachmann, the most

CS Europe was held in the sumptuous Frankfurt Hilton, close to the city's banking district

common sources emitting at around 530 nm are either diode-pumped solid-state lasers or second-harmonic generation lasers, which are both relatively complex contraptions employing an infra-red source and a frequency doubling mechanism. Direct green lasers are sought after, because they are smaller and potentially cheaper.

Osram has been developing a green laser for several years, and Bachmann revealed some of the latest lab results: 522 nm lasers with 80 mW continuous-wave output and a wall-plug efficiency of 5-6 percent. Commercial production of 515-530 nm lasers with an output of at least 50 mW is set for 2012: "I'm confident that the price can reach $5-10 per piece," said Bachmann in response to a price inquiry from a delegate.

GaAs and GaN for wireless

Talks outlining the future for compound semiconductor technologies in the wireless sector were given by several speakers, including TriQuint's Senior Director of Corporate Advanced Technology Development, Otto Berger, and Jeffrey Shealy, Vice-President of RFMD's Mobile Products Group (Defence and Power).

Berger began with some jaw-dropping statistics: smartphones will account for more than 50 percent of the handset market in 2013; and over the next four years mobile data transfer will increase at a compound annual growth rate of 92 percent, leading to an exchange of 75 million terabytes of data in 2015. To cope with all this traffic, 3G and 4G networks will use complex modulation schemes to transmit and receive information over more than 40 frequency bands, including former TV bands and those currently used for GSM. The changes will have implications on the front-end technology in handsets, which must support multiple communication systems, including Bluetooth and WLAN, in parallel. Only power amplifiers with excellent linearity and efficiency will be suitable, says Berger, which will have to operate over multiple bands.

Keynote speaker at the inaugural CS Europe conference was MBE pioneer Klaus Ploog, who pioneered the development of GaN structures on non-polar planes

According to him, a typical 3G handset currently combines a quad-band GSM / EDGE and 4 band WCDMA. In future, handset makers will be looking for products that are cheaper, take up less space, and offer improved performance alongside higher efficiency at good linearity. Berger believes that the first step down this road will involve either the repackaging of two die into one module, or the monolithic integration of PA die. A "merged" power amplifier providing multimode and multiband operation on a single die will follow that, and even further ahead new technologies will be introduced to boost performance, such as envelope tracking. Berger is adamant that GaAs will continue to be the material of choice for the handset, thanks to its combination of strong RF performance, low-noise, high-voltage capability. "Silicon offers low cost and low performance," says Berger, "and it will not enter the smartphone market."

In Berger's opinion, GaAs is also an attractive option in base-stations: compared to the incumbent silicon LDMOS technology, a TriQuint TriPower lineup with Doherty driver uses 15 percent less energy. Cutting energy consumption in basestations can have a big impact environmental impact, because network infrastructure accounts for 71 percent of the carbon dioxide emissions produced by the mobile industry, according to the GSMA Green Manifesto. Berger touched on the GaN effort at TriQuint, highlighting the company's leading role in the DARPA Wide Bandgap Semiconductor program and its involvement in the Nitride Electronics neXt generation Technology (NEXT) project that is run by the same organization. The latter program is targeting development of high dynamic range logic operating at 300-500 GHz and based on E/D-mode GaN.

The role of power devices made from this wide bandgap material in commercial and defence applications was the focus of Shealy's talk. He began by listing the various markets where GaN can play a role: military communications; electronic warfare; military and civilian radar; cable TV line amplifiers; digital video broadcast; cellular base stations; and industrial, scientific and medical markets. According to him, GaN is attractive in all these applications, thanks to its ability to deliver high powers at high frequencies.

Shealy said that RFMD's GaN-on-SiC products combine a wide bandwidth with high efficiency and high power. According to him, tremendous bandwidth stems from high impendence and enables multi-band radios; a low capacitance holds the key to high efficiency circuit techniques that enables a smaller heatsink; and a high breakdown voltage supports the high power density that

Klaus Ploog pointed out that optical approaches could help to improve data communication within computer hardware. Intel has been at the forefront of efforts to do this, developing InP-on-silicon hybrid lasers. In this image of a 50 Gbit/s silicon photonics link, the transmit module (left) sends laser light from the silicon chip at the center of the green board, which then travels through optical fiber to the receiver module (right), where a second silicon chip detects the data on the laser and coverts it back into an electrical signal. Credit: Intel

unlocks the door to production of high-power amplifiers. "We tell our customers, if you can do it with silicon, you should," says Shealy, who by implication knows that GaN fits the bill when great performance is the key criteria.

He explained that the AlGaN/GaN HFETs that RFMD makes have 0.5 μm gate length, feature a dual field plate technology with the gate and source connected, and have a Ti/Al/Ni/Au ohmic contact and a Ni/Au gate. Production of these transistors that are grown on 3-inch SiC substrates kicked-off in 2009 using a process technology described by the company as GaN-1. This can be used to build devices that have an operating voltage of 28-65 V, a peak efficiency of 65 percent and a breakdown of 400 V. These are suitable for electronic warfare, military communication, radar and cellular basestation infrastructure.

Commercial launch of a GaN-2 process occurred last year. This process yields devices with an operating voltage of 15-48 V and a 6dB improvement in linearity over their predecessors. According to Shealy, broadband handheld radios, cable TV and industrial, scientific and medical applications could all benefit from devices made with this process. GaN-3 is in the pipeline and promises to deliver operating voltages in the range 36-65 V, improved linearity and high peak efficiency. Shealy says that the target applications are cellular infrastructure, public mobile radio and next-generation military radio.

RFMD manufacturers it GaN chips in-house in a high-volume GaAs fab, and this leads lead to lower production costs, says Shealy. He revealed that these are falling all the time, with every doubling in cumulative area shipped driving down manufacturing costs by 21 percent. Shealy also spoke about the company's GaN wafer production plans for their 2012 financial year, which began on April 4, 2011. Die manufacture should hit 2.3 million for the fiscal year, with monthly wafer starts increasing by 39 percent during that timeframe. RF amplifiers and switches will account for about 45 percent of production, cable TV line amplifiers another 30-35 percent and the remainder is expected to be devoted to foundry services.

According to RFMD's own research, the total addressable market for GaN RF power devices in 2011 is about $1 billion. Cellular basestations account for 49 percent of this, with the remainder split between radar (22 percent), military communication (9 percent), industrial (7 percent), broadcast (5 percent), electronic warfare (4 percent), and security (4 percent). Shealy revealed that the company's estimate of the value of the served available market for GaN high power amplifiers is $300 million, with four-fifths of that in the defence sector.

Shealey rounded off his talk by detailing arguments for the inclusion of GaN in various applications. For example, he believes that employing these wide bandgap devices in point-to-point backhaul radio simplifies the power-combining network, thanks to the high operating voltages that lead to high impedances, and it also cuts the number of components required – switching from GaAs to GaN cuts the number of amplifiers that are needed for a 10 W output at 6-9 GHz from three to two. Another example that he gave was the remote radio-head output transmitter for 4G and LTE networks, which requires a high-power amplifier. GaN amplification leads to small, lightweight units that have wide bandwidth, a peak efficiency of 65 percent and can operate at high temperatures, reducing cooling requirements. Shealey's abiding message, like many of the other speakers at the first CS Europe conference, was that the III-Vs are already playing a key role in many applications and many more opportunities lie in store over the coming years. Grab these, and sales will rise, propelling the industry into an even healthier state and giving us all an even greater incentive to lift our heads and see our collective progress.

www.cseurope.net

Alexander Bachmann from Osram Opto Semiconductors revealed that the German outfit will be launching 515-530 nm green laser diodes with an output of at least 50 mW in 2012. Credit: Osram

SEMI standards approves new standard 'SiC Defect Catalogue'

A meeting of the SEMI standards European Compound Semiconductor Technical Committee was held in Frankfurt, Germany, on 21st March, the day before CS Europe. Before the main committee meeting commenced, a short standards information session was held for the benefit of new participants. The main advantages of standards for the industry were summarised. Chief among these are the opportunity to produce simpler and cheaper products by avoiding unnecessary options, and the ability to freely exchange material processes and suppliers where standardised verification procedures are in use. The lessons learned from the history of GaAs, where two different flat options still are in use today because standards were not introduced in time to prevent this, were emphasised. Standardisation is an open, transparent and global process, which is driven by volunteers worldwide for the benefit of the semiconductor industry.

At the main committee meeting a ballot review on the new proposed standard 'SiC Defect Catalogue' was performed and the document was approved for publication as a new standard. In addition to this a ballot review on the 5-year review of SEMI M54-0404 'Guide for Semi-insulating (SI) GaAs Material Parameters' was carried out and the standard was re-approved without change. The status of the other active task forces in this committee, which are addressing carbon in GaAs and Determination of Etch Pit density in GaAs and InP, was reported.

The next meeting will be held in Würzburg, Germany in April. Further details are available at www.semi.org/standards or from the co-chair Arnd.Weber@Sicrystal.de.

Roy Blunt, IQE

CS Industry Award Winners **2011**

The inaugural **Compound Semiconductor Industry Awards** were presented at the **CS Europe Conference held in Frankfurt** and attended by 150 industry professionals.

On 22nd March 2011, Compound Semiconductor Magazine hosted the "CS Europe Conference" at the Hilton Hotel, Frankfurt, Germany. Attended by 150 industry professionals from the compound semiconductor industry and early feedback suggests the conference was a resounding success. With a dual track conference session, pioneering companies from around the globe outlined the best opportunities for the compound semiconductor industry, and what has to be done to seize them.

As part of the conference, Compound Semiconductor Magazine presented "The CS Industry Awards 2011". These awards recognised success and development along the entire value chain of the Compound Semiconductor industry from research to completed devices, with a focus on the people, processes and products that drive the industry forward.

The CS Industry Award Winners were shortlisted from 60 entries globally. A six week campaign through Compound Semiconductor saw 1500 industry specialists vote for their winners.

The winners are:

SUBSTRATES & MATERIAL AWARD
Sumitomo Electric Industries, Ltd.
for the world's first 6-inch diameter GaN substrates

Sumitomo Electric unveiled its 6-inch diameter GaN substrates back in November 2010. The Japanese firm has been producing GaN for many years, and began with the manufacture of 2-inch material, before proceeding to manufacture larger diameter GaN substrates. Gallium nitride based materials enable better thermal dispersion than

Richard Stevenson, Consulting Editor of CS Magazine presents CS Industry Award to EV Group

allowing LED manufacturers to reduce chip sizes and increase output power. Sumitomo anticipates that its 6-inch GaN substrates will also be used in power devices because of the excellent thermal conductivity, electric responsiveness and breakdown voltage of devices made using these materials.

EPIWAFER PROCESSING AWARD
EV Group for the 850TB/DB temporary bonding/debonding

EV Group's cost-effective method of temporary bonding of a device wafer to a carrier wafer prior to thinning was recognised for allowing device wafer thickness to be further reduced, enabling enhanced device performance. Additionally, temporary bonded wafers can be handled and processed like standard bulk wafers. Adding only two process steps, temporary bonding and debonding, allows thin wafer processing on standard equipment in any existing fab.

METROLOGY, TEST AND MEASUREMEANT AWARD
Cascade Microtech, Inc. for the BlueRay DS

Cascade Microtech's innovative BlueRay DS probe station allows testing double-sided substrates typically performed in a laboratory with the ability to meet the throughput and reliability requirements of a production environment. The BlueRay DS is a universal platform for a multitude of applications in semiconductor test such as LED, MEMS, and optical devices and has made testing backside-emitting LEDs possible. Cascade was awarded for being the first company to offer a modular wafer probing solution that grows with the process requirements of the development lab to the production fab.

MOST INNOVATIVE DEVICE AWARD
RF Micro Devices for the RFRD6460 PowerSmart

RFMD's RFRD6460 3G multi-band, multimode PowerSmart Power Platform is targeted at smartphones and mobile internet devices. The product was awarded for providing extensive flexibility and customisation, extensive battery life, all in a small footprint whilst accelerating original equipment manufacturer's time to market. Furthermore, the RFRD6460 contains the industry's first RF configurable power core, designed to seamlessly merge with its VSWR-tolerant, quadrature patented power amplifier technology.

FAB MANAGEMENT AWARD
Cree Inc. for 150-mm SiC substrates

Cree was recognised for a breakthrough in the development and commercialisation of high quality 150-mm SiC substrates with micropipe densities of less than 10/cm^2. The current Cree standard for SiC substrates is 100-mm diameter material. SiC is a high-performance semiconductor material used in the production of a broad range of lighting, power and communication components, including LEDs, power switching devices and RF power transistors for wireless communications. The significant size advancement of single crystal SiC substrates to 150-mm can enable cost reduction and increased throughput.

R & D AWARD
TriQuint for its advanced GaN research and development

After TriQuint received a DARPA research award of $16.2 million, and proceeded to develop new GaN based circuits through the Nitride Electronic NeXt-Generation Technology (NEXT) program. Much of the NEXT program is focused on developing devices that can be used in harsh environmental conditions experienced in aerospace and defence applications. There have been many new developments and these could set the stage for revolutionary new designs. TriQuint hopes that the leap in technology resulting from NEXT program research will be looked back upon as a significant turning point in the evolution of semiconductor engineering.

The next edition of CS will provide more detailed analysis of all the winners from CS Industry Awards.

RFMD turbo-charges its BiFET

At **RFMD**, we have upgraded our BiFET technology, replacing the JFET device that allowed integration of new DC circuits with a D-mode pHEMT. The result: more efficient products offering greater functionality.

Within the compound semiconductor industry, one of the most competitive markets is undoubtedly high-volume manufacture of GaAs-based chips. In this market, which is dominated by sales to handset manufacturers, chipmakers are only successful if they continually drive down average selling prices while developing smaller, high-performance components.

Today, sales of wireless tablets and smart phones are ramping fast, and the health of the order book of a GaAs chipmaker is governed by their ability to produce devices with very high levels of integration that can be housed in tiny packages. Long-term profitability also hinges on keeping a step ahead of trends in the consumer market, to ensure that products are built into next-generation prototypes of compact, data-rich devices.

Innovation holds the key to launching products offering ever-higher levels of integration and smaller footprints. In the latter part of the last decade, many of the world's leading GaAs chipmakers excelled in this area by combining an amplifier and a switch on the same chip. At RFMD, which is based in Greensboro, NC, we succeeded in this endeavour, combing a JFET and a HBT on a single die.

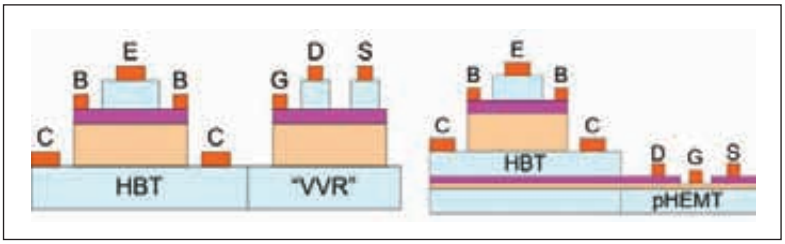

Figure 1. RFMD has upgraded its BiFET technology. The significant changes introduced for the second-generation technology are the replacement of the JFET with a D-mode pHEMT and additional optimization to the HBT. The impact on manufacturing that results from this new generation of BiFET is the ability to independently optimize and control the HBT and pHEMT performance

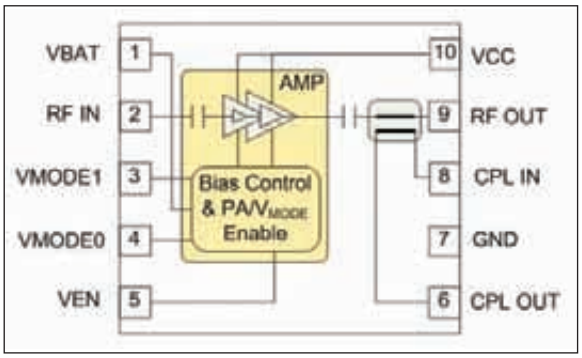

Figure 2. RFMD' s RF722X family delivers incredibly low levels of power consumption at low power levels, thanks to the introduction of three digital modes of operation

Staying at the forefront of GaAs technology demands continual improvement, and to this end we have recently developed a second generation of our BiFET technology, which we call our BiFET2 process. New products being designed around our technologically advanced BiFET2 process will essentially provide a 'refreshed,' or enhanced, version of our original BiFET1. Turning to the BiFET2 will equip products with greater functionality and a higher level of performance, including reduced current consumption and exceptional efficiency.

BiFET evolution

During the last decade, the backbone of the wireless handset front-end has been the pairing of a GaAs HBT

power amplifier (PA) with a GaAs pHEMT, which is responsible for RF switching. Initially these chips were fed with a regulated supply, but this was subsequently replaced with either a silicon controller IC or a GaAs FET die, due to cost pressures. The multi-die silicon approach has many downsides, requiring large design teams, high assembly costs, increased wire bonding and an increased size for the overall end product. So it is of little surprise that BiFET technology, which addresses all of these concerns, is popular.

Our first-generation BiFET employed a HBT alongside a simple JFET device, enabling internal voltage regulators to be created from this device [1]. Due to the need to incorporate an RF switching capability and DC regulation requirements, we, along with our competitors, have upgraded technology to next-generation BiFETs [2-4]. Our BiFET2 technology unites our latest generation InGaP HBT and D-mode pHEMT on a single die (see Figure 1 for a comparison of our two generations of BiFET technology).

One of the great strengths of the BiFET is its short development time. This stems from elimination of silicon control chips: we find that wafer fabrication cycle times for silicon are up to four times longer than those for our in-house manufacture of GaAs wafers.

The concept of technology re-use has dominated our thinking, right from our initial steps in research and development through to our final refinements of a high-volume process delivering high yields. We decided that the building blocks for our BiFET2 would be our first generation D-mode pHEMT and second generation InGaP HBT.

By leveraging existing, well-known, high-yielding device technologies, we are able to reuse the epi-capability and the fab processes that went into those original process technologies. Taking this approach enables us to increase BiFET process yields and take our end-products to new levels of performance and functionality.

Better BiFETs, better products

Our Cellular Products Group and Multi-Market Products Group have both designed products that exploit the benefits of the BiFET2. In the Cellular Products Group, this technology has given our designers the opportunity to integrate more functionality into the 3G product portfolio, empowering us to deliver industry-leading performance.

For example, the BiFET2 technology has underpinned our development of the RF722x product family. These pin-for-pin compatible WCDMA PA modules, which are housed

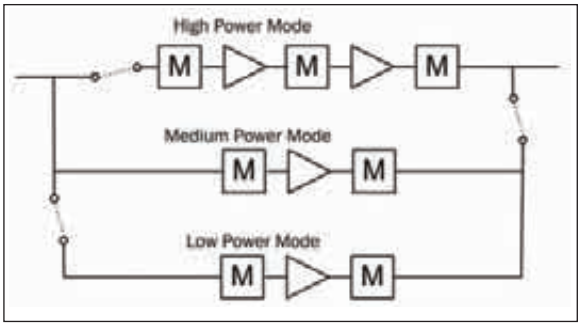

Figure 3. The RF722x family of 3G products isolate each mode independently

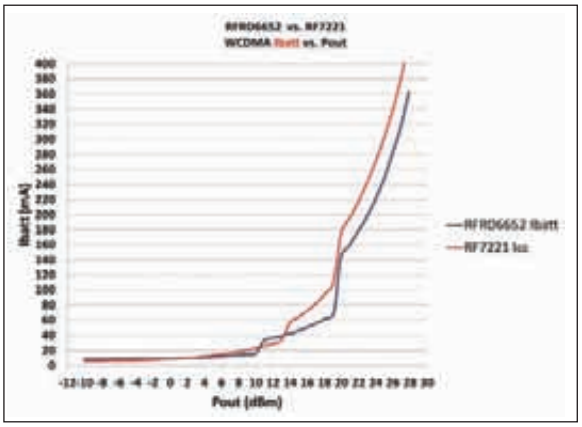

Figure 4. The latest BiFET technology enables increased battery life. This plot shows the output power versus current for the RF722x and RF724x. The latter is paired with the RF6562 DC-DC buck converter, and the reference design is referred to as RFRD6562.

in compact 3 mm x 3 mm packages, cover all the major frequency bands and are optimised for chipsets using three-mode control schemes. Turning to three digital modes of operation cuts current consumption as power levels decrease and yields best-in-class performance (see Figure 2 for the block diagram for the RF722x product family).

In the RF722x family of 3G products, our designers isolate each mode independently, thanks to the integration of the FET devices with the HBT PA. This is possible because of the high impedance of the FET switching device, and has paved the way to improved performance at each mode: The optimum matching impedance can be set in every case without trading-off performance in other modes. The upshot is minimization of current drain in each mode of operation, culminating in longer battery life (see Figure 3 for a detailed block diagram of the RF matching and switches).

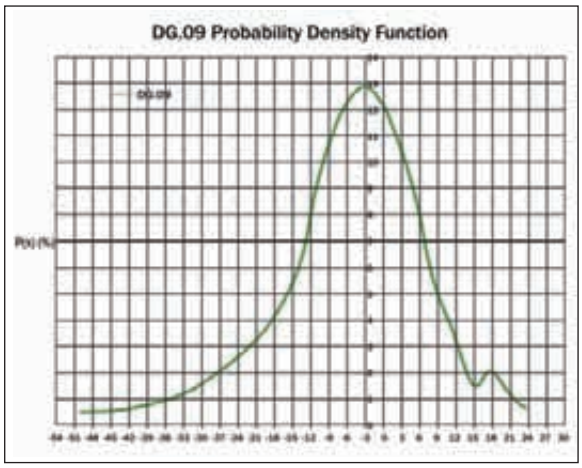

Figure 5. One suitable approach to comparing products serving the WCDMA protocol is the DG09 curve, which estimates the probability density of varying output powers for WCDMA voice modulation

The Cellular Products Group has also used the BiFET2 product family to create the RF724x portfolio of WCDMA PAs, which address all major frequency bands and deliver exceptional peak efficiency and current through multi-bias control.

This family of WCDMA products that is accommodated in the industry standard 3 mm x 3 mm package delivers peak linear efficiencies of 48-51 percent. In comparison, the current industry standard is just 40 percent. The pin out for the RF724x is identical to the RF722x shown in Figure 2, but the functional block diagram only has one RF PA line-up similar to the high power path in RF722x.

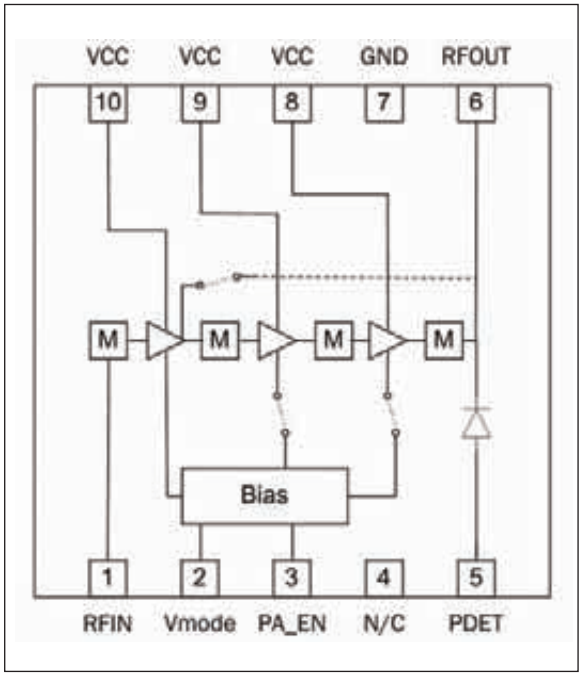

Figure 6. The RF5612 features RF and DC switching and is capable of dual-mode operation

One of the biggest differences between the RF724x and the RF722x series is design: the latter achieves efficiency optimisation through bias circuit control and the former realises its performance through RF switching and matching. In both cases the product family delivers a significant step up in performance over its predecessor thanks to incorporation of BiFET2 technology. When paired with an RFMD companion DC-DC converter, this BiFET2 product delivers best-in-class current consumption while seamlessly integrating into platforms where General Purpose Input/Output (GPIO) two-bit control is utilized.

The user provides the PA and DC-DC converter with Vmode 0 and Vmode 1 logic control, and the collection of devices optimises collector voltage and bias voltage to deliver unprecedented performance. The output power versus current for the RF722x and RF724x is shown in Figure 4, where the RF724x PA is paired with the RF6562 DC-DC buck converter (the reference design is referred to as RFRD6562).

A useful metric for comparing products serving the WCDMA protocol is the DG09 curve, which provides an estimate of the probability density of varying output powers for WCDMA voice modulation (see Figure 5 for an example). A similar approach has been used in the past to construct a CDG curve, which was developed for CDMA-based mobile operators in search of a more adequate depiction of what was really happening with a mobile phone's output power during typical operation. GSMA has quickly adopted a similar metric, as the expansion of WCDMA modulation showed similar attributes. Designers can efficiently compare WCDMA solutions by looking at the DG09 probability density function and the swept output-power-versus-current data that is collected. The DG09 for the RF722x and the RF724x with DC-DC converter (RFRD6652) are listed in Table 1. Further improvements are possible. The DG09 current of 21.6mA that is realised with the RF6562 converter can be reduced to just 13 mA, by introducing a continuously varied DC-DC converter.

In the Multi-Market Products Group, a representative BiFET2 product under development is the RF5612, a linear PA module housed in a 4 mm x 4 mm laminate package that is designed for WiMAX and LTE applications. Targets for the RF5612 include 25 dBm power at 2.5 percent error vector magnitude (EVM) for a 3.3 V supply voltage. BiFET technology is widely used in the RF5612. It provides RF and DC switching and results in a product capable of dual-mode operation. The transition between the high-power and low-power modes occurs at power levels of 8 dB. In low-power mode, an RF switch connects the output of the first stage directly to

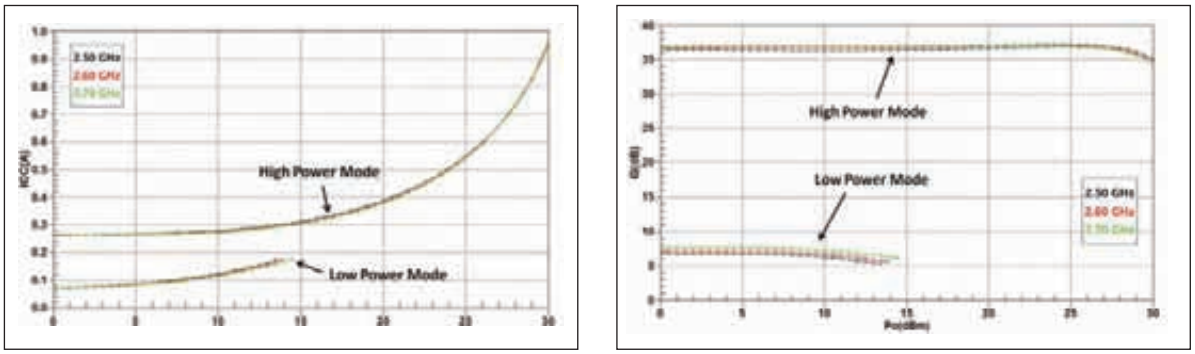

Figure 7. Plots of the current (a) error vector magnitude (b) and gain (c) for the RF5612 PA module. The black, red, and green represent frequencies 2.5, 2.6, and 2.7 GHz, respectively

the output pin, cutting current consumption thanks to DC switches that turn off the bias to the second and third stages. The pin out and block diagram for the RF5612 PA module is shown in Figure 6, and Figure 7 compares the EVM, current and gain – all as a function of output power – for both modes of operation. The plots reveal that the overall module current drawn in low power mode is less than 100 mA compared to more 500 mA at full power. Gain steps from 36 dB to 7 dB over this range.

Our development of the RF5612 PA module, plus that of other products detailed above, highlights our efforts to exploit BiFET technology in new products where integration, performance and small footprint are required. Cutting-edge manufacturers and developers of wireless products continually pushing the envelope for performance, size, cost, functionality and customer ease-of-use welcome this endeavour.

This article was written by RFMD's Bob Baeten, Director of Engineering, Multi-Market Products Group and RFMD's Jackie Johnson, Director of Engineering, Cellular Products Group.

	DG09
	mA
RF7221	24.34
RFRD6652	21.64

Table 1. DG09 current for RF722x vs. RF724x with DC-DC converter (RFRD6652)

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Cluster or batch: what's the best tool for LED chipmakers?

Contacts, transparent conductive oxides and reflective coatings influence the performance of cutting-edge high-brightness LEDs. Each of these requires thin-film deposition, which can be realised by either using a collection of batch tools to process a set of wafers in single process steps, or a by employing a far more integrated cluster tool to handle a single wafer in a whole series of process steps. **Allan Jaunzens from Evatec** outlines the merits and drawbacks of both approaches.

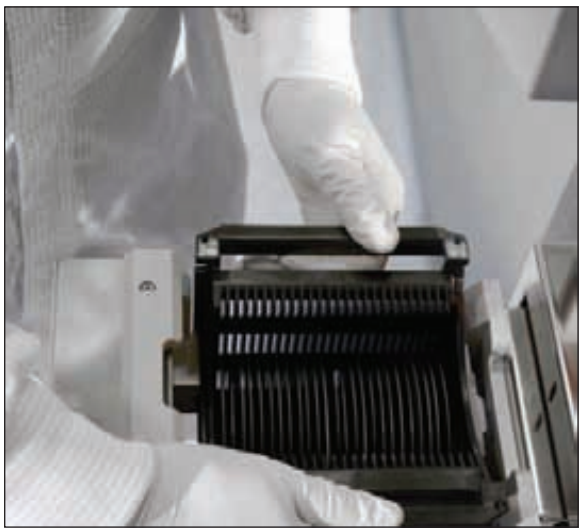
Although MOCVD growth of active materials lies at the heart of the latest high-brightness LEDs, these light emitters can only reach their full potential when additional layers have been optimised too. This includes the transparent conductive oxides that combine efficient carrier injection into the active region with minimal absorption of light generated by the device, and reflectors and anti-reflection stacks that control the output profile of the chip (see "Thin films in LEDs" on p. 38 for a more details).

Every LED chip manufacturing facility is equipped with tools that can deposit and pattern various types of thin films on substrates with diameters of 2-inches or more. The nature of the films that are deposited, the way this is done and the materials that are used will vary from LED manufacturer to LED manufacturer, but all of these chipmakers are targeting increases in device output, higher electrical efficiency and lower manufacturing costs.

Cutting LED production costs is possible by transferring production to larger substrates. Although this move requires capital expenditure, it could pay dividends, because the LED market is currently growing at a tremendous rate and is widely tipped for further expansion throughout this decade. Equipment suppliers are aiding this transition by launching so-called 'bridge tools' that are compatible with 6-inch substrates and can also accommodate 8-inch production in future.

Typical box coater batch system – available in chamber sizes from 0.5 to 2 m

Robot loading of substrates into an evaporation batch system involves: Front end cassette load / unload, substrate pick, dome load including metrology substrates, and dome transfer to coater



Every LED manufacturer that is looking to scale-up production will have to weigh up the relative merits of using batch or cluster tools for the processing of larger wafers. Key issues are the impact that each approach will have on the deployment of damage free processes, the possibility to match substrate throughput and handling with both upstream and downstream processes and whether this technology offers future flexibility.

Essential requirements for LED makers

Although LED producers differ in their choice of chip architectures and their selection of thin-film materials, they do share several requirements for their processes. First and foremost, they all want processes that they currently use to scale to 6-inch without any compromise in physical uniformity, in either etch or deposition, over what is achieved currently on 2-inch or 4-inch material. This requirement includes no changes in uniformity to the optical or electrical properties of the film, which is only possible by designing reactors that can retain control of substrate temperatures and internal film stresses over larger process areas.

Another common demand by LED makers is improved repeatability – in terms of batch-to-batch, wafer-to-wafer and wafer-within-wafer – when migrating to larger diameters. Currently, LED manufacturers are asking for repeatabilities of +/-3 percent or better to enable them to increase manufacturing yields and ultimately maintain profit margins.

Chipmakers also want the introduction of processes that increase chip efficiency, which is influenced by the choice of thin film materials and how they are incorporated into the device. On top of that, they are looking for faster cycle times. Etch and deposition processes tend to be fairly

quick, so the greatest gains can come from reducing times associated with pumping, heating, cooling and handling a batch of wafers. Transferring processes to lower temperatures is also viewed as an attractive move, because it diminishes the likelihood of film or substrate damage and can enable the introduction of new materials technologies.

Batch processing: the pros and cons

Batch and cluster platforms with specific hardware enhancements can fulfil the deposition and etch requirements of many LED makers – their strengths and weaknesses will be discussed in turn.

Batch platforms for deposition and plasma etch are already well established in 2-inch and 4-inch LED manufacturing lines, where they are either employed to deposit films by evaporation or PECVD, or used to selectively etch away material. As the name suggests, substrates are processed in batches, traditionally with manual loading and unloading of a set of wafers. The process chamber must be pumped and vented for each cycle.

Evaporation steps in LED fabs often involve commercial 'box coaters', which have a pedigree in industry stretching back 50 years. They are flexible manufacturing tools that can handle a whole range of coating materials, substrate types, sizes and shapes. Coating uniformities as good as +/-1 percent over small wafers can scale up to 6-inch or 8-inch with the right know-how and larger platforms that can accommodate larger substrates sizes and boost throughput.

One great strength of evaporation is that it lends itself to fast, low-cost development of new processes – all that may be required is simply a change in evaporation materials. Increased throughput and higher yields are now possible, thanks to new hardware developments including recent advances in e-gun engineering technology that have led to a step change in the number of hearths available for evaporation, even in relatively small systems. This reduces system fill and maintenance times.

Another relatively new variant is ion-assisted evaporation. This can deliver better films than conventional evaporation where relatively low particle energies of the coating flux, in the range 0.1 to 1eV, are typical. Such energies lead to low surface mobility, which in turn causes moderate film densities (80-90 percent of the theoretical value) that can ultimately limit the stability of the film's optical and mechanical properties.

This technology involves an ion source, which is used to produce inert and reactive ions that are accelerated towards the substrate, bombarding the growing layer during deposition. The momentum of these particles is transferred to surface atoms, improving their mobility and reducing voids associated with conventional evaporation. The upshot is a layer density that is closer to that of the theoretical values. What's more, this superior film is formed without the need for high process temperatures, which are often used in conventional evaporation processes that improve film quality but lengthen the overall process time.

Substrate Size	2"	3"	4"	6"
Dome Capacity	152	66	42	20

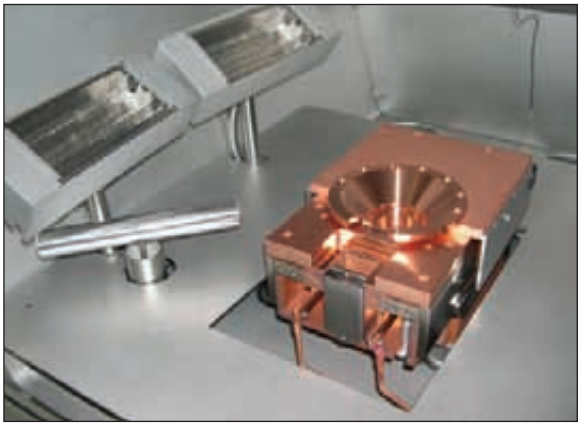
Table 1. Batch capacity according to substrate size for mid-size 760 mm evaporator

Cathode Diameter (mm)	250	350	450
2" Substrate Capacity	18	40	65

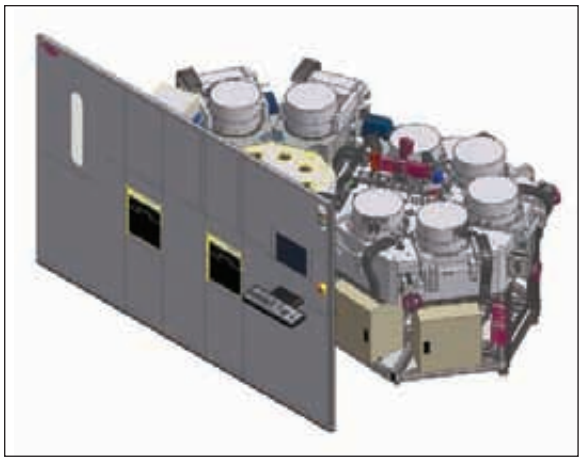
Table 2. Typical development of batch size for 2-inch substrates with cathode scale up in plasma processing systems

The higher quality of the film results in a reduction in shifts of optical performance with temperature and humidity. 'Densification' to an even higher degree is possible by turning to 'plasma ion assist' and 'ion plating' variants of this technique. In these processes the material that is being evaporated is also partly ionised and arrives at the substrate with high kinetic energies - typically 10 eV. The films that result have an extremely low degree of absorption or loss.

Traditionally, high-volume LED manufacturing has involved the manual handling of wafers. Some chipmakers are now



e-gun with 'digital control' for ITO or metals evaporation processes



Complex cluster configuration with separate load, unload stations, central handler, a batch module for multiple sputter cathodes and three additional single process modules

looking to eliminate all possibe sources of handling errors and yield losses, and are turning to cassette-to-cassette systems that involve robot wafer loading of the coating dome within a controlled environment. Such systems can also fully track wafer position for the coating process, thereby enabling the highest levels of traceability and statistical process control. Another deposition technology that is compatible with batch processing is PECVD, a well-established technology that is capable of depositing thin and thick SiO_2 layers on 2-inch or 4-inch substrates on typical batch platforms of 300 mm. The purpose of the layer dictates the required film quality, but modern PECVD reactors offer LED makers sophisticated possibilities, such as control of internal film stress and the film refractive index in addition to the usual deposition rate.

It is also possible to eliminate manual cleaning of PECVD reactors by purchasing a tool that features *in-situ* plasma cleaning. Although more complex than evaporation, PECVD can be scaled without compromise in deposition uniformity. 500 mm reactors are now available that can either handle larger wafers or significantly increased batch quantities for 2-inch and 4-inch wafer sizes. A major limiting factor for larger tool sizes is the handling and loading times relative to deposition times, which can dominate in the case of thinner films.

In addition to film deposition, etching is often used to bolster LED output according to substrate type. This step can pattern substrates and increase extraction efficiencies, and it can also be used to process the epitaxial films. Depending on the material and process requirements, either reactive ion etching or plasma-enhanced etching are routinely used by LED chipmakers. Just like PECVD, reactor technologies can be scaled up without compromising in etch uniformity

A case for cluster tools?

The major alternative to batch processing is to use a cluster tool. It is an approach that is widely used in the silicon industry, which already processes wafers up to 12 inches in diameter.

Unlike typical batch tools, cluster tools integrate many different process types on a single platform. Process chambers remain under vacuum continuously, resulting in excellent performance stability and the opportunity to perform a sequence of steps without intermediate exposure to air.

The cluster-based approach involves cassette-to-cassette operation, and 2-inch or 4-inch 'mini-batches' can already be handled conveniently. As the LED industry migrates to 6-inch, the approach will change to direct wafer handling, which is also well proven for silicon processing

Up until recently, cluster tools incorporated a series of 'single process' modules, with the wafer being passed between them by a central handler. However, some equipment manufacturers are now starting to integrate batch modules into their tools, a step that blurs the distinction between the traditional definition of batch and cluster tools.

Although more complex to manage that a traditional batch tool, a cluster tool architecture brings the flexibility to add new modules or technologies as production demands change or grow. Traditionally, one downside of these tools has been a lack of customisation for LED manufacturing that offer increased process control flexibility, but that shortcoming is now being addressed.

New features for cluster tools include adjustable source and substrate geometries that simplify development and optimisation of new processes; sputter source technologies for rapid film prototyping in thin-film alloys, which enable simultaneous deposition from several

Simple cluster configuration with load lock, central handler and single process modules for sputter, etch

sources; and integrated metrology facilities, such as stress measurement, plasma and optical monitoring for stress control and accurate end-point termination of optical layers.

Cluster tools are well suited to the integration of typical PECVD and ICP etch processes that have already been described for batch tools. What's more, it is possible to address some of the handling limitations for batch tools by integrating the same processes on a cluster platform. And last but by no means least, thanks to their load lock configuration, cluster tools are also ideal for sputtering, a high-energy coating technologies that is becoming more mainstream in LED manufacturing.

Although the sputtering process is more complex to scale than well established evaporation processes, the high kinetic energies (10-20 eV) and the increased mobilities that result enable formation of dense, stable single layers and also the deposition of dielectric stacks for anti-reflection coatings in reflector and contact layers. One of the biggest advantages of sputtering is that it can yield films with outstanding mechanical and optical layer performance, which can be formed without substrate heating, a usual requirement when using conventional evaporation. Eliminating this heating step slashes process and handling time, while opening up more possibilities to process materials that degrade at elevated temperatures. The most recent developments also enable deposition of high-quality, transparent conductive oxides, such as indium tin oxides layers with customized transmission and resistivity requirements without any damage to plasma-sensitive sub-layers and also eliminates the post-deposition, high-temperature anneal often required after evaporation.

Horses for courses?

It is widely expected that cluster tool sales to the LED industry will increase. However, that does not mean that any single approach will become dominant to the exclusion of all others. While the cluster-based approach is undeniably attractive, converting existing fabs from batch tools and processes to cluster-based alternatives is costly and time-consuming.

In addition, the competition from cluster tools is certain to spur further improvements to existing batch processes – that is not surprising, given that manufacturers of evaporation tools have been doing this for years and years so that their technology continues to play a leading role in many industries.

For some chipmakers, there are also concerns that failure of a cluster tool could be far more disastrous than that of a batch tool, impacting the progress of several processing steps. However, some LED manufacturers will not be put off by this, but rather be won over by the appeal of automated handling and process flexibility safe in the knowledge that these tool types are proven in 6-inch, 8-inch and even 12-inch silicon wafer fabs. In short, the debate between batch tools and their cluster-based rivals is by no means over.

Plasma sources enable enhanced evaporation at lower process temperatures

Thin films in LEDs

A modern high-brightness LED incorporates many thin films. These may include:

- Heat sinks for reducing the operating temperature of the LED, so that it can allow the device to run far more efficiently. Tertiary or quaternary alloys need to be deposited, often with strict limitations on processing temperature to avoid damage to sub-structures.
- Contact layers that are typically single or multi-metal layers with a thickness of 100-300 nm. These films must realize good bonding to the substrate and ensure excellent electrical conductivity.
- Transparent conductive oxide layers that marry high optical transmittance to low resistivity. By far the most popular choice is indium tin oxide (ITO), but materials such as aluminium-doped ZnO are gaining attention. Requirements are typically a film transmittance of at least 90 percent and a sheet resistance that is ideally less than 10 Ohm/☐.
- Reflective layers that control the direction that the light is emitted, leading to enhancements in extraction efficiency and ultimately increasing the lumen-per-Watt produced by the device. The simplest approach is to insert metallic reflectors: Performance is only moderately sensitive to the angle of incidence, but reflectivity levels are limited. Optical performance is better with hybrid reflectors, which are metal mirrors that incorporate a few dielectric layers to boost reflectivity across a limited wavelength range. A third option is to employ dielectric-only reflectors, which are made by pairing two materials with significantly different refractive indices, such as SiO_2 and TiO_2. This approach yields the best optical properties if enough pairs of contrasting materials are stacked on top of each other, but the resulting composite is sensitive to the angle of incidence and relatively complex to manufacture. A significantly different approach to boosting LED extraction, which does not involve thin-film deposition, is to pattern the substrate prior to growth.

Multi-source manufacturing: Overcoming challenges reaps rewards

When the order books swell to breaking point, chipmakers can go and build a new fab. But isn't it better for them to hold on to their cash and find a foundry partner that replicates in-house processing and provides a second source of product manufacture? This is the **Anadigics'** way, say the company's **Dan Stofman and Kevin Chang,** who tell the story behind implementing this strategy.

At some point in the career of nearly every IC designer the time comes when they face the challenge of designing products for different semiconductor fabs or technologies. This could result from the designer switching employer, or involve the company adding a foundry to its manufacturing strategy. However, regardless of what exactly happens, there is often the need to translate existing designs to a new fab or process.

At the outset, developing products for a different fab is tough, due to a lack of experience with a new design kit – the set of tools and documentation that describe the capabilities and limitations for device layout, processing, modeling, test, reliability and statistics. This kit provides a complete design environment – including design rules, design rule check algorithms, and the device models for making any device.

Foundry service providers have excelled at delivering robust, well-developed design kits for their customers. However, the nature of RF and microwave devices often requires additional design kit customization to enable manufacture of unique structures. This presents a challenge when working with a foundry service.

Matters are further complicated by a foundry's specific implementation of any process using both bipolar and field effect transistors (a BiFET process). For years GaAs circuit designers have longed for the flexibility that silicon designers enjoy with BiCMOS technology, which can take advantage of the best characteristics of both bipolar transistors and FETs. This dream is now a reality, thanks to the introduction of a III-V BiFET technology that allows integration of HBTs and pHEMTs, implemented in InGaP on a single GaAs die.

However, this newfound freedom comes with a price, creating additional challenges when designing products in multiple BiFET fabs. The BiFETs are being used to

manufacture high-efficiency power amplifiers for mobile phones and other cellular communications equipment. This is a growing market – according to Christopher Taylor from the market analysts Strategy Analytics, the GaAs device industry has recovered nicely from early 2009 to register strong revenue gains, driven primarily by GaAs-based power amplifiers in smartphones. Growth in smartphones and other cellular devices will continue, leading to a doubling of power amplifier demand to more than 4.5 billion units in 2015. Smartphone use is also helping to spur a dramatic increase in data consumption on wireless networks, leading to growth in infrastructure radio equipment, which also uses GaAs.

At Anadigics, which is based in Warren, NJ, we are at the forefront of the manufacture of chips incorporating BiFET technology. To meet the demands of our customers and increase our sales in the handset sector, we are increasing manufacturing capacity. To do this, several years ago we embarked on a multi-source strategy, adding a foundry component to our existing in-house capability. Such an approach combines tremendous flexibility in overall capacity with the retention of fixed internal capacity that is invaluable for technology and product development. We needed to find a fab partner that could reproduce the range of high-quality, differentiated products that we had developed in our 150mm InGaP GaAs fab. Examples of our trailblazing efforts include the first development and implementation of a commercially viable BiFET process into volume production, called the InGaP-Plus, plus the development of several generations of products using this type of process.

In the fourth quarter of 2009, we revealed that we had signed a strategic agreement for the design and manufacture of GaAs ICs with the Taiwan foundry WIN Semiconductors. Our thinking behind this move was to utilize the GaAs fab capacity of WIN for several new

Anadigics has developed a BiFET process at its fab in Warren, NJ

product lines, while we would continue to manufacture other new product lines and existing products in-house. WIN is a good match for us, because it provides foundry services in HBT technology utilizing InGaP as the emitter material. This Taiwanese foundry was selected because one of its HBT processes can deliver BiFET products with RF power, performance, linearity, and reliability similar to our own InGaP-Plus BiFET processes.

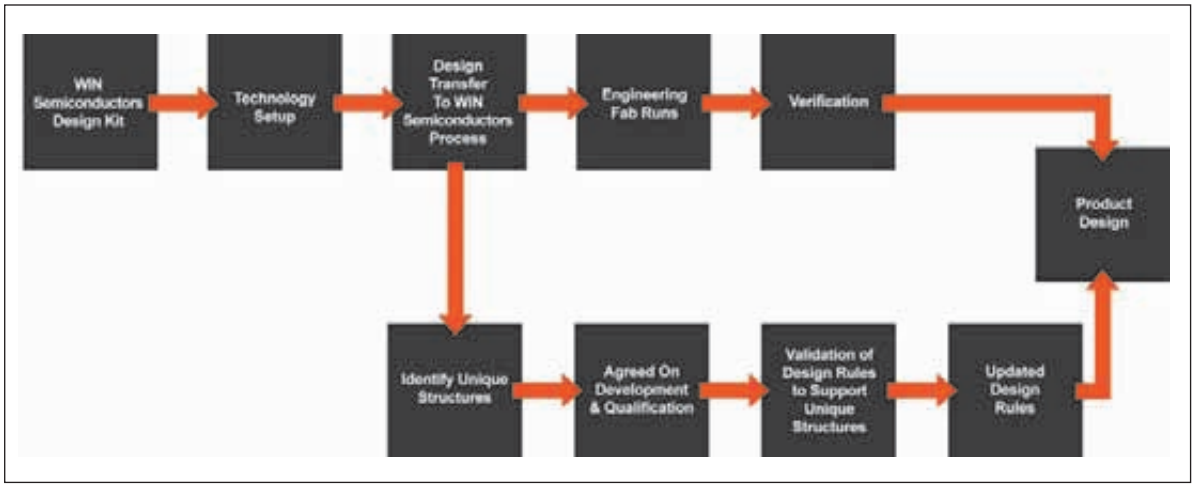
Since announcing our strategic agreement, we have worked closely with WIN, and our engineers have leant how to utilize WIN's foundry for the production of industry-leading 3G and 4G RF power amplifier devices. Implementation began with WIN providing us with a design kit for the desired BiFET process. Our engineers were then able to start porting designs from the in-house fab process to that used by our foundry partner. However, inevitably, there was some teething-trouble, with some device structures failing to exactly match the characteristics of those produced at the Warren fab.

After extensive analysis, the causes of the divergent product performance characteristics were identified as a combination of differences between the BiFET processes at the two fabs and the inclusion of several unique device structures utilized in our novel design approaches. To address this, engineers from both firms worked together, extending and qualifying WIN's design rules to accommodate the required device structures. These rules were optimized for both our product development and WIN's process.

Success in our relationship with WIN hinged on development of device models that are optimized for the specific products that are fabricated with the BiFET process employed at the Taiwanese foundry. Designers can simulate the overall performance of full circuits and products with transistor device models that capture the electrical behavior of devices. When our engineers use these models, they are particularly interested in the behavior of transistors under specific, large-signal RF conditions. This interest extends to the impedance and parasitic capacitance of metal interconnects between and to these circuit elements.

In addition to accurate device models, designers tend to use 'rules of thumb' or known methods to design their products. Often these are based on experience in a proven process using predictable device models. Consequently, the best way to determine the optimal device structures needed for full product design was to begin by process-engineering wafers with test structures at the WIN fab. Our technology team characterized these test structures and then defined new models that would support our performance and layout requirements. Specifically, we used this characterization to support new scalable models for FETs and HBTs.

Once the new models were generated, they were included in a design kit specific to the simulation tool used by our IC designers – the Advanced Design System (ADS) from Agilent Technologies. An ADS design kit



The approach that has been adopted for transferring of Anadigics' technology to WIN's processing line

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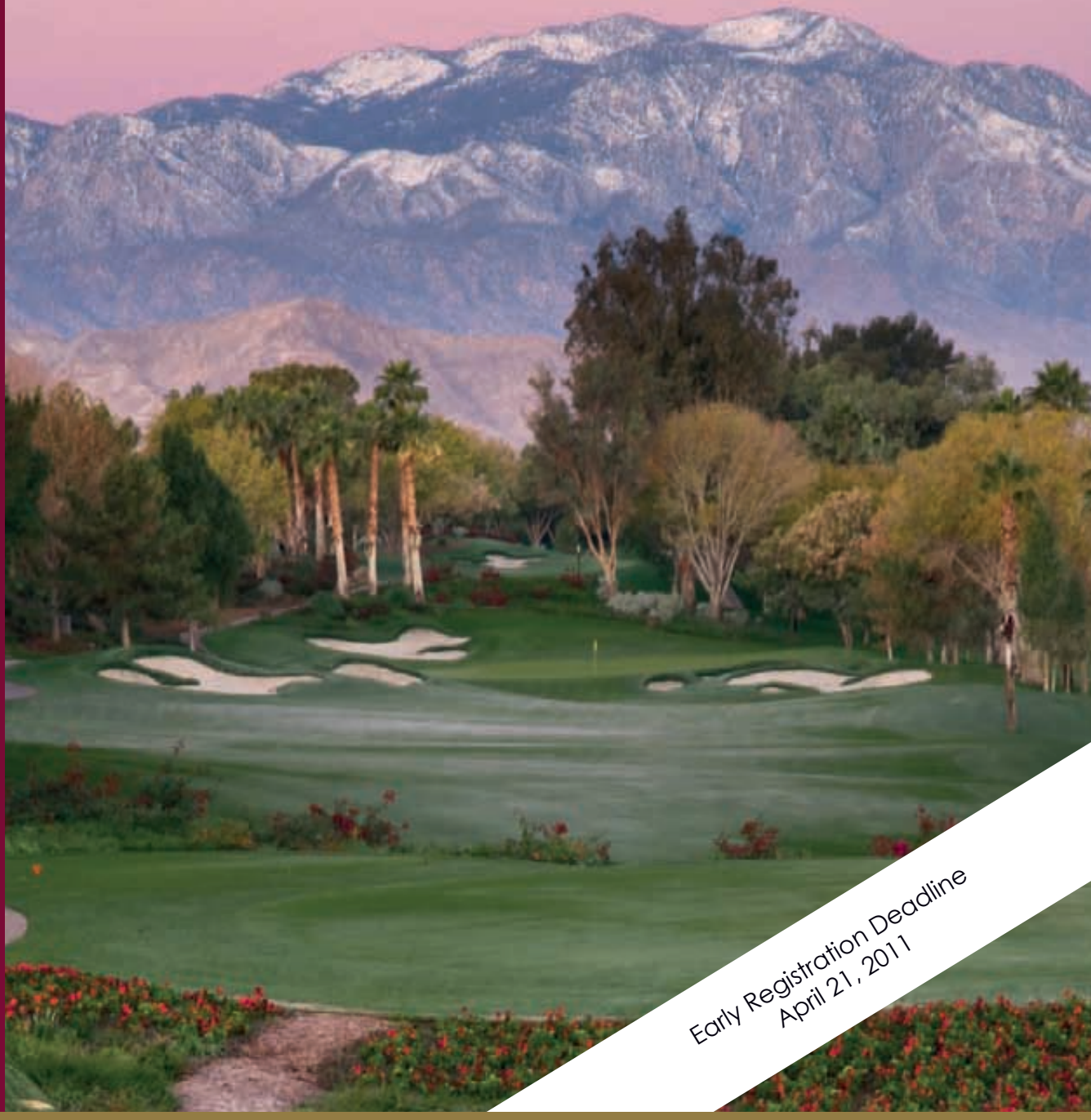

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includes all information needed to design and simulate an IC in a supported process. Device definitions are included, along with the associated model files and subcircuits, the corresponding schematic symbols and the presentation of the symbols to the user in convenient library and palette listings.

After the new design rules were qualified by WIN, the official design rule manual was updated. This document consists of a series of numerical and descriptive physical layout rules that designers must adhere to, to ensure high-yield product manufacture. Since the design rules are specific to a particular semiconductor manufacturing process, new and converted IC layouts must be updated to comply with all rules for the targeted process.

The next two steps were to roll out identical definition and documentation of the new design rules at both fabs, and then update the design rule check (DRC). A DRC is a comprehensive, automated verification for ensuring the physical layout of a particular IC complies with all design rules. We also created a custom DRC regression test suite of sample device layouts to ensure that any changes to the DRC software did not create any false reported rule violations from other design rules that were not changed. By putting in the effort to create both a comprehensive design rule manual and well-implemented DRC software, we had laid the foundations for realizing higher overall product yield and reliability, shorter design cycles and faster time to market. Once the new DRC had been validated in conjunction with the design manual and the test suite, it was run on existing engineering mask sets to confirm its ability to reliably identify design rule violations. Creating the new device models and a design kit is an iterative process. When devices and structures are first created, they are done so using agreed-upon development and qualification criteria. At this stage, the proposed design rules are also validated, to confirm that they support the desired devices and structures and produce the anticipated results. Once the initial device models are completed and the design kit updated, the process is repeated to optimise the models, design manual, and ultimately, the DRC software.

Whatever this approach sounds like in theory, it will be judged by how it works in practice. And it does – we have been able to develop products for manufacture at WIN, while churning out chips with industry leading performance and reliability at our own fab. What's more, we now find it as easy to roll out new products at our partner's fab as we do in Warren. We decided that the first set of products to reach volume production at WIN would be the HELP3DC series, which is based on our unique High-Efficiency-at-Low-Power (HELP) technology. The HELP3DC series provides the same benefits as its predecessors, but has been optimised for use with DC-DC converters. The new HELP3DC products manufactured at WIN have shown the same industry leading performance as the HELP products manufactured in-house.

Our implementation of multi-source manufacturing required significant effort from our partner and ourselves. This yielded a significantly enhanced design kit, thanks to leveraging our exceptional engineering technology, device modeling, and design talent in harmony with the processing and technology expertise at WIN. The upshot is the opportunity we now have to design new products at WIN with the same performance as products made in-house. This enables us to ship even more products that give customers the world-class performance and reliability they have come to expect.



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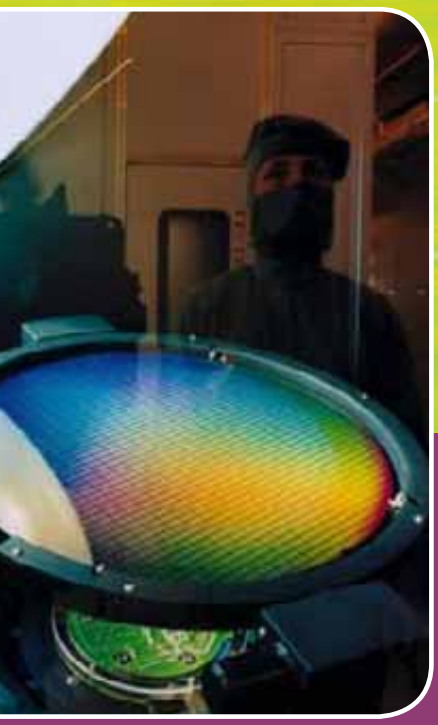

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Processing of thin compound semiconductor substrates

In the first follow up to the successful inaugural Compound Semiconductor Industry Awards, **Thorsten Matthias, Thomas Uhrmann, Chad Brubaker and Paul Lindner of EV Group** discuss their award winning temporary bonding system

Compound semiconductor materials such as GaAs, SiC, LiTaO3 or InP offer distinct electrical advantages, but typically suffer from the low thermal conductivity. The most effective method for heat transfer is wafer thinning. Due to the brittleness of these materials thin compound semiconductor wafers are temporarily bonded to a rigid carrier for thinning and backside processing. The bonded wafers can be processed in standard fabs with standard equipment.

Thermal management of compound semiconductor devices was the primary driver for thin wafers and devices in the past. Recently with the advent of 3D stacked devices and heterogeneous integration the reduced form factor has become an important benefit. For thermal management the wafers are first thinned and then through wafer vias are created. The vias serve both as heat sink and as the electrical grounding for the device [1]. Thinning and subsequent processing of compound semiconductor wafers presents an enormous challenge to the overall production of devices on these materials, as the materials themselves are extremely fragile (much more so than silicon).

Figure 1: Ultra-thin GaAs wafer mounted on a film frame

Processing of front- and backside of a thin wafer can be implemented by two ways. The first approach is that the thin wafer is handled directly. This requires dealing with the problem of thin wafer handling on each individual piece of equipment, which requires specialized wafer cassettes, robot end-effectors, pre-aligners and process modules. This approach has several disadvantages. The required capital expenditures are very high as every piece of equipment has to be upgraded. The bow and warp of thin wafers changes with every single film layer that is added. This means that even if thin wafers of one specific product can be handled directly, it might not be possible to handle thin wafers of another product directly. There is also the risk that changes to the process flow change the stress within the thin wafer in such a way that direct handling is not possible any more.

There are also technical limitations to direct handling of thin wafers as the wafer breakage rate inevitably increases sharply for ultra-thin wafers. The second approach is to temporarily bond the thin wafer to a carrier wafer. The carrier wafer provides mechanical stability to the thin device wafer. Temporarily bonded wafers can be handled and processed like standard bulk wafers. This last point is very important for the cost-of-ownership of thin wafer processing. Adding two process steps, temporary

bonding and debonding, enables to run thin wafers in existing fabs with existing equipment.

The generic process flow for thin wafer processing with temporary bonding to a carrier wafer is straight forward. The starting point is a device wafer with complete front-side processing. This device wafer is bonded to a carrier wafer with its frontside in the bond interface. After bonding the first step is back-thinning of the wafer.

Usually back-thinning is a multistep process consisting of mechanical back-grinding and subsequent stress relief etching and polishing. After back-thinning the backside of the device wafer can be processed using standard wafer fab equipment. The carrier wafer gives mechanical support and stability and protects the fragile wafer edge of the thin wafer. When all backside processing is done, the wafer gets debonded, cleaned, and transferred to a film frame or to other output. Temporary bonding and debonding is an enabling technology.

Benefits

The main benefits of temporary bonding and debonding using a rigid carrier are:

Compatibility with standard fab equipment

The bonded wafer stacks literally mimic a standard wafer. The geometry of the bonded stack can be tailored in such a way that the resulting geometry is in accordance with SEMI wafer standards. This brings the advantage that standard wafer processing equipment can be used without any modification. No downtime at all is required to switch between processing of standard thick wafers and temporarily bonded thin wafers.

Compatibility with existing process lines

With the addition of only two pieces of equipment, the temporary bonder and the debonder, a complete process line or even fab is enabled to process thin wafers.

Compatibility with existing processes

The mechanical and thermal properties of the bonded wafer stack are very similar to a standard thick wafer. This enables the use of existing wafer processing recipes, which have been proven and qualified for standard wafers.

Compatibility with future process flows

The user has the full flexibility to change the processing sequence and the individual process steps for backside processing. After temporary bonding the device wafer is securely protected against mechanical damage. Furthermore, adding process steps or modifying the process flow does not impact the cost of ownership for thin-wafer processing.

Figure 2: The fully automated EVG850 Temporary Bonder with dry-film Lamination

Compatibility with product roadmaps

For many devices and products, the roadmaps lead to even thinner wafers in the future. With temporary bonding the entire backside processing becomes independent of the wafer thickness. Reducing the wafer thickness does not require any modifications or adjustments to the processing equipment.

An important consideration is the selection of the rigid carrier. The mechanical, thermal and geometrical properties of the carrier can have significant impact on the wafer processing. The typical choice is a carrier wafer, whose thermal expansion is matched to the device wafer.

Unmatched thermal expansion between device and carrier wafer would result in wafer bow at elevated process temperatures. It is possible to use a carrier wafer out of the same material as the device wafer as this guarantees perfect matching of thermal expansion. In addition a standard wafer as carrier guarantees compatibility in terms of wafer properties e.g. flat position and flat length. This approach is regularly being used for e.g. Si, LiTaO3 or InP wafers. For GaAs wafers frequently sapphire carriers are being used. Many CS wafer fabs employ legacy carrier concepts using oversized carriers. Temporary bonding and debonding is compatible with any kind of carrier independent of material, size and shape.

The temporary adhesive has to fulfil many different requirements. The material has to work with a variety of surface properties and films. The coating method has to be compatible with high wafer topography and bumps. The material has to be rigid at room temperature for backgrinding, resist high temperatures and typical back-end chemistries and must not out gas in vacuum. On top of that after all the backside processing has been done,

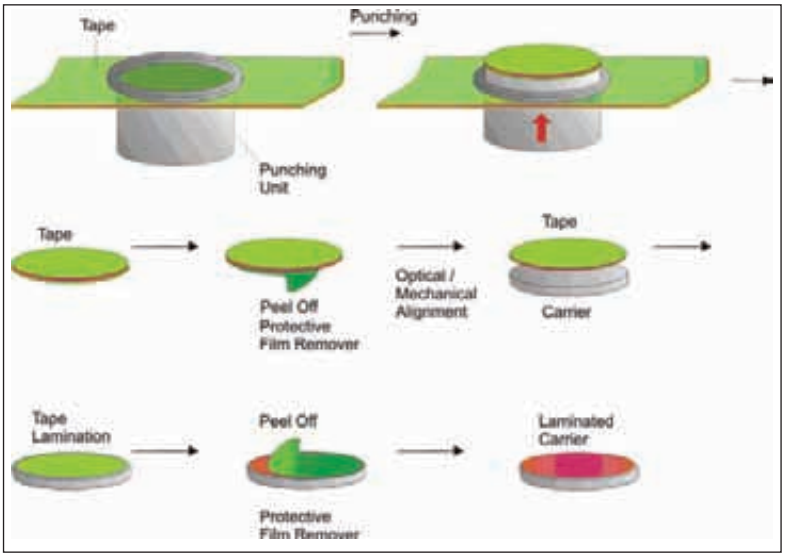


Figure 3: Schematic process flow of the dry-film lamination module on the EVG®850 fully automated Temporary Bonder for dry-film adhesives

the adhesive has to be debondable and cleanable. This list of requirements explains why extensive material and process qualification is so important. For temporary bonding there are 3 success criteria:

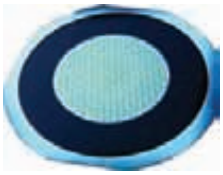
Wafer alignment

It is important that the device wafer is well aligned to the carrier wafer. Obviously any overhanging edge of the thin wafer would result in wafer breakage. For volume manufacturing it is important that the device wafer is accurately centered on the carrier wafer. For all the downstream processes after back-thinning the wafer stack will be registered and pre-aligned based on the perimeter of the wafer stack. Due to the wafer edge bevel the device wafer diameter gets reduced during thinning so that ultimately the perimeter of the carrier wafer becomes the perimeter for the wafer stack. As the SEMI standard for wafer diameter is quite loose it is important to perform a centre-to-centre alignment instead of an alignment with edge pins. Only centre -to- centre alignment with <50µm alignment accuracy guarantees high throughput for all downstream processes as the device wafer is immediately centred after pre-alignment.

Void free bond interface

Any entrapped gas bubble can potentially burst the thin wafer during processes at elevated temperatures. Vacuum cavities e.g. topography on the wafer not completely filled by the adhesive, would significantly impact the mechanical stability and the local thermal properties. Therefore it is absolutely necessary to achieve void free bonding. Reflowing adhesives e.g. thermoplastics can fill up all topographical features during the bond process. Dry film laminates can only deal with very limited topography on the wafers. In order to achieve a void free bond interface the wafer bonding system has to provide very good temperature and pressure uniformity.

Figure 4: The EVG850DB debonding system integrates debonding of the thin wafer, cleaning and film frame mounting within one system



Minimal thickness variation

During backgrinding the device wafer will be processed in such a way that the device wafer backside is coplanar to the outer surface of the carrier wafer. The carrier wafer itself has very high co-planarity. However, any thickness non-uniformity of the adhesive layer will result in thickness variations of the thin device wafer. A wedge in the adhesive layer creates a wedge in the thin wafer, whereas convex or concave adhesive layer variations create a convex or concave thin device wafer.

Waxing lyrical

In the past wax was very popular as adhesive. Wax is dispensed at elevated temperatures onto the active device wafer surface or the carrier wafer. On the EVG850TB Temporary Bonding system the temperature of the coating chuck can be adjusted to ensure a uniform layer thickness of the spin coated wax layer across the wafer. The thickness of the spin coated wax layer ranges up to some tens of µm (e.g. 20-50µm).

After coating the substrates get transferred to a bake module in order to remove the solvent prior to bonding. The bond occurs in the bond chamber under vacuum (5e-2 mbar) and at temperatures up to 210°C. After the bonding step the wafer pair is loaded to a chill module and then transferred to the receive cassette. At elevated temperatures the adhesion of wax decreases drastically allowing debonding of the substrate with very little applied force. The main challenge with wax is the low thermal stability.

Dry film adhesive tapes, especially double-sided thermal release tapes enable higher process temperatures. The EVG850TBL Temporary Bonder is the first production system combining dry film lamination and wafer bonding. The dry-film adhesive tape, supplied to the machine on a reel-to-reel basis, gets punched out according to the requested dimension and is laminated onto the carrier substrate with optical tape-to-carrier alignment within +/-15µm after automatically removing both protective films.

Figure 3 is illustrating the process flow in the dry-film lamination module. Advantages of the punching technology compared to the cutting technologies (laser and blade cutting) are better edge quality for minimum interference with the bonding and back-grinding process, no carrier edge degradation through cutting blades and more flexibility in tape dimension and shapes.

The tape diameter can be chosen to be slightly smaller than the carrier diameter, thus enabling pyramid structured assemblies for minimum wafer edge breaking rates during mechanical back-grinding. The main challenges of dry film adhesive tapes are the limited ability to deal with topography and the moderate total thickness variation of the tapes.

Specialist adhesives

Specially designed spin-on thermoplastic adhesives like the Brewer Science WaferBONDHT 10.10 provide high thermal stability and high chemical resistance. As the material is applied by spin coating the thickness variation of the material is very good even for thick layers up to 100µm. During the bond process the adhesive is reflowing and can fill all topography on the wafer. The EMC-3D consortium [2] has qualified the WaferBOND HT 10.10 adhesive from Brewer Science Inc. for the complete via-last TSV process [3]. Anadigics reported the successful implementation of WaferBOND material and the EVG850 platform in high volume for a 150mm GaAs HBT back-end process [4].

The debonding technology is the cornerstone of thin wafer handling. EVG's production debonding system EVG850DB integrates debonding of the thin wafer, cleaning and film frame mounting within one system (Figure 4). Alternatively the thin wafers can be loaded into coin stacks or put onto single wafer carriers. For thermoplastic adhesives, a slide-off debond process is used.

Because it's a thermal release process, slide-off debonding enables both usage of a silicon carrier (as compared to UV debonding which requires glass carriers) as well as non-perforated carriers (compared to solvent debonding). Slide off debonding enables a low-cost carrier – basically a standard silicon wafer. The debonding process itself happens within the adhesive layer, with zero force exerted on the device wafer surface during debonding. After debonding, the residual adhesive layer is cleaned with a single wafer solvent cleaning. The ability to clean the adhesive after debonding is another key specification for a temporary adhesive. It makes the thin wafer handling solution compatible with solder bumps (undercut!) in the interface.

Mechanical debonding would create significant force on the bump with the risk of ripping the bumps off or leaving residue on the wafer. Slide-off debonding has been qualified for wafers with bumps or pillars on the front- as well as backside of the thin wafer [3] (Figure 5).

Conclusion

Thin wafer processing is a necessity for many devices in CS wafer manufacturing. Recent advances in material and process technology allow thin wafer processing at high process temperatures and for wafers with high topography like bumps. Ultra-thin wafers with <50µm thickness can be processed in each standard fab with the addition of just two process steps, temporary bonding and debonding.

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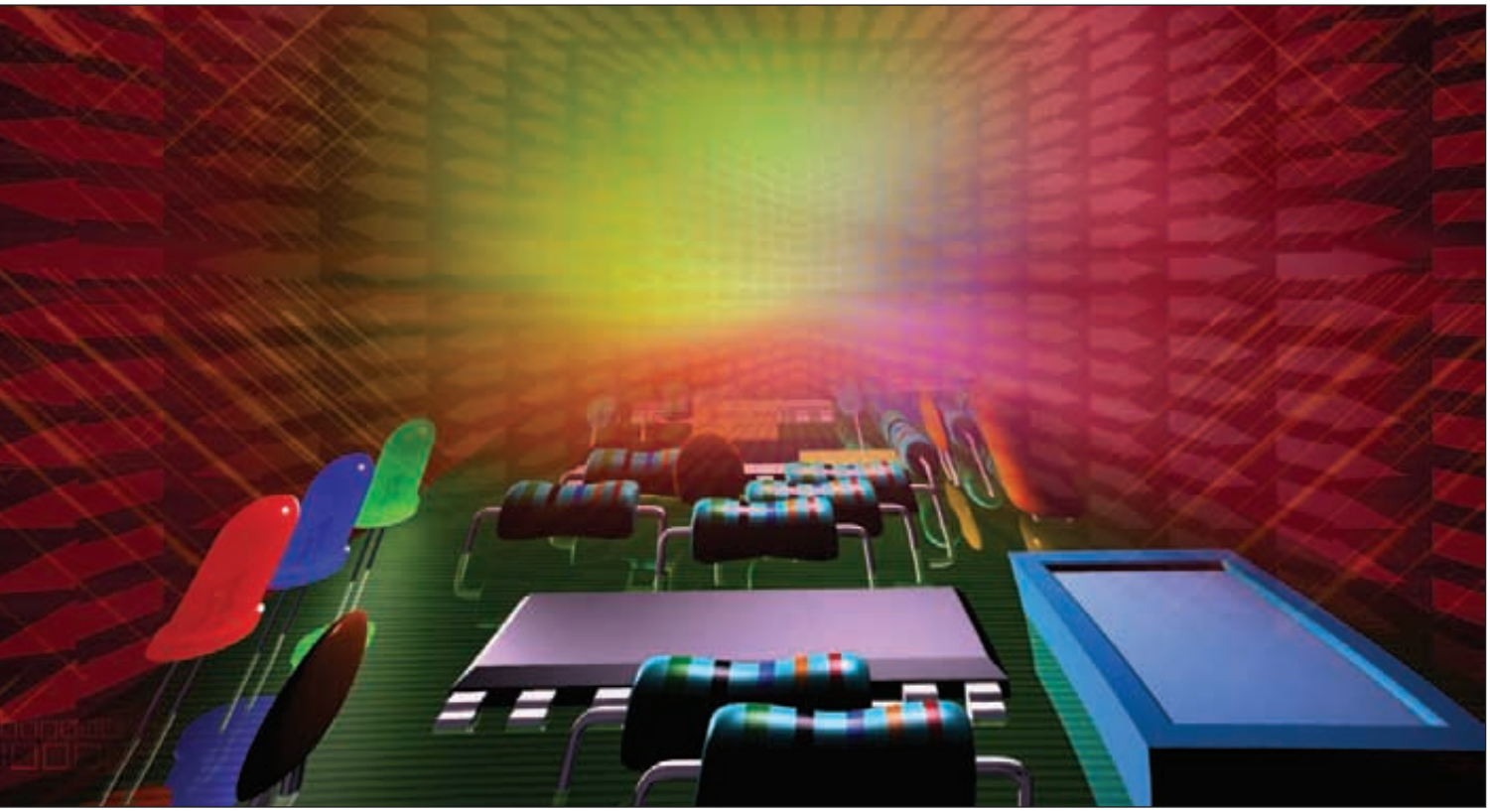


Integrating the compounds with silicon

Are you are looking for a resource covering all aspects of III-Vs on silicon development, from growth approaches and *in-situ* monitoring tools to a survey of the capabilities of LEDs, lasers, transistors and solar cells? If so, you might consider investing in a copy of *III-V Compound Semiconductors: Integration with Silicon-based Micoelectronics,* writes Richard Stevenson.

The benefits of building III-Vs on silicon have been known for decades. Such an approach can marry the low costs, high levels of circuit integration and large manufacturing volumes associated with silicon with a range of superior properties that come from the III-Vs.

Making real devices from this pairing is very tough, but years of endeavour in this direction are starting to bare fruit. A few years ago a partnership between Intel and the University of California, Santa Barbara, produced an InP-based laser on silicon. And in the last month or so, Sematech and imec have independently produced III-V transistors on 200 mm silicon, and Bridgelux has reported 135 lm/W GaN-on-silicon LEDs.

Such efforts will spur further developments of III-Vs on silicon, and drive an increase in the number of researchers starting to work in this area. One of the ways that those just starting out in this new field can learn the secrets of earlier successes is by trawling through the literature, but if that sounds too much like hard graft, they have an easier option available: Picking up a copy of the

recent publication from CRC Press, *III-V Compound Semiconductors: Integration with Silicon-based Microelectronics*.

Like many specialist texts, each chapter is written by an expert in their field to improve overall coverage. This helps to create a comprehensive book that covers the issues associated with growth of compound semiconductors on silicon, characterisation of the resultant materials, and details of various devices: LEDs, transistors, lasers and solar cells. The treatment of these topics is fairly academic, but in between the smattering of equations are snippets of sage advice on how to produce good-quality epilayers.

Two of the biggest obstacles to producing high-quality nitrides on silicon are the significant lattice and thermal mismatches between the pair of materials. Left unchecked, this causes the wafers to bow. However, this distortion can be monitored by *in situ* reflectance sensors that provide an insight into the causes of bow and ultimately help to address this issue. An entire chapter is devoted to this important topic, covering the theory behind the cause of strain and the bowing that results, as well as illustrating this issue with practical examples.

Various approaches that can yield high-quality nitrides on silicon are covered in an excellent, wide ranging chapter written by Armin Dadgar from the Otto-von-Guericke University Magdeburg. This section of the books deals with substrate orientations; patterning of the surface; use of intermediary SiC and oxide layers, including the porous variety; silicon on insulator structures; and layer transfer.

One of the most engaging chapters of the book is *III-V Solar Cells on Silicon*, which is co-authored by Steven Ringel and Tyler Grassman from The Ohio State University. These writers begin by making a compelling case for using silicon, rather than germanium, as the basis for making triple-junction solar cells on earth and in space.

According to them, silicon substrates are half the mass of germanium equivalents, and less brittle, enabling a four-fold reduction in the mass of the cell. This is a significant advantage, given the amount of energy that it takes to put objects into orbit. In addition, the thermal conductivity of silicon is twice that of germanium, improving heat dissipation in an environment where cell temperature can routinely reach 80-100 °C.

In concentration photovoltaic systems these advantages also make a difference. However, here the biggest benefit associated with a switch from a germanium to a silicon substrate is lower manufacturing cost, which stems from growth on far larger diameter material.

Ringel and Grassman go on to outline the challenges of forming high-quality III-V layers on silicon. This includes issues related to lattice and thermal mismatch, plus the unwanted formation of anti-phase domains. Approaches to overcoming these potential problems are then highlighted and the results of single and multi-junction cells described, before the authors draw the chapter to a close by describing the benefits of moving to an inverted metamorphic design.

Avoiding formation of anti-phase domains is also discussed in a chapter by Edward Chang from National Chiao Tung University. This section of the book details development of III-V transistors for logic and high-frequency mm-wave applications. Efforts on silicon substrates have been very limited, so understandably Chang describes progress made on III-V platforms, which should pave the way to future progress. Unfortunately, the chapter does not cover the very recent advances made at Sematech and imec on 200 mm silicon, so the coverage is already a little off the pace.

This is one of a very few quibbles that I have with the book, which also suffers from minor repetition occurring during the introduction of every chapter. This is probably inevitable, given the number of authors, and a price worth paying for expert commentary. At $160 the book isn't cheap, but is still a small price to pay if it cuts the time to develop devices or processes.

Adding wells combats droop

Upping the number of quantum wells from six to nine slashes LED droop

RESEARCHERS from the University of California, Santa Barbara, have shown that increasing the number of quantum wells in an LED can slash its droop, the decline in device efficiency as current is cranked up.

The team, which includes Stephen DenBaars and Shuji Nakamura, fabricated two high-power blue LEDs that differed only in the number of quantum wells. The version with six quantum wells had an external quantum efficiency (EQE) of 50.7 percent at 20 mA, falling to 38.4 percent at 60 mA. In comparison, the chip with nine quantum wells had an EQE of 49.7 percent at 20 mA and 49.5 percent at 60 mA. Both devices had mesa sizes of 526 μm x 315 μm and a peak emission wavelength of 447 nm.

One of the noteworthy features of this study is that it uses high-power LED structures. In this case, the devices are grown on patterned sapphire.

The LEDs fabricated by the researchers featured 20 nm-thick barriers, 4 nm-thick quantum wells and a 10 nm-thick undoped $Al_{0.15}Ga_{0.85}N$ electron-blocking layer. "Though our wells may be a little thicker [than those used in many commercial LEDs], it is the best structure for a high output power LED at UCSB," revealed Tanaka.

He believes that LEDs with more quantum wells suffers from less droop because the current density in these structures are lower, reducing non-radiative Auger recombination.

In addition, he argues that more quantum wells can reduce the overflow of carriers – particularly electrons – through the active region.

S. Tanaka et al. Electron Lett.
47 335 (2011)

Nanolithography promises cheaper telecom lasers

Engineers produce 20 mW lasers with a side-mode suppression ratio of 60 dB using nano-imprint lithography

A PARTNERSHIP between Tampere University of Technology and the laser manufacturer Modulight promises to cut the cost of manufacturing single-mode, 1.5 μm InP-based lasers.

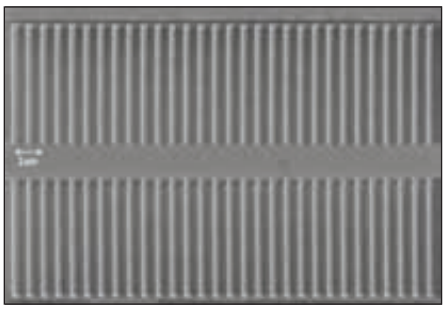
This class of laser, which is used in telecom networks, normally employs a buried Bragg grating for selective optical feedback. One major downside of this approach is that it requires epitaxial re-growth, which complicates fabrication and can degrade device performance. The established way for avoiding re-growth is to turn to electron-beam lithography. Thanks to the efforts of the Finnish team, nano-imprint lithography can now provide a cheaper alternative. "While EBL lithography requires an investment in the range of € 2 million, modern UV-mask aligners require an investment of less than € 0.1 million for the UV tooling," explains lead-author Jarkko Telkkälä from Tampere University of Technology.

According to Telkkälä, nano-imprint lithography should also cut production costs. Electron beam lithography is a direct write technology, and exposure time for the wafer can be several hours. In contrast, nano-imprint lithography can imprint a whole wafer in a few minutes. "In general, nano-imprint lithography is suitable for roll-to-roll process implementation, and hence is more suitable for volume production and cost-effective processing of distributed feedback laser than any other method," says Telkkälä.

He and his co-workers produced their InP lasers using a fabrication approach that is similar to the one they have previously used to make GaAs lasers emitting at 894 nm and 980 nm, and GaSb-based variants operating at 1945 nm.

One major step forward with the latest batch is the improved coupling of the optical field to the surface gratings, which results from an adjustment to the laterally corrugated ridge-waveguide layout.

By switching to a grating with a large lateral extension, aspect-ratio-dependent etching was avoided, preventing formation of non-etched pockets at the bottom of the grating trenches that dramatically reduce coupling efficiency.



Single-mode 1.5 μm lasers feature gratings that were formed using a EVG 620 mask aligner with tooling for nano-imprint lithography

The engineers fabricated 1.5 μm lasers by taking a commercial InP-based epi-wafer from Modulight and applying a grating pattern with a 726 nm period. The soft stamp patterned and UV-curved nano-imprint lithography resist – a mr-UVCCur06 liquid polymer from Micro Resist Technology, formed an etch mask for the PECVD grown 100 nm-thick SiN layer. This nitride film was used again as the etch mask for InP.

Dry etching to a depth of 1400 nm left 350 nm of p-side cladding untouched. The SiN layer was then removed, and the wafer passivated with SiO_2, which also filled the grating trenches. Conventional ridge waveguide fabrication steps followed to yield a 300 μm-long laser that was attached, *p*-side up, to a copper mount.

These devices produce 20 mW with a side-mode suppression ratio of 60 dB and an emission linewidth less than 200 kHz. Preliminary lifetime tests revealed no degradation in the first 1000 hours of operation.

"These results are comparable of better to most 1550 nm DFB lasers available on the market," claims Telkkälä.

J. Telkkälä et al. Electron Lett.
47 400 (2011)

Electron leakage can improve efficiency droop

ELECTRON leakage can, in some cases, significantly improve efficiency droop in wide-well InGaN double-heterostructure (DH) LEDs according to researchers at the Chang Gung University, Taiwan. However, the peak external quantum efficiency (EQE) is decreased and the start point of efficiency drop shifts to a higher current density.

The latest results are contrary to previous results, which have indicated carrier leakage from multiple quantum wells (MQWs) can cause efficiency droop. The researchers also found that inserting an extra magnesium-doped GaN/InGaN/GaN quantum well structure on the p-side of the electron blocking layer data showed electron overflow.

Lin, a lead member of the team, commented when driving LEDs at a current density greater than 80 A/cm^2, other than reduced Auger recombination, the efficiency droop is probably dominated by the injection efficiency of holes rather than electron leakage in the wide-well InGaN DH LEDs.

The team compared the performance of two LED structures. The electron blocking layer (EBL) was 20nm thick p-type $Al_{0.1}Ga_{0.9}N$.

The researchers compared the EQE and efficiency droop of the control sample (LED-1) to that of a sample with a 3.5-nm-thick undoped $In_{0.25}Ga_{0.75}N$ test well inserted between the p-type $Al_{0.1}Ga_{0.9}N$ EBL and p-type GaN layer (LED-2). In order to improve the electron overflow into the test well, the p-type $Al_{0.1}Ga_{0.9}N$ EBL was reduced to 5 nm.

The EQE of the control sample reached a maximum of 11% at 84 A/cm^2, then, dropped rapidly to 5.7 percent at 521 A/cm^2. For LED-2, the EQE reached 8.0 percent at 209 A/cm^2 and decreased monotonically to 6.1 percent at 521 A/cm^2.

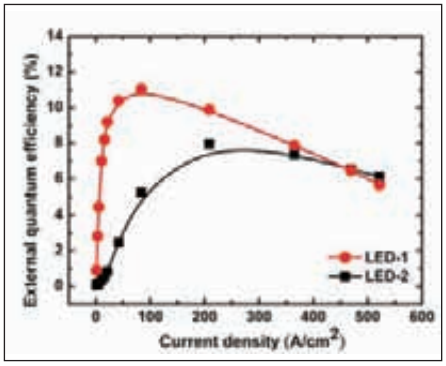


Fig 1: EQE of samples LED-1 and LED-2 as a function of forward current density

LED-1 exhibited a significant drop of 48.5 percent in EQE in the measurement range of 83.4 to 521 A/cm^2, while the EQE drop of LED-2 was only 23.1 percent in the same measurement range. Chang said that the team will now focus on further improving the injection efficiency of holes through optimisation of the structure of the p-type EBL.

L.-B. Chang *et al.* Applied Physics Express **4** 012106 (2011)

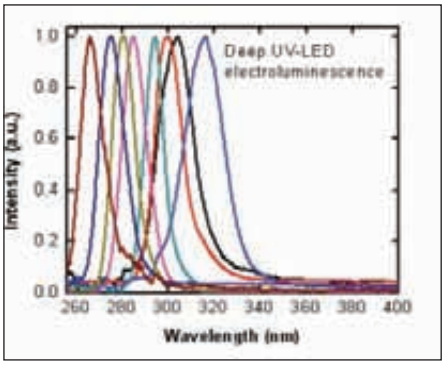
Plasma-assisted MBE boosts deep UV LED efficiency

BOSTON UNIVERSITY'S Wide Bandgap Semiconductor Lab claims that it has fabricated the first efficient deep UV-LEDs in the 320 nm to 265 nm range grown by plasma-assisted MBE.

This method of growth was modified to lead to AlGaN alloys with a strong band structure potential fluctuations and LEDs with high internal quantum efficiency (IQE). Over the last two decades, progress in producing efficient deep UV LEDs has been hindered by the fundamental limitation in material properties of AlGaN. The lack of phase separation in AlGaN means that the band structure prevents potential fluctuations and carrier localisation.

This leads to high sensitivity of the IQE of quantum wells in AlGaN-based LEDs to the density of dislocations and other defects, compared to InGaN-based blue LEDs. The IQE bottleneck in deep UV-LED must be addressed before such devices can be used in high power applications such as municipal and industrial water disinfection.

This breakthrough was achieved by growing the active region of the deep UV-LEDs under a liquid phase growth mode. The



growth proceeds by dissolving the arriving nitrogen and aluminium atoms in the liquid gallium and their incorporation in the growing AlGaN film from the liquid phase. Thickness variations of the liquid gallium on the top of the growing AlGaN film would normally produce lateral variations in the composition of the AlGaN alloys. This would lead to a band structure promoting potential fluctuations to prevent carriers for migrating and recombining non-radiatively in dislocations or other defects. High IQEs of between 30 percent and 50 percent have been reported by the team since 2009.

The deep UV LEDs structures were grown by plasma-assisted MBE incorporating such high IQE QWs together with a number of novel features such as polarisation enhanced n- and p-type AlGaN carrier injection layers.

300 μm x 300 μm bare-die devices emitting at 273 nm have produced 0.4 mW output power at 25 mA DC drive current and 1.3 mW at 100 mA in the pulsed mode. The EQE peaked at 0.4 percent.

"We identify the problem in the deep UV-LED efficiency being the IQE, where drastic improvement in fundamental material growth technology needs to be obtained compared to incremental gain from chip design optimisation or packaging," says lead author Yitao Liao.

He explains that he and his co-workers have developed a unique process to manufacture AlGaN-based UV-LEDs with high efficiency on low cost *c*-plane sapphire. "Our advantages in the IQE will become more evident at the device level after these bare-die LEDs get packaged to improve light extraction and heat sinking."

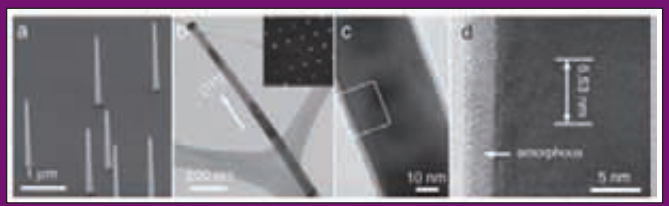
Yitao Liaoet al., Applied Physics Letters **98** 081110 (2011)

Strain could unleash tunneling in GaAs nanowires

Researchers from the University of Sydney and the Australian National University has discovered that GaAs nanowires (NWs) exhibit super stiffness. They also show extraordinary elasto-plastic deformability with a typical elastic strain of 11 percent, which is 100 times greater than that of conventional bulk GaAs.

Thanks to changes in the band structures of semiconductors with mechanical strain, this discovery could provide enormous possibilities for the semiconductor industry. Via strain engineering, the opportunity to tune the electronic and optoelectronic properties of nanowires becomes possible. Bulk III-V semiconductors including GaAs are usually very brittle with negligible elastic and plastic strain. The researchers studied the mechanical behaviour of GaAs NWs using the *in-situ* transmission electron microscopy (TEM) nano-compression technique. This is capable of simultaneous in-situ high-resolution force-displacement measurement and TEM imaging.

Yanbo Wang of the University of Sydney made several important findings. Firstly, the elastic strain limit reaches 10–11% for NWs with diameters between 50 to 150 nm and that obvious plastic deformation occurs in NWs with diameters less than 25 nm. Secondly, the Young's modulus of the NWs increase significantly



An SEM image of GaAs NWs (a). A TEM image of a NW and a < 110 > SAED pattern (b). An enlarged TEM image of a NW (c). A high-resolution TEM image (d) showing the part marked with a white rectangle in (c) showing the sphalerite structure of GaAs covered by an amorphous surface layer. A distance of 6.53 nm between 20 {111} planes is marked in (d).

with decreasing NW diameter to values that are more than double that of bulk GaAs. Wang and Xiaozhou Liao from the University of Sydney and the group led by Chennupati Jagadish in the Australian National University are now working together to understand details of the effect of structure/geometry on the mechanical behaviour of various semiconductor nanowires.

Y.-B Wang et el Advanced Materials ***23*** *1356 (2011)*

Researchers refine the characterisation of dislocations in 4H-SiC

RESEARCHERS from Fraunhofer Institute for Integrated Systems and Device Technology IISB in Erlangen, Germany, have unravelled inconsistencies surrounding a well established characterisation method for determining the level of crystalline defects in SiC. What's more they have developed a superior approach, which has been verified by means of a comparative study.

As part of their experimental effort, the scientists have also uncovered the existence of two types of threading dislocations that have never been seen before. Their efforts are important, because SiC, especially the modified compound 4H-SiC, is a well-suited material for energy efficient and compact power electronic devices. The material quality, especially the density of extended defects like dislocations, is a limiting factor for device performance and production yield.

In order to develop SiC substrates and epitaxial layers with a reduced dislocation density, a reliable and economical characterisation method for dislocations is needed. Defect Selective Etching (DSE) meets both requirements and is well-established for SiC and other materials. However, even prior to this study, some inconsistencies have been witnessed with regard to the influence of the doping states of samples on the defect-selective etching behaviour of 4H-SiC.

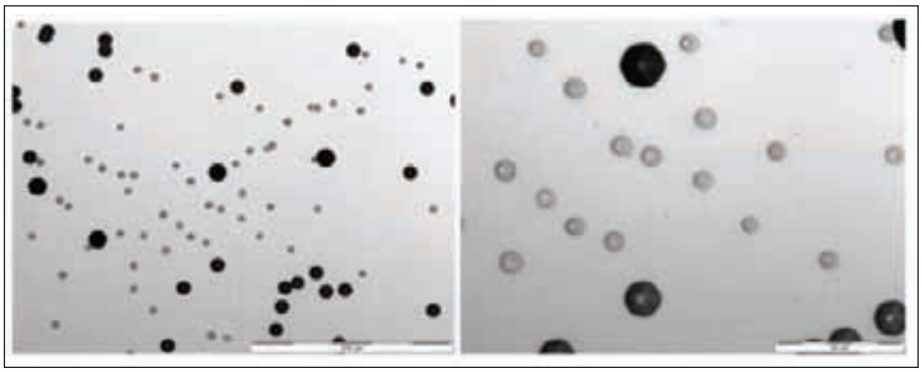
The researchers say their current study has proved,for the first time,that the conduction type, i.e. n-type or p-type material, and the doping level of the sample have to be taken into account in order to interpret etch pits. Different types of threading dislocations, such as screw- (TSD) and edge- (TED) type dislocations, were identified by Synchrotron X-ray Topography (SXRT) for differently doped 4H-SiC materials. In addition, defect selective etching was conducted in order to decorate the intersection point of each dislocation at the sample surface with an etch pit.

Then, dislocations seen from SXRT were compared to etch pits observed using DSE in order to verify the correlation of dislocation types with etch pit types. For example, the scientists observed TSD, with large hexagonally shaped pits. A 1:1 correlation of etch pits and dislocations was found, in other words, each dislocation is decorated by an etch pit and vice versa. Furthermore, the existence of two unexpected types of threading dislocations, so-called TED II and TED III dislocations, was proven experimentally by SXRT investigations.

At certain doping levels of n-type 4H-SiC material, so-called TED II dislocations are decorated by TED II specific etch pits. For other doping levels and in p-type material, TED II dislocations are indistinguishable by their etch pits from TED and TED III dislocations. At least, threading edge type (TED, TED II and TED III) dislocations are distinguishable from TSDs for all doping states except for highly n-doped substrates.

From now on, the researchers say DSE can be applied as a reliable and economic characterisation method for dislocations in 4H-SiC.

B. Kallinger *et al*. Journal of Crystal Growth **314** 21 (2011)



Etch pits of different types of threading dislocations in 4H-SiC: roundish etch pits (TED II specific etch pits), small hexagonally shaped etch pits (corresponding to TED, TED III dislocations), large hexagonally shaped etch pits (correlated to TSDs). Copyright: Fraunhofer IISB

GaAs nanowires can rapidly recover from cracks

THE TIME needed for self-healing was a function of the crack size. The discovery holds implications for increased reliability and extended lifetime of nanowire-based semiconductor devices.

Researchers from The University of Sydney and The Australian National University have discovered a repeatable self-healing process in which a partially fractured GaAs nanowire (NW) restored its original single crystal structure immediately after a compressive force is removed.

Since III-V semiconductors are susceptible to microcracks and fracture when subjected to repeated thermal or mechanical loading, self-healing of NWs could increase the reliability and extend the lifetime of NW-based semiconductors devices.

The researchers studied the self-healing process of GaAs NWs using the *in-situ* transmission electron microscopy (TEM) nano-compression technique.

Yanbo Wang of The University of Sydney did a series of *in-situ* experiments and found that fractured GaAs NWs experienced a self-healing process within 16 seconds after an external compressive load was removed.

The time needed for self-healing was a function of the crack size, and the self-healed site resumed its original single crystal structure and was strong enough to sustain some tensile force.

Wang and Xiaozhou Liao from The University of Sydney and the group led by Chennupati Jagadish in The Australian National University are now working together to understand the mechanism of the self-healing process.

Y. Wang et al in Nano Letters, DOI: 10.1021/nl104330h.

Terabit photonic integration for next-generation optical networks

Infinera's InP monolithic PIC contains more than 150 optical components, which are all integrated onto a single chip smaller than a fingernail.

INFINERA'S photonic integrated chip (PIC) is at the heart of a new 10-channel receiver, each operating at 100 Gbit/s rates. The firm says it is the first in the industry to achieve a capacity of a trillion bits per second.

The chip is an InP-based monolithic PIC and is designed to operate nominally at a wavelength of 1550nm and over the C band of the optical fibre spectrum. The PIC has more than 150 optical components, such as frequency tunable local oscillator (LO) lasers, optical hybrids for mixing the LO and incoming signals and variable optical attenuators for LO power control. It has a spectral demultiplexer to separate the individual wavelength channels. These components are all integrated onto a single chip smaller than a fingernail.

"Traditional transponder-based system architectures are inflexible and costly and time-consuming to upgrade," said Radhakrishnan Nagarajan, Research Fellow at Infinera. "Our PIC approach enables us to make optical networks more powerful, flexible and intelligent than ever before using equipment that is significantly smaller, less expensive and uses much less energy."

In virtually all types of data transmission, the information is encoded in ways that allow it to travel the farthest while occupying the least amount of signal spectrum.

The key technical advance in the PIC designed for Infinera's new 100Gbps per channel is its way of detecting incoming data encoded using the optical industry's most spectrally efficient modulation technique called polarization-multiplexed QPSK. In a manner similar to how AM (amplitude modulation) and FM (frequency modulation) imprints information on, respectively, the amplitude and frequency of radio waves, QPSK modifies the light's phase to represent the data. As a result, using QPSK with polarization multiplexing, four times as much information is conveyed each second compared with the previous method, which simply switched the light on and off.

"But just as important as a clever and efficient encoding method for the transmitter is a fast and reliable way for the receiver to convert the information back to its original form," said Nagarajan. "For polarization multiplexed QPSK we designed and integrated narrow-line-width lasers that detect the phase encoded data in a very efficient manner."

Infinera expects PICs with a capability of a terabit or more to be commercially available within a few years. The company has announced that a 500 gigabits-per-second PIC will be available in 2012.

Further details of this work were presented at the OFC/NFOEC that took place in Los Angeles, CA

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News Digest Contents

LEDs

ZemosLED raises the bar with 80,000 hour LED module

Based on a Cree LED die SiC substrate, the Zemos9090 has an exceptionally low thermal resistance, combined with a large heat spread area, which are responsible for its long life.

Korean firm ZemosLED has announced the US launch of the patented, 80,000 hour Zemos9090 LED package.

The Zemos9090 has seen extensive use in the company's own line of lighting fixtures with extended lifespans, but has not previously been available to third parties as a discrete component. The company anticipates strong demand from manufacturers of intermediary LED components, and end lighting products, who have been limited by current technology to a 50,000 hours lifespan.

Constructed almost entirely of copper and silver, and based on the SiC substrate Cree LED dies, the Zemos9090 has an exceptionally low thermal resistance, combined with a large heat spread area, which are responsible for its long life.

The Zemos9090 also utilises ZemosLED's patented phosphor deposition technology, allowing for maximum light conversion, and precise colour temperature control.

"Often there is inadequate attention given to the thermal performance of LED products. Actually, this is perhaps the most critical aspect of LED product design, and must be addressed at every stage of development, from the LED package, to the lighting enclosure," says CTO M.S. Yoon. "Not only does good thermal performance increase lifespan, but it also increases efficiency. With conventional package designs, our product lifespans would be greatly reduced, so the Zemos9090 is really a core technology for ZemosLED, allowing us to achieve 80,000 hours."

To accommodate various LED applications, the company will also offer the Zemos9090 as individual modules, in custom LED panels, and in colour temperatures from 2,700K to 7,000K.

Cree LED Troffers Revolutionise Commercial Lighting

The new Cree CR series delivers shorter payback, better light quality and efficacy than fluorescents.

Antiquated, inferior commercial lighting has had a much-needed transformation with the revolutionary new series of LED troffers from Cree.

The Cree CR family of architectural troffers, including the CR24, CR14 and CR22, bring a superior combination of performance, aesthetics and affordability to a market traditionally lit by outdated, flickering fluorescent tubes.

Cree's CR Series Architectural Troffer Family (Photo: Business Wire)

The CR series is redefining commercial lighting by offering a no-compromise alternative when upgrading over fluorescent lighting. More affordable than comparable fluorescent options, CR series fixtures deliver higher-quality light, longer life and greater energy savings, with an estimated payback of less than a year in a typical office installation.

"We chose the Cree CR troffers because the payback calculation was clear," said Richard J. Michal, PE, MBA, LEED-AP, facilities engineer planning design and construction, Butler University. "Seeing the CR troffers installed, they have an elegant aesthetic that produces an incredibly high-quality light. When you combine that with our predicted energy and maintenance savings, it was a no-brainer."

"You never need to install fluorescent troffer lighting again," said Chuck Swoboda, Cree chairman and CEO. "The traditional lighting experts keep telling us what LEDs can't do, and we keep showing them that anything is possible. We think it is time to rid the world of the compromises inherent in choosing fluorescent lighting — the flickering, toxic mercury, poor colour, ineffective dimming and disposal expense."

"Our life cycle cost analysis using Cree LED lighting on our projects decreased the watts-per-square-foot by upwards of 60 percent," said Nick Santore, PE, LEED-AP, Senior Electrical Engineer at O'Brien/ Atkins Associates. "That decrease translated into measurable reductions in building HVAC equipment sizing requirements, delivering additional savings."

According to Freedonia Group, the 2009 US indoor lighting fixture market is estimated at U.S. $6.4 billion. Lighting represents 27 percent of American commercial building energy consumption, according to the U.S Department of Energy.

The Cree CR troffer family is powered by Cree TrueWhite Technology to deliver a combination of 90 CRI and up to 110 lumens per watt, which the firm says far outperforms any other current lighting options.

An innovative thermal management system enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy and colour consistency. All fixtures feature step or 0-10V dimming, are designed to last at least 50,000 hours and feature a five-year warranty.

The CR troffer family includes three models and multiple performance options: 1ft x 4 ft, 2ft x 4ft and 2ft x 2ft.

The Cree CR series is made in the United States, sold through Cree LED Lighting sales channels and is currently shipping in volume.

The CR troffers will also be demonstrated at Cree's booth #1925 at Lightfair International in Philadelphia, May 17-19.

Seoul Semi brings Z4 LEDs to light

The Z4 series of LEDs operating at 1W have a high efficiency of 100lm/W and a colour rendering index (CRI) greater than 85

LED manufacturer Seoul Semiconductor has unveiled a high-intensity Z-Power LED series called 'Z4.' Seoul Semiconductor has continuously expanded its LED product line in accordance with its 2011 business plan which targets the release of a new product suitable for a different market every month.

The new model is a 1W LED light which is one of the most demanding in the current LED market. It is good for general lighting such as those used in incandescent lamps and MR16 bulb-type lighting.

In particular, Seoul Semi says the Z4 is very competitive in terms of price with outstanding luminous efficiency (100lm/W) and luminous flux of 100ml. And it also provides excellent brightness, efficiency and colour rendering properties for a 1W LED with a CRI greater than 85.

Seoul Semi says its Z4 LED helps to prevent degradation at high temperatures and offers exceptional reliability and high protection against heat compared to other competitive products. Above all, a price-competitive Z4 is highly competitive product in 'cost/lm' which is most important for LED for lighting.

Until now, Seoul Semi LED performance was judged by 'lm/W', but now the firm feels that 'cost/lm' is more important for performance after releasing high intensity products over 100lm. In addition, the company has adopted a silicon lens for optical safety. This product is available in two colours: warm white and cool white.

In-sup Ra, Vice president of Seoul Semiconductor, said, "We have developed the high-efficiency, low-price Z4 series with the goal of increasing our market share in the world's most demanding 1W LED

Samples of the Z4 series are available now and mass production will begin in May.

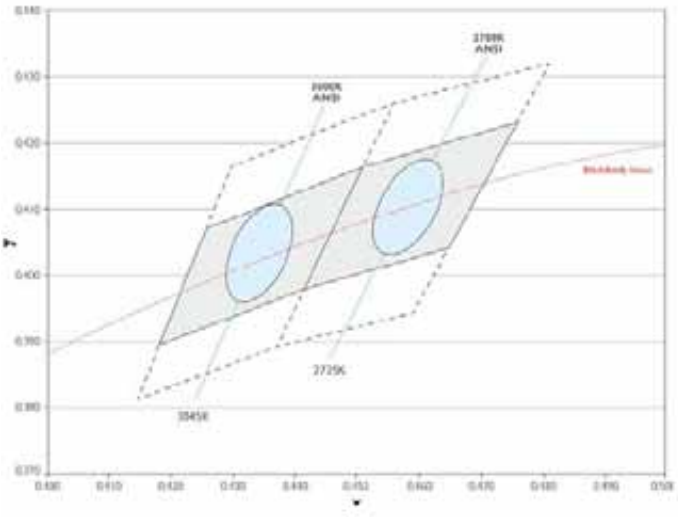
Lumileds launches latest illumination grade LED

The LUXEON A features Freedom From Binning and is ideal for use in homes, restaurants and shops.

Philips Lumileds has revelealed its latest illumination grade LED that reduces the engineering effort required for new solutions and delivers Freedom From Binning.

The LUXEON A shares the LUXEON Rebel ES platform and footprint and incorporates a 2 square millimetre thin film flip chip and Lumiramic phosphor technology to deliver the highest quality of light at 2700K and 3000K with very high efficacy and light output.

All LUXEON A LEDs are hot-tested and specified at a junction temperature of 85°C that represents real-world operating conditions. Lumileds' unique chip and phosphor technology allows colour targeting that ensures all LUXEON A emitters fall within a single 3-step MacAdam ellipse on the black body curve. The quality, uniformity, and consistency of the light from LED to LED relieves luminaire manufacturers and lighting designers of many of their long held concerns about the suitability of LED technology for illumination applications.



Freedom From Binning delivers the entire LUXEON A distribution within a single 3 MacAdam Ellipse space at each of the targeted colour temperatures, 2700K and 3000K.

"We are intent on delivering illumination grade LEDs that improve the state-of-the-art in lighting. Our LUXEON LEDs are delivering performance that does not require sacrifices in the quality of light for homes, restaurants, shops, and other applications in pursuit of energy efficiency and reduced operating costs," said Steve Barlow, Senior VP Sales and Marketing.

Freedom From Binning gives the industry great confidence in quality of light and Lumileds' hot testing pays dividends for the engineers that design LED solutions. The LED industry has long tested and specified products at an LED chip junction temperature of 25°C. It's well known that in applications like down lights and retrofit lamps, LED junction temperatures are more likely to be near 85°C.

This has meant that luminaire manufacturers have had to make many complex calculations to determine actual light output, efficacy, and colour point of their products. Lumileds' hot testing simplifies the entire process by providing the actual operating condition information so that there's no ambiguity, performance hyperbole, or wasted engineering effort.

LUXEON A is available for sampling and design-in activities and will go into high-volume production in early May 2011.

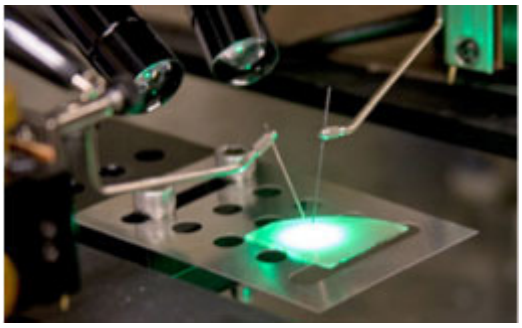
Zeroing in on the Elusive Green LED

Researchers have discovered a new method for boosting the light output of Green LEDs. This could be a critical step towards the development of LED televisions and displays.

Researchers at Rensselaer Polytechnic Institute (RPI) have developed a new method for manufacturing green LEDs with greatly enhanced light output.

The research team, led by Christian Wetzel, professor of physics and the Wellfleet Constellation Professor of Future Chips at Rensselaer, etched a nanoscale pattern at the interface between the LED's sapphire base and the layer of GaN that gives the LED its green colour.

Overall, the new technique results in green LEDs with significant enhancements in light extraction, internal efficiency, and light output. The discovery brings Wetzel one step closer to his goal of developing a high-performance, low-cost green LED.



"Green LEDs are proving much more challenging to create than academia and industry ever imagined," Wetzel said. "Every computer monitor and television produces its picture by using red, blue, and green. We already have powerful, inexpensive red and blue LEDs. Once we develop a similar green LED, it should lead to a new generation of high-performance, energy-efficient display and illumination devices. This new research finding is an important step in the right direction."

Sapphire is among the least expensive and widely used substrate materials for manufacturing LEDs, so Wetzel's discovery could hold important implications for the rapidly growing, fast-changing LED industry. He said this new method should also be able to increase the light output of red and blue LEDs.

Results of the study, titled "Defect-reduced green GaInN/GaN light-emitting diode on nanopatterned sapphire," were published last week in the journal *Applied Physics Letters*, and are featured in the Virtual Journal of Nanoscale Science & Technology, published by the American Institute of Physics and the American Physical Society. The paper may be viewed online at: http://dx.doi.org/10.1063/1.3579255

The research program is supported by the U.S. Department of Energy National Energy Technology Laboratory (NETL) Solid-State Lighting Contract of Directed Research, and the National Science Foundation (NSF) Smart Lighting Engineering Research Centre (ERC), which is led by Rensselaer.

LED lighting only requires a fraction of the energy required by conventional light bulbs, and LEDs contain none of the toxic heavy metals used in the newer compact fluorescent light bulbs. In general, LEDs are very durable and long-lived.

First discovered in the 1920s, LEDs – light-emitting diodes – are semiconductors that convert electricity into light. When switched on, swarms of electrons pass through the semiconductor material and fall from an area with surplus electrons into an area with a shortage of electrons. As they fall, the electrons jump to a lower orbital and release small amounts of energy. This energy is realized as photons – the most basic unit of light. Unlike conventional light bulbs, LEDs produce almost no heat.

The colour of light produced by LEDs depends on the type of semiconductor material it contains. The first LEDs were red, and not long thereafter researchers tweaked their formula and developed some that produced orange light. Years later came blue LEDs, which are frequently used today as blue light sources in mobile phones, CD players, laptop computers, and other electronic devices.

The holy grail of solid-state lighting, however, is a true white LED, Wetzel said. The white LEDs commonly used in novelty lighting applications, such as key chains, auto headlights, and grocery freezers, are actually blue LEDs coated with yellow phosphorus – which adds a step to the manufacturing process and also results in a faux-white illumination with a noticeable bluish tint.

The key to true white LEDs, Wetzel said, is all about green. High-performance red LEDs and blue LEDs exist. Pairing them with a comparable green LED should allow devices to produce every colour visible to the human eye – including true white, Wetzel said.

Today's computer monitor and television produces its picture by using red, blue, and green. This means developing a high-performance green LED could therefore likely lead to a new generation of high-performance, energy-efficient display devices.

The problem, however, is that green LEDs are much more difficult to create than anyone anticipated. Wetzel and his research team and investigating how to "close the green gap," and develop green LEDs that are as powerful as their red or blue counterparts.

Aixtron CRIUS II qualified with Chi Mei in Taiwan

The CRIUS II will aid the firm's capacity expansion as it can easily be converted from 2- to 4-, 6-inch or larger wafer size production, an important factor for GaN LED manufacturing.

Aixtron SE says that its latest Close Coupled Showerhead (CCS) MOCVD platform system, the CRIUS II, has been successfully qualified for mass production within the Chi Mei Group, based in southern Taiwan, outperforming expectations as to process stability, uniformity, and throughput.

Chi Mei was the first customer in Taiwan to receive the new system. The 55x2-inch wafer configuration CCS CRIUS II was installed and commissioned by the local Aixtron service team at facilities near the Southern Taiwan Science Park. Since then the team has been working closely with the customer to expedite the qualification process.

A company representative remarked that it has been a seamless transition from the CRIUS to the CRIUS II due to the system's straightforward process transfer capabilities - the unique CCS reactor chamber technology simply requires the application of area-scaling factors. This qualified system will shortly be fully operational and will provide the shortest time-to-market for its family of HB-LED products.

The CRIUS II can easily be tuned to the optimum performance and can further be converted from 2- to 4-, 6-inch or larger wafer size production, an important factor for GaN LED manufacturing. Since larger wafer sizes play a crucial role in reducing the manufacturing cost in LED production, the CRIUS II is the best option to increase the productivity of HB-LED manufacturing. Compared to the CRIUS, the CRIUS II reactor capacity has been increased from 31x2-inch to 55x2-inch wafers. Alternatively, the CRIUS II reactor chamber can accommodate as many as 13x4-inch wafers.

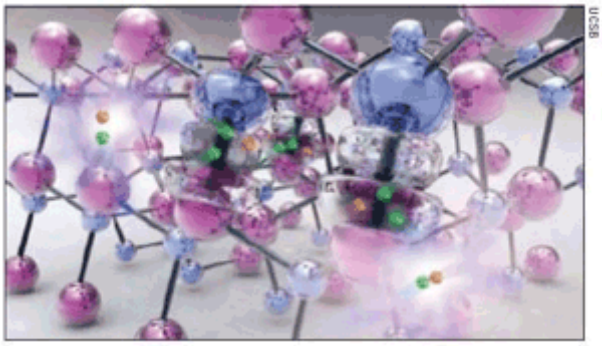
Theorists claim to have solved LED droop puzzle

UCSB scientists have used quantum-mechanical calculations and are backing up experimentalists by saying that LED droop can be attributed to Auger recombination and indirect Auger effects.

Researchers at the University of California, Santa Barbara, say they've figured out the cause of a problem that's made LEDs impractical for general lighting purposes. They say their work will help engineers develop a new generation of high-performance, energy-efficient lighting that could replace incandescent and fluorescent bulbs.

"Identifying the root cause of the problem is an indispensable first step toward devising solutions," says Chris Van de Walle, a professor in the Materials Department at UC Santa Barbara (UCSB) who heads the research group that carried out the work.

Van de Walle and his colleagues are working to improve the performance of nitride-based LEDs, which are efficient, non-toxic and long-lasting light sources. They investigated a phenomenon referred to as "droop," which is the drop in efficiency that occurs in these LEDs when they're operating at the high powers required to illuminate a room. The cause of this decline has been the subject of considerable debate, but the UCSB researchers say they've figured out the mechanism responsible for the effect by performing quantum-mechanical calculations.



In the normal light-emitting process an electron (green) and a hole (orange) recombine radiatively (bright areas). In the Auger process, an electron can collide with a hole in the vicinity of another electron and transfer energy to the second electron, wi

LED droop, they conclude, can be attributed to Auger recombination, a process that occurs in semiconductors, in which three charge-carriers interact without giving off light. The researchers also discovered that indirect Auger effects, which involve a scattering mechanism, are significant; a finding that accounts for the discrepancy between the observed degree of droop and that predicted by other theoretical studies, which only accounted for direct Auger processes.

In nitride LEDs, "These indirect processes form the dominant contribution to the Auger recombination rate," says Emmanouil Kioupakis, a postdoctoral researcher at UCSB and lead author of a paper published online April 19 in *Applied Physics Letters*. The other authors are Van de Walle, Patrick Rinke, now with the Fritz Haber Institute in Germany, and Kris Delaney, a project scientist at UCSB.

LED droop can't be eliminated because Auger effects are intrinsic, but it could be minimised, the researchers say, by using thicker quantum wells in LEDs or growing devices along non-polar or semi-polar growth directions in order to keep carrier density low.

"With Auger recombination now established as the culprit, we can focus on creative approaches to suppress or circumvent this loss mechanism," Van de Walle says.

The work was supported by the Centre for Energy Efficient Materials, an Energy Frontier Research Centre funded by the U.S. Department of Energy, and by UC Santa Barbara's Solid State Lighting and Energy Centre.

Computational resources were provided by the U.S. Department of Energy's National Energy Research Scientific Computing Centre at Lawrence Berkeley National Laboratory, the California NanoSystems Institute's Computing Facility at UC Santa Barbara, and the National Science Foundation-funded TeraGrid.

LED business booming with 165 billion shipments in 2011

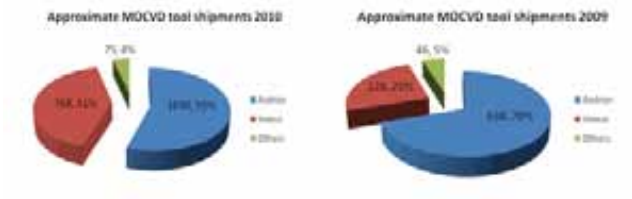
This massive demand is fuelling niche markets for equipment according to The Information Network. Also, Veeco gained market share from Aixtron in 2010 for MOCVD shipments from 2009.

The LED market is expected to explode as unit shipments increase more than 40% in 2011 and double between 2010 and 2013, according to the report "The Solid State Lighting Revolution: Market Analysis And Insight On Reducing Manufacturing Costs," recently published by The Information Network, a New Tripoli, PA-based market research company.

"The rapid increase in the market for LEDs used in various applications such as notebook backlights and automobile headlights is also spurring heavy capital investments by LED makers, noted Robert Castellano, president of The Information Network. "LEDs are creating a niche market for conventional suppliers of semiconductor processing tools and a lucrative market for MOCVD suppliers."

High brightness LEDs (HB-LEDs) will reach nearly 135 billion units shipped in 2011 from less than 100 billion in 2010. Backlight LEDs (BLU-LEDs) will reach 30 billion units shipped, up from 20 billion in 2011.

In 2010, Nichia led the market with a 15% share, down from a 16% share in 2009. Samsung LED rocketed to the number two position with a 10.5% share, up from only a 6.5% share in 2009.



In 2010, Aixtron led the market in MOCVD tool shipments with a bit more than a 55% share followed by Veeco with a 41% share of 786 tools sold. In 2009, Aixtron held nearly a 70% share followed by Veeco with a 25% share of only 228 tools sold.

"Pushing for further growth in MOCVD installations is China, which introduced a MOCVD stimulus program that is expected to result in $1.6 billion in spending on MOCVD tools from 2010 to 2012 ," added Castellano. "In 2010, China represented nearly 35 % of MOCVD installations."

LEDs are currently a $10 billion niche market compared to the $250 billion semiconductor market. The consensus forecast of 786 MOCVD tools represents a market of nearly $2 billion based on an average selling price of $2.5 million for each MOCVD tool. MOCVD represents 8% of the typical cost breakdown for a packaged LED.

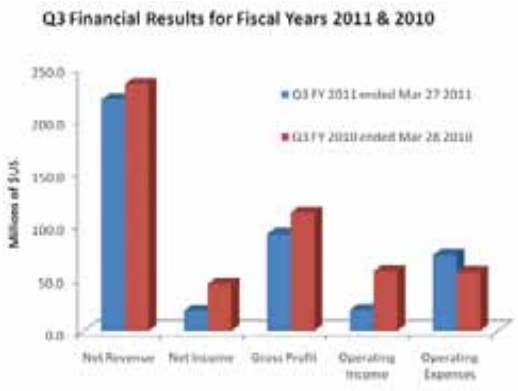
Other front-end tools represent more than 3% of the cost and equates to an additional $500 million market for lithography and metrology tools. The biggest sector, 65%, represents back-end processes such as substrate removal, chip separation, and packaging.

The backlight sectors will exhibit the fastest growth in the HB LED market with an overall compound annual growth rate of more than 40%, led by the LCD TV sector exhibiting a CAGR of 300.3% between 2007 and 2012.

Cree net income slashed 57% and profit by 18%

The firm's latest quarterly results showed that the operating income was also greatly reduced (by 65%) over the same quarter last year.

Cree has reports its financial results for the third quarter of fiscal year 2011.



The company announced revenue of $219.2 million

for its third quarter of fiscal 2011, ended March 27, 2011. This represents a 6% decrease compared to revenue of $234.1 million reported for the third fiscal quarter last year and a 15% decrease compared to the second quarter of fiscal 2011. GAAP net income for the third quarter of $18.9 million, or $0.17 per diluted share, decreased 58% year-over-year compared to GAAP net income of $44.6 million, or $0.41 per diluted share, for the third quarter of fiscal 2010.

"Q3 results were in-line with our revised lower targets for the quarter," stated Chuck Swoboda, Cree chairman and CEO. "The results reflect both our continued success in LED lighting and the challenges of managing the LED chip and components business through a business cycle with short lead-times and low order visibility. We continue to be a leader in LED lighting and remain confident we are on the right track as we look forward to further disrupting the market and leading the LED lighting revolution in the years ahead."

Q3 2011 Financial Metrics:

* Cash and investments ended the quarter at $1,073.1 million, which was a decrease of $37.7 million from Q2 of fiscal 2011.

* Accounts receivable (net) decreased $9.2 million from Q2 of fiscal 2011 to $125.9 million, with days sales outstanding of 52, an increase of 5 days from Q2 of fiscal 2011.

* Inventory increased $24.1 million from Q2 of fiscal 2011 to $169.6 million and represents 119 days of inventory, an increase of 23 days from Q2 of fiscal 2011.

Recent Business Highlights:

* Signed a comprehensive, worldwide patent cross-license agreement with Osram GmbH designed to further accelerate the growth of the LED lighting market.

* Announced a two-year extension of the strategic agreement signed with Zumtobel Lighting GmbH in 2008.

* Introduced the Cree XLamp MT-G LED, which is the first LED to deliver the performance required for high-output halogen retrofit applications such as 35 to 50 watt MR16 replacement bulbs.

* Released the Cree XLamp XM-L EasyWhite LED, which delivers a lower cost solution for 25 watt replacement lamps by combining the benefits of our unique colour mixing technology in a single high output, small footprint package.

* Set a new industry benchmark for colour rendering with the commercial release of the Cree LBR-30TM LED lamp.

Business Outlook:

For its fourth quarter of fiscal 2011 ending June 26, 2011, Cree targets revenue in a range of $225 million to $245 million with GAAP gross margin targeted at 40%. GAAP operating expenses are targeted to increase by approximately $0.5 million to $72 million. The tax rate is targeted at 14% for fiscal Q4.

GAAP net income is targeted at $16 million to $23 million, or $0.15 to $0.21 per diluted share. The GAAP net income target is based on an estimated 110.5 million diluted weighted average shares.

Cree hosted a conference call to review the highlights of the fiscal third quarter 2011 results and the fiscal fourth quarter 2011 business outlook.

The call is archived and available on Cree's website through May 3, 2011.

LED demand in the military to dominate NVIS market

The consumption value of packaged LEDs used in Night Vision Imaging System (NVIS)-compatible lighting is forecast to increase from $36.2 million last year (2010) to $132.8 million in 2017.

ElectroniCast Consultants has released a new market research study of the global consumption of LEDs used in Night Vision Imaging System (NVIS) compatible lighting in non-civilian applications, such as military, law enforcement, emergency medical services (EMS) and related applications.

According to the ElectroniCast study report, the use

of LEDs in NVIS - compatible lighting will continue to be dominated by the Military market sector. The Military sector includes the Army, Air Force, Navy, Marines, Coast Guard, National Guard (and State-level Guard/Defence) and the equivalent from countries worldwide.

The Law Enforcement sector includes Local, State and National Law Enforcement (National: all of the "3-letter" agencies, plus other/related– FBI, DHS/ICE, DEA, ATF, CIA, DSS, etc, plus many other relative law enforcement), as well as the equivalent from countries worldwide. The application category also includes Emergency Services: Emergency Medical Services-EMS, Fire/Rescue/Forestry, etc.

"ElectroniCast forecasts that the worldwide consumption of package LEDs used in non-civilian NVIS compatible lighting will increase at an average annual growth rate of 20.4 %, from $36.2 million last year (2010) to $132.8 million in 2017," said Stephen Montgomery, president of International Business and Director of the LED practice at ElectroniCast. "LEDs provide an excellent NVG (night vision goggle) compatible lighting solution in aircraft, ships/watercraft, ground vehicle, ground field command, and 'man-portable' devices, which is winning market share from filter-based and other conventional lighting," Montgomery added.

"The Ship/Watercraft category under the Military sector is the current market leader, and it is forecast with the fastest growth (2010-2017), led by LEDs used in exterior NVIS compatible lighting. The Military Aircraft category holds a relative market share 31.5 % of the total worldwide consumption value in 2011," Montgomery concluded.

Impressed Epistar orders more Aixtron systems for HB-LEDs

The repeat order from the Taiwanese firm was based on the excellent run-to-run and system-to-system reproducibility of the G5 reactor.

Aixtron SE has announced further shipments of MOCVD systems to Epistar. The contract is for multiple AIX G5 HT reactors in a 14x4-inch configuration which will be dedicated to the growth of high brightness LEDs.

The systems are delivered in the first and second quarter of 2011. Aixtron´s local support team will install and commission the new reactors in Epistar's state-of-the-art clean-room facility at their production complex in Taiwan.

Following Epistar´s successful qualification of the AIX G5 HT in 2010, this latest repeat order is a further endorsement of G5´s very rapid time-to-production and excellent system-to-system reproducibility, both of which are key factors in a highly competitive market and a considerable driver of cost reduction.

Ming-Jiunn Jou, President of Epistar, comments, "The new reactors will form the backbone of our planned capacity expansion for our high brightness LED production program. In particular, we have been impressed by the run-to-run and system-to-system reproducibility the G5 has shown. This makes the G5 the leading MOCVD system in terms of throughput and yield, allowing us to quickly ramp up our capacities and expand our product portfolio even further in the direction of solid state lighting products. The G5 clearly demonstrates Aixtron´s manufacturing excellence with an easy scalable route for our process recipes."

Located at the Hsinchu Science-based Industrial Park, Taiwan, Epistar Corporation has for over a decade been focused on the development, manufacture and marketing of ultra-high brightness (UHB) LED products. Via its proprietary MOCVD process technology, Epistar continues to successfully commercialize worldwide a full range of UHB LEDs having compact size, low power consumption and long operation life.

Bavarian municipality switches to Osram powered LED street lighting

The community of Pielenhofen will prove that LED street lighting can be used in small as well as large cities.

The new-build Rohrdorf area of the Pielenhofen community near Regensburg is planning to install

nine street lights with LED technology from Osram Opto Semiconductors.

And that's only the beginning . Stage by stage, Pielenhofen will switch over its street lighting to LED across the community's whole area. It is a measure that not only pays off for large cities; small communities can also achieve huge savings as a result, and making a contribution to sustainability.

Photo: Osram

The community of Pielenhofen near Regensburg benefits recently from street lights based on LED technology. They achieve an optimum illumination of the street, conforming with the relevant norms, avoiding scattered light and staying below the limit regarding dazzle.

The switchover to modern light solutions, such as LED technology, is a purposeful measure for reducing energy costs long-term and for equipping a community to meet the future. It is also a step which cities, towns and municipalities must make over the next few years.

This is because, since the end of 2009, the EU regulations requiring the reduction of CO2 emissions and of energy consumption also relate to products which do not themselves consume any energy, but do have major implications for energy consumption, as is the case for street lighting.

Thus, starting in April 2012, certain luminaires for street lighting, such as the sodium vapour lamps used in Pielenhofen, will be withdrawn from the market; from 2015, the mercury vapour lamps used by many municipalities will no longer be sold within the EU. From then on, it will only be efficient high-pressure discharge lamps or LEDs which will be permitted.

The Pielenhofen community in the Regensburg administrative district is thus taking on a front-runner role with its plans to re-equip its lighting resources. LED-based street lights are an optimally suited alternative for making the forthcoming change; the high yield, in terms of light, makes LED-based luminaires significantly more efficient.

In less frequented streets, the lighting can be dimmed at nights by means of the flexible light control used for LED systems. Added to this is the good colour rendering index of LED light sources , also at night-time, this provides a natural optical impression in terms of the colours, and thus a higher degree of safety, due to a more clearly contoured environment. In addition, LEDs offer greater product longevity, they require maintenance work significantly less frequently than conventional lighting does and thus also save costs.

The street lights to be deployed in Pielenhofen community are of the "Kassel" type, from the manufacturer Herkules. These are equipped with a kit for retrofit purposes and with Golden Dragon Plus LEDs from Osram; in stages, they will also replace the sodium vapour lamps in the community area. As a pilot project, the mayor, Reinhold Ferstl, had two LED luminaires installed in the heart of the locality back in February 2010 with positive feedback from the local residents.

"What convinced us was the modern technology, as it not only produces more pleasant, warm light: the light diodes only project their light into the desired direction", Ferstl observes. This effect is reinforced by the integrated lens of the Golden Dragon Plus. This makes it possible to generate a brighter and more even illumination of a defined area, despite low intake of power. It also achieves an optimum illumination of the street, conforming with the relevant norms, avoiding scattered light and staying below the limit regarding dazzle. The dimmer function is also brought into effect in Pielenhofen: in the evening, the lighting is reduced by 50 %, making an additional saving of energy.

The successive process of switchover to street lights based on LED technology is not, however, a matter of pure necessity for the parish of 1,500 residents; in fact it is a part of a sustainable overall concept. "For a long time now, we have

been consistently maintaining our course with regard to sustainability", Mayor Ferstl explains. "In modernising our street lighting, we made a conscious decision in favour of quality "Made In Germany" and a producer of lighting products from the region", Reinhold Ferstl points out. "Sustainability is not a matter of fashion for us. We want to live up to it in all its facets".

U.S. consumption of LED products increases 17% from 2009

The 12x12-inch (or larger) LED Panel category is forecast to capture the lead in relative market share of consumption value between 2010 and 2017.

ElectroniCast Consultants has released of a new market review and forecast of LED light panels/ fixtures, which are used in TV broadcast, motion pictures and by professional videographers, in the United States.

"The process of producing video, television programming, and motion picture productions in the field is a challenge because of harsh environment, cramped spaces, limited lighting, and the wiring necessary to connect field production cameras to various devices. Innovation components now allow for construction of efficient, durable, quiet-running and lightweight LED light fixtures, which are essential in the field as well as controlled studio environments," said Stephen Montgomery, president of International Business at ElectroniCast Consultants.

"The USA consumption of LED production panel/ fixtures last year (2010), which are used in the broadcast TV, motion pictures and videography applications, increased 17% from 2009. During the forecast period (2010-2017), the consumption value of the LED fixtures is forecast to increase at an average annual growth rate of 22.7 %," added Montgomery.

According to ElectroniCast, the 12x12-inch (or larger) LED Panel category is forecast to capture the lead in relative market share of consumption value. The Circular/ Ring/ Fresnel fixture category, which includes fixtures with an outer diameter of 12-inches or larger, is forecast to take the second-place position in market share. In terms of volume (number of units), the smaller-sized units will hold substantial market share during the forecast period; however, because of their relatively lower average selling price (ASP) compared to the larger-sized units, they have a smaller market share in terms of value.

LED lighting is well accepted by the broadcast TV, motion pictures and videography industry sectors for lighting effects and set lighting, mainly because of its flexibility. A single light source can generate a great variety of colours. Additionally, continuous cost/performance improvements driven by technological advancements are driving the LED lighting fixture market from a niche-only solution to a general use solution.

Another benefit, directly related to the use of lighting in studios and sets, is the consumption of less electrical power consumption for not only because LEDs use less energy, but also less air conditioning is required since heat generated by an LED bulb is negligible. Also, television broadcasters and film studios are proud to publicise that they are good corporate citizens by incorporating LEDs in their operations and thereby embracing "Green Technology."

In terms of value the USA consumption of LED professional use production light panels/fixtures in the TV broadcast, motion picture/film and videographers (weddings, events, business promotions, etc) was led by the motion picture industry sector with a 60% relative market share in 2010.

Optogan shows off prowess as a Bavarian-Russian high-tech company

The LED chip and lighting manufacturer's plant in St. Petersburg was visited by delegates of the Bavarian Ministry of Economic Affairs.

Representatives of the Bavarian delegation of the Ministry of Economic Affairs, which is focused on sustainable power generation and supply, visited Optogan´s LED plant in St. Petersburg last Friday.

The aim of the delegation was the expansion and intensification of the existing economic ties between Bavaria and Russia. Russia is the largest and most important trading partner for Bavaria in Eastern Europe. This year Bavaria is partner country in the so called “German Week” in St. Petersburg.

The visit of the St. Petersburgh plant included a factory tour of the LED lighting plant.

Bavarian Delegation visits Optogan

During the tour, the founders of the Optogan group described the recent developments in the field of LED lighting and reported on their development aims for the Russian and global market.

“Optogan is a prime example of a Bavarian-Russian high tech company. The manufacturing plants in Landshut, Bavaria and St. Petersburg, Russia, are through Optogan’s presence, economically and technologically connected, “ stated Hans Schleicher, Permanent Secretary of the Bavarian Ministry of Economic Affairs, Infrastructure, Transport and Technology.

The Optogan Group has office locations, among others, in Landshut and St. Petersburg. The plant in Landshut produces high performance LED chips, conducts and directs the international business. St. Petersburg is responsible for the LED housing and packaging along with the end assembly of luminants and luminaires.

“Our offices complement each other perfectly. Due to a Russian modernisation offensive, the primary energy consumption should be reduced by 40 % by the end of 2020. With the introduction of LED technology Optogan is able to make a decisive contribution,” said Hans Peter Ehweiner, CEO of Optogan GmbH.

Optogan founder Maxim Obnoblyudov and Hans Schleicher, Permanent Secretary of the Bavarian Ministry of Economic Affairs, Infrastructure, Transport and Technology during the factory tour

Marktech introduces 650nm Point Source LED

By eliminating the “Dark Spot” typically associated with conventional LEDs, the Point Source LED series should yield far more accurate results in critical sensing applications.

An unobstructed narrow 650nm beam of light output is the key feature of Marktech’s Point Source LED series.

Ideal for critical sensing applications which require a precise light output pattern, this high reliability series of product is available in a variety of packaging options from miniature ceramic surface mount to TO-18 and TO-46 metal can types. Additionally, there are many lensing options available depending on the beam output desired.

Marktech Point Source LED

The Point Source Series is ideally suited for applications including Encoders, Linear or Edge Positioning Sensors and Medical sensing equipment. The unobstructed, radiated beam pattern is made possible by masking the die and relocating the topside electrode. By eliminating the “Dark Spot” typically associated with conventional LEDs, the Point Source LED series will yield

far more accurate results in critical sensing applications. These devices also offer an extremely low thermal coefficient.

Die aperture windows are available up to 200µm. Custom packaging, sorting and testing are additional services Marktech also offers for these products.

Osram LEDs enable stable performance in extremes

With the excellent thermal management and stability of these LEDs, the street lamps installed at Ningxia can perform very well at both high and low temperatures.

LED street lighting can be used in variety of conditions and that is why the application is replacing traditional lighting fixtures rapidly. In the extreme weather conditions of Ningxia, a central province close to Mongolia, Osram Opto Semiconductors' OSLON SSL LEDs have been installed in solar powered street lamps.

These LED lamps withstand the challenging near desert climate and provide stable performance and uniform illumination, fulfilling the requirements set out by the city and its planners.

GBT's solar powered streetlamp in Ningxia enabled by OSLON SSL LED

The 174 new street lamps line the 2.6km of Da Xue Road in Shizhuishan City of Ningxia Province. As the city is close to the Gobi Desert with an average of 28 days of fine weather per month and large temperature differences between day and night, the local government has decided to use solar energy to power these new street lamps.

"By using solar energy alone, the street lamps need to be of very low power consumption. With Osram's OSLON SSL LED as light source, our solar powered street lamps are estimated to save more than RMB 300,000 per year in energy cost alone and reduce carbon dioxide emission by more than 53 tonnes annually," said Xin-jun Dang, Managing Director of GBT Technologies (Shenzhen) Limited, the company which installed the street lamps.

"On the other hand, we are pleased to work with Osram who provides an excellent application support to us. As the weather conditions are rather extreme, Osram's LED simulation reports also help us make improvements to the designs before the fixtures are installed."

These 1 W LEDs, measuring only 3mm x 3mm, deliver outstanding efficiency at all currents. Combined with the excellent thermal management and stable quality of these LEDs, the street lamps can perform very well even when the temperature goes down to -20°C.

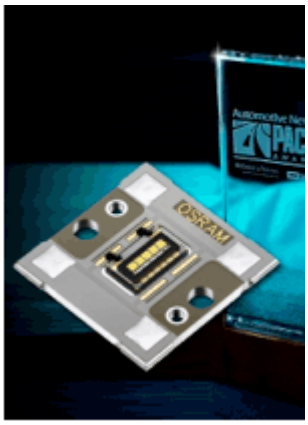
"Other than 80° beam angle LED used in this Ningxia streetlighting project, we also have 150° LED. Both types of LED radiate light over a specified angle and the emission can be easily redirected via equipping with lens or reflector based on different design requirement from lighting fixtures," said Kai-chong Cheng, Marketing Director of Osram Opto Semiconductors Asia.

To further save energy and to provide comfortable illumination to the road, light sensors are installed to control the luminance. On a normal day, the lamps will work in full light for five hours and will be turned down to half light (half power) until dawn. On other occasions when light conditions vary, the luminance can be adjusted accordingly. As a result, each lamp will consume only 80W, which is only 1/5 of a high pressure sodium lamp.

Osram keeps up its innovation with PACE Award

Osram OSTAR Headlamp GaN based LED was recognised for innovation in forward headlamp control in motor vehicles.

Osram Opto Semiconductors was an award winner at the 17th Annual Automotive News PACE Awards for innovation held at a black tie ceremony held earlier this week at the Max M. Fisher Music Centre in Detroit, Michigan. The award was accepted by Peter Knittl, LED automotive director at Osram Opto.



Osram's OSTAR Headlamp LED

Osram's OSTAR Headlamp LED won an award in the Product category, which honours innovation in new products, components or systems that have significant market impact and act as "game changers" in the automotive industry. The prestigious PACE (Premier Automotive Suppliers' Contribution to Excellence) Award is presented by Automotive News, Ernst & Young and Transportation Research Centre (TRC).

OSTAR Headlamp LED featured in the Audi A8 sedan

The Osram OSTAR Headlamp LED uses the auto industry's 1st ThinGaN light-emitting diodes (LEDs) with phosphor layer transfer. The Osram OSTAR Headlamp was developed with a unique integrated shutter function to control the output of the light, eliminating the need for mechanical shutters and projecting a clearly-defined legal beam pattern onto the road without the loss of light commonly associated with mechanical shutters.

The Osram OSTAR LED platform of products provides more styling freedom, reduces energy use, is more reliable and generates more light than conventional headlamps. It is available in five chip configurations -- 1X1, 1X2, 1X3, 1X4 & 1X5 -- with precisely packaged chip spacing to achieve a consistent and uniform beam pattern critical to the optical design. Typical light values achieved for each LED chip are 160 lm at 700 mA. Depending on the variant and operating current, values between 125 lm and 1100 lm are achievable. An innovative conversion process provides a seamless white colour impression at maximum brightness levels.

With its scalable brightness, Osrm says the OSTAR headlamp is perfectly suited to all headlamp functions. In the top-of-the-line Audi A8 sedan, Osram OSTAR LEDs have advanced headlamp lighting beyond simple low and high beams. The OSTAR Headlamp LED provides all of the forward lighting functions, including LED headlamp for night time driving, low beam light sources for daytime running lights and special lighting functions such as motorway beams, cornering lights and all-weather lights.

"Osram Optical Semiconductors is pleased to have been selected as one of the lead suppliers to participate on such a prestigious flagship vehicle as the Audi A8," said Peter Knittl. "LEDs already meet all the requirements of modern automobile lighting and are setting new standards in many respects, and the implementation of our latest OSTAR Headlamp LED forward lighting technology into this vehicle is a prime example."

Cree delivers brightest & efficient lighting-class LED array

The firm's latest product is intended to reduce system cost, speed up time-to-market and simplify fixture and lamp design for use in applications such as omnidirectional bulbs and directional downlights.

Cree, a manufacturer of LED chips and lighting products, is announcing the industry's first lighting-class LED array that helps reduce overall system cost by combining superior efficacy, ease-of-design

and ease-of-manufacture.

The Cree XLamp CXA2011 LED array is designed to deliver the smooth light output and consistent colour needed for applications such as omnidirectional bulbs or directional downlights.

“The CXA2011 LED has been incredibly easy to work with, enabling us to create very high-performance products,” said Jason Lee, president of Gama Illuminer. “It gave us a plug-and-play solution with the right combination of brightness, efficacy and colour consistency with real-world 85 C specifications. Creating a design with CXA2011 was simple and manufacturing will be underway in record time.”

“Combining fast and flexible system design with ease-of-manufacturing, the CXA2011 LED array helps customers quickly create a broad range of LED-based designs,” said Mike Watson, Cree senior director of marketing, LED components. “Lower system cost and quicker time-to-market are keys to accelerating the LED lighting revolution.”

Easy-to-use screw-mounts simplify the manufacturing and design process by eliminating the need for complex design-specific engineering and reflow soldering. With the CXA2011, Cree leads the way on colour accuracy by extending the industry’s largest offering of LEDs characterized at real-world operating temperatures (85 C).

The CXA2011 LED array delivers up to 4000 lumens at an operating temperature of 85 C (1A, 5000 K) in a single component. It is available in 2-step and 4-step EasyWhite options, delivering the industry’s tightest LED-to-LED colour consistency—reducing system complexity and making light source selection as easy as specifying a colour temperature.

XLamp CXA2011 LED arrays are available now with standard lead times.

GaAs plays a new role in organic spintronics

Ohio scientists say that expertise and equipment for compound semiconductor device fabrication is already in place and must be capitalised on. With organic and inorganic materials working together, computer chip technology can move forward straight away.

Researchers at Ohio State University have created the first electronic circuit to merge GaAs with organic “spintronics” devices that utilise the spin of electrons to read, write and manipulate data.

Ezekiel Johnston-Halperin and his team combined GaAs with a unique plastic material that is under development in colleague Arthur Epstein’s lab at Ohio State University.

Ezekiel Johnston-Halperin Arthur Epstein

Last year, Epstein, demonstrated the first successful data storage and retrieval on a plastic spintronic device.

Now Johnston-Halperin, Epstein, and their colleagues have incorporated the plastic device into a traditional circuit based on GaAs. Two of their now-former doctoral students, Lei Fang and Deniz Bozdag, had to devise a new fabrication technique to make the device.

The researchers transmitted a spin-polarized electrical current from the plastic material, through the GaAs, and into an LED as proof that the organic and inorganic parts were working together.

“Hybrid structures promise functionality that no other materials, neither organic nor inorganic, can currently achieve alone,” Johnston-Halperin said. “We’ve opened the door to linking this exciting new material to traditional electronic devices with transistor and logic functionality. In the longer term this work promises new, chemically based functionality for spintronic devices.”

Normal electronics encode computer data based on a binary code of ones and zeros, depending on whether an electron is present or not within the material. But researchers have long known that electrons can be polarized to orient in particular directions, like a bar magnet.

They refer to this orientation as spin -- either "spin up" or "spin down" -- and this approach, dubbed spintronics, has been applied to memory-based technologies for modern computing. For example, the terabyte drives now commercially available would not be possible without spintronic technology.

If scientists could expand spintronic technology beyond memory applications into logic and computing applications, major advances in information processing could follow, Johnston-Halperin explained. Spintronic logic would theoretically require much less power, and produce much less heat, than current electronics, while enabling computers to turn on instantly without "booting up."

Hybrid and organic devices further promise computers that are lighter and more flexible, much as OLEDs are now replacing compound semiconductor LEDs in the production of flexible displays.

A spintronic semiconductor must be magnetic, so that the spin of electrons can be flipped for data storage and manipulation. Few inorganic semiconductors are magnetic. Of those that are, all require extreme cold, with operating temperatures below −100 0C. That's colder than the coldest outdoor temperature ever recorded in Antarctica.

"In order to build a practical spintronic device, you need a material that is both semiconducting and magnetic at room temperature. To my knowledge, Art's organic materials are the only ones that do that," Johnston-Halperin said. The organic magnetic semiconductors were developed by Epstein and his long-standing collaborator Joel S. Miller of the University of Utah.

The biggest barrier that the researchers faced was device fabrication. Traditional inorganic devices are made at high temperatures with harsh solvents and acids that organics can't tolerate. Fang and Bozdag solved this problem by building the inorganic part in a traditional cleanroom, and then adding an organic layer in Epstein's customised organics lab, a complex process that required a redesign of the circuitry in both parts.

"You could ask, why didn't we go with all organics, then?" Johnston-Halperin said. "Well, the reality is that industry already knows how to make devices out of inorganic materials. That expertise and equipment is already in place. If we can just get organic and inorganic materials to work together, then we can take advantage of that existing infrastructure to move spintronics forward right away."

He added that much work will need to be done before manufacturers can mass-produce hybrid spintronics. But as a demonstration of fundamental science, this first hybrid circuit lays the foundation for technologies to come.

For the demonstration, the researchers used the organic magnet, which they made from a polymer called vanadium tetracyanoethylene, to polarize the spins in an electrical current. This electrical current then passed through the GaAs layer, and into an LED.

To confirm that the electrons were still polarized when they reached the LED, the researchers measured the spectrum and polarization of light shining from the LED. The light was indeed polarized, indicating the initial polarization of the incoming electrons.

The fact that they were able to measure the electrons' polarization with the LED also suggests that other researchers can use this same technique to test spin in other organic systems.

Further details of this work are published in the paper "Electrical Spin Injection from an Organic-Based Ferrimagnet in a Hybrid Organic-Inorganic Heterostructure," by Lei Fang *et al* in *Physical Review Letters,* 106, 156602 (2011) ; DOI: 10.1103/PhysRevLett.106.156602

This research was funded by the National Science Foundation's Materials Research Science and Engineering Centres program, Ohio State's Institute for Materials Research, and the Department of Energy.

Pro-Lite acquires majority shareholding in SphereOptics

With this acquisition, Pro-Lite hopes to grow its light measurement business in the German-speaking and Eastern European LED characterisation markets.

Pro-Lite Technology is now the majority shareholder of German company SphereOptics GmbH (based in Uhldingen).

With the acquisition of SphereOptics, Pro-Lite will apply its technical leadership to help grow its light measurement business in the German, German-speaking and Eastern European markets.

Pro-Lite is a supplier of specialist equipment and services with a technical focus in the following areas of photonics: instruments for measuring light and the optical properties of materials; lasers and related equipment; opto-mechanics and positioning equipment; optics & optical materials. Formed in 2002, Pro-Lite distributes the light measurement products made by Labsphere, Radiant Imaging, Ocean Optics and Konica Minolta in the UK and Ireland.

SphereOptics serves the German-speaking and Eastern European markets with light measurement, NIR spectroscopic and hyperspectral instrumentation as well as diffuse reflectance materials and optical standards. Formed in 2003, SphereOptics GmbH distributes the products made by Labsphere, Radiant Imaging, ASD and Headwall Photonics.

Pro-Lite and SphereOptics share a common focus in serving the lighting, LED, display and automotive markets with innovative photometric, spectroradiometric and goniophotometric test equipment for luminaires, solid state lighting, lamps, displays and LEDs. The combined company's mission is to become the premiere company providing light measurement and optical instrumentation to the European market.

Demonstrating its commitment to supporting its clients in the LED and Solid State Lighting markets, Pro-Lite made significant investments in 2010. The company doubled the size of its premises at the Cranfield University Innovation Centre (near Milton Keynes, UK) and invested over £100,000 ($160,000, €115,000) in a photometric test & demonstration laboratory.

The dark room facility is equipped with 25cm and 1m Labsphere integrating sphere spectroradiometer systems, a luminaire goniophotometer system and imaging photometer from Radiant Imaging, a range of luminance and illuminance photometers and colorimeters from Konica Minolta and several irradiance spectroradiometers from Ocean Optics.

Pro-Lite also provides a rental service for the hire of photometers that are used to measure the "brightness" and colour of displays and all manner of light sources (lamps, luminaires, LEDs etc). Pro-Lite's photometric measurement and equipment hire services will now be available to customers of SphereOptics in Germany, as well as in German-speaking and Eastern European countries.

Pro-Lite director Robert Yeo said, "The acquisition of SphereOptics presents an exciting opportunity to bring Pro-Lite's technical leadership in light measurement to the German and Eastern European markets. There are strong synergies between our two companies which we will exploit to better serve our customers working with LEDs, displays and lighting".

SphereOptics' Christina Boehme will continue to serve as General Manager and minority shareholder under Pro-Lite's ownership. Boehme said, "SphereOptics is pleased to be working with Pro-Lite. We serve similar markets with the same light measurement products from Labsphere and Radiant Imaging. Pro-Lite's technical leadership will support the growth of the SphereOptics business in Germany and Eastern Europe".

Cree LED portfolio speeds up customer time-to-market

Cree TrueWhite technology is now available for 230 V, high-lumen, low-bay and high-ceiling applications.

Cree, a leader in LED lighting, has unveiled the LMH6 module, a high-lumen LED module designed

to further simplify lighting design, reduce overall cost and accelerate time-to-market for Cree customers in Europe and Asia.

Featuring Cree TrueWhite Technology, the LMH6 module targets commercial applications where high efficacy, brightness and light quality are critical, such as restaurants, retail, airports, schools and hospitality lighting.

"The LMH6 module is designed with the needs of the 230-volt European and Asian lighting markets in mind," said Scott Schwab, product line manager, Cree LED modules. "We are enabling our customers to address the 150mm and 200mm downlight market with beautiful, energy-efficient lighting offering the highest quality and efficacy available in the industry. Cree continues to innovate and expand our customers' options with our LED module family, building on the success of our LMR2 and LMR4 LED modules"

The LMH6 module is the first high-lumen product in Cree's fully-integrated LED module family. Designed to last at least 50,000 hours, the LMH6 module delivers 2000 lumens at 74 lumens per watt or 2900 lumens at 78 lumens per watt. It is available in 3000 K and 4000 K colour temperatures, both with a CRI of 90.

Fully-integrated DALI dimming allows for greater flexibility and control when compared to traditional dimming systems. Integrated driver electronics, optics and primary thermal management result in a comprehensive, drop-in ready solution and locking tabs that can simplify the design of additional trim kits.

The 230-volt LMH6 module complies with multiple international standards and is RoHS compliant. Sample evaluation kits are available now directly from Cree's website, www.cree.com/modules, and production quantities are available with standard lead times.

Osram LEDs provide a light line

Spanish firm DSTA is striking out on new paths to provide safety solutions for pedestrian road crossings and has opted to use Osram's Golden Dragon LEDs.

With the help of "Light Line", a warning light installed in the pavement, crossing the road becomes safer for pedestrians. In parallel to the switch function for the traffic light, "Light Line" uses a red or green signal to show whether the street can be crossed without danger or not.

The warning light was developed by DSTA, a Spanish company that designs and manufacture LED solutions for traffic, lighting and transports. The signals in the various colours are provided by light emitting diodes from Osram Opto Semiconductors.

Particularly at less busy traffic periods, pedestrians often step onto a road crossing when the traffic light has already switched to red. This does not always have a happy ending. To reduce the resulting number of accidents, DSTA, has developed a solution with its "Light Line", signalling to the pedestrian directly at his or her feet, additionally to the normal traffic light, whether it is possible to cross without danger.

The warning light is integrated into the pavement and functions on a synchronous basis with the traffic light switch system; if the traffic light switches to red, the "Light Line" also switches to red and warns the pedestrian. As soon as the traffic light is showing green again, the "Light Line" also turns green. The double light signal is intended to bring about a higher level of attentiveness among pedestrians, prompting them not to cross the road when the signal is red, even if no vehicles are to be seen at that moment.

To get a rapid and reliable light signal, DSTA is opting for red and green Golden Dragon LEDs from Osram.

Golden Dragon LEDs are very robust, defying jolts, wind and weather, as well as accumulations of dirt on the pavement. The compact modules have very flat designs for the luminaires and a factor which also offers the opportunity of a problem-free retrofit installation. The decisive factor for DSTA was the low level of maintenance workload required by the LED: depending on environmental conditions. Golden Dragon LEDs have an average operating lifetime of up to 100,000 hours. This keeps maintenance costs very low and traffic is scarcely influenced as a result. Thanks to its low power

requirement, in providing a high quality of light, the product is also a particularly efficient solution.

First test installations of the "Light Line" are in place in the Spanish cities of Burgos and Terrasa; further projects are to be launched in the near future. "Cost efficiency is an important factor, which is why more and more municipalities are opting for this LED system when it comes to pedestrian safety", observes Ramón Fernández Morales, Business Development Manager at DSTA. "Golden Dragon LEDs are particularly economical and are the optimum solution for us, thanks to their energy efficiency and their low maintenance requirement."

The "Light Line" warning light, integrated into the pavement, gives a green or red light signal to pedestrians, in addition to the normal traffic light, showing whether it is possible to cross the road without danger.

LDK Solar to join sapphire substrate market

The firm is installing a new Chinese manufacturing facility which will have the annual capacity to supply two million two-inch equivalent pieces of sapphire wafers to the LED industry.

LDK Solar, a manufacturer of multicrystalline silicon solar wafers and PV products, has invested approximately $40 million to establish a new manufacturing plant in Nanchang City, Jiangxi Province in China.

This new manufacturing facility will have capacity to supply two million two-inch equivalent pieces of sapphire wafers per year and be positioned to capture the growing opportunities in the LED industry.

"We are very pleased to expand our wafer manufacturing to Nanchang City, Jiangxi Province," stated Xiaofeng Peng, Chairman and CEO of LDK Solar.

"We believe this new investment in manufacturing sapphire wafers has a great synergy with LDK Solar's crystallisation and wafer engineering and manufacturing expertise, and will enhance LDK Solar's product offerings."

"We also would like to express our sincere appreciation to Nanchang City and Jiangxi Province for the support they have shown us during the planning and construction of our wafer and module plants over the past two years," Peng concluded.

SemiLEDs revenue suffers due to competitive pricing

The quarter did not meet the firm's expectations relative to revenue, EPS or gross margin due to the aggressive, competitive pricing environment and the firm's decision to preserve its market share.

SemiLEDs, a developer and manufacturer of LED chips and LED components, has announced its financial results for the second quarter of fiscal year 2011, ended February 28, 2011.

Revenue for the second quarter of fiscal 2011 was $10.0 million, a 30% increase compared to $7.7 million in the second quarter of fiscal 2010.

"While we believe the long term market opportunity of LEDs has not changed, the quarter did not meet our expectations relative to revenue, EPS or gross margin due to the aggressive, competitive pricing environment and our decision to preserve our market share," said Trung Doan, Chairman and CEO of SemiLEDs.

"Efforts to improve our gross margin include taking actions to improve our yield, transition to four inch wafers in our Taiwan facility, as well as ramping volume production of our new high brightness LED chip, I-Do, which delivers up to 135 lumens per

watt, enabling us to provide our customers with a very cost effective lighting solution," he continued.

GAAP net loss for the second quarter of fiscal 2011 was $1.2 million, or a loss of $0.05 per diluted share, compared to GAAP net income of $1.9 million, or $0.04 per diluted share, for the second quarter of fiscal 2010. The Company recorded a foreign currency transaction loss of $0.2 million in the quarter.

GAAP gross margin for the second quarter of fiscal 2011 was 23%, compared with 41% in the second quarter of fiscal 2010. GAAP operating margin for the second quarter of fiscal 2011 was negative 6%, compared with 28% in the second quarter of fiscal 2010. Margins were negatively impacted by previously announced pricing pressure, lower capacity utilization, change in product mix, as well as a shortage in metal organic chemical compound.

The Company's cash and cash equivalents was $102.6 million at the end of the second quarter, an increase over the prior quarter ending balance of $9.9 million. SemiLEDs completed an initial public offering in December 2010, generating net proceeds of $95.5 million, before deducting expenses of the offering of $3.4 million. Cash flow from operations was $1.7 million in the second quarter of fiscal 2011 compared to $1.6 million in the first quarter of fiscal 2011.

For its third quarter of fiscal 2011 ending May 31, 2011, SemiLEDs expects revenue in a range of $6.0 million to $7.0 million with GAAP net loss of $2.6 million to $2.0 million, or a loss of $0.10 to $0.07 per diluted share, based on an estimated 27.3 million diluted weighted average shares. GAAP gross margin is expected to be in the range of 25% to 30%.

BluGlass & SPTS JV to establish R&D RPCVD site in UK

The JV says feedback from customers indicates that the theoretical performance advantages of RPCVD are now recognised as the core value proposition for the LED industry.

Australian based Bluglass Limited and UK based SPTS have, as part of a Joint Venture (JV), commenced the establishment of a Remote Plasma CVD (RPCVD) research and demonstration site in the UK.

This facility will include the retrofit of a field-proven SPTS CVD production platform to incorporate its RPCVD technology. The JV, focused on the commercialisation of the RPCVD technology for LED production, commenced in October of 2010 and has seen the establishment of a JV team in Silverwater Australia, and now in the UK.

Progress is being made on all fronts with some milestones progressing faster than others. The technology has seen some significant improvements, however due to repair and maintenance issues with the 5th Generation RPCVD tool, leading to machine downtime, there has been some delay in achieving single crystal material at the high standard set by the company.

Despite this, progress has been made on this milestone and other improvements such as greater growth rates when compared to previous generations. The JV is still working towards the achievement of quality single crystal material and is very confident in its achievability.

SPTS has also strengthened its involvement in the JV with the commencement of the design of its RPCVD research and demonstration site and machine in the UK.

President of SPTS, William Johnson said "SPTS believes in the RPCVD technology, firmly supporting the commercial potential of our Joint Venture with BluGlass. Having engaged with our LED customers we are encouraged by their validation of the RPCVD value proposition and level of interest in the outcomes of the Joint Venture."

"Accordingly SPTS have further strengthened our commitment to the JV with the allocation of additional resources, budget and the advanced commencement of activity and research here in the UK," Johnson added.

Feedback from customers indicates that the theoretical performance advantages of RPCVD are now recognised as the core value proposition for the LED industry. The RPCVD process is

increasingly anticipated to be used in conjunction with existing technology, broadening the potential market opportunity.

BluGlass CEO, Giles Bourne added, “We have been extremely fortunate to find such an expert and well connected partner to bring our technology to the market. The progression of our technology since the commencement of the JV has been very encouraging”.

The Joint Venture is geared towards the delivery of single crystal material, a top quality demonstration facility in the UK with access to global customers and to surpass the MOCVD benchmark in material quality in order to deliver RPCVD to the mainstream LED manufacturing market.

Imec to host technology forum 2011

The forum will discuss many topics including GaN-on-silicon HEMTs, LEDs and solar cells. It will be held on May 25 & 26 2011 at Sheraton Brussels Airport Hotel, Brussels, Belgium.

The Imec Technology Forum brings together executives from companies and institutes in Asia, Europe and the USA to share their vision of the future and discuss the challenges they are facing in regard to the enabling technologies to realize this vision. The Forum provides a venue for international networking and learning. It is a meeting place for international company leaders from the nanoelectronics, healthcare, energy, wireless communications and embedded systems industries. ITF 2011 brings an exciting mix of renowned speakers from world-leading companies in nanoelectronics, healthcare, energy, wireless communications, smart systems, as well as imec executives and top researchers. They will give firsthand insights in future developments, technological challenges and recent findings straight out of the labs. Sessions include :

· Smart integration for next generation smart systems
· Smart vision and communication systems
· Clever power

Keynotes will include:

· Semiconductors, core of a sustainable amazing world (Luc Van den hove, President and CEO, imec)
· The smartphone “phenomenon” – a Qualcomm perspective (Steve Mollenkopf, Executive Vice President and Group President, Qualcomm)
· Bridging photonics and computing (Mario J. Paniccia, Intel Fellow and Director Photonics Lab, Intel)
· The New Normal (Peter Hinssen, Co-Founder, Across Group and CEO, Across Technology)
· Innovations for the emerging world: India’s experiences (Vijaya Kumar Ivaturi, Chief Technology Officer, Wipro)
· Overcoming the last barriers to mass adoption of LEDs in illumination (Jy Bhardwaj, Vice President Technology R&D, Philips Lumileds Lighting Company)

Additional keynotes will be made by :

· Chilhee Chung, Executive Vice President and General Manager, Semiconductor R&D Centre, Samsung Electronics
· Jan-Willem Brands, Chief Technology Officer, Barco
· Andrew M. Thompson, Co-Founder, Chief Executive Officer, Proteus Sohrab Emami, Chief Architect and Co-Founder, SiBEAM The presentations will include:

“Semiconductor technology solutions for future smart systems” by Malgorzata Jurczak, Manager of Memory Devices Program, imec “Beyond today’s industrial solar cells” byJörg Horzel, Principal Scientist Solar Cell Technology, imec “GaN-on-Si HEMTs: a cost effective solution to break the silicon limits in power conversion technology” by Denis Marcon, Development and Reliability Engineer, imec

Cree introduces low cost LEDs for 25 W replacement lamps

The lighting-class LED combines the high light output and small footprint of the XLamp XM-L LED package with Cree’s EasyWhite colour mixing technology.

Cree, a leader in LED lighting, has announced the industry’s first lighting-class LED component that

combines the high light output and small footprint of the XLamp XM-L LED package with Cree's unique EasyWhite colour mixing technology.

The new XM-L EasyWhite LEDs reduce the cost and complexity associated with binning and colour mixing, as well as using multiple discrete LEDs. This can enable customers to reduce the price and improve the performance of LED solutions for compact directional lighting, such as 20-25 W halogen MR, PAR and B10-style (candelabra) replacement lamps.

In these applications, Cree says that previous single LED solutions were not able to achieve enough light output to match the incumbent incandescent products. Traditional multi-LED configurations complicate the overall system design and have the added disadvantage of not emulating the look of a light bulb's filament. The XM-L EasyWhite LED enables a single LED component to deliver the performance and design simplicity needed for 25 W replacement lamps.

At just 4 W of power, XM-L EasyWhite LEDs produce up to 340 lumens at an operating temperature of 85 C in warm white (3000K) in a single component. Like XLamp MT-G LEDs, XM-L EasyWhite LEDs are characterised at 85 C, allowing customers to accurately select XM-L LEDs at a specific colour temperature. The XM-L EasyWhite is available with the industry's tightest LED-to-LED colour consistency, replicating the uniformity of incandescent light bulbs.

"XM-L EasyWhite LEDs give customers the best of both worlds: the color consistency of an EasyWhite array in the compact size of a discrete component," said Mike Watson, Cree, senior director, marketing and product applications, LED Components. "In 2009, Cree was the first LED manufacturer to eliminate binning for LED components with our innovative EasyWhite color mixing technology. XM-L EasyWhite LEDs, along with the recently introduced XLamp MT-G EasyWhite LEDs, accelerate the adoption of LED lighting into applications traditionally addressed by energy wasting halogen sources."

XM-L EasyWhite LEDs are available in 2-step MacAdams Ellipse colour points. They are also available in either a 6V or a high voltage 12V configuration, which enables the use of efficient, small and low-cost drivers. XM-L EasyWhite LEDs have the same low profile dome and 5mm x 5mm footprint as the current XM-L LED family.

XLamp XM-L EasyWhite LEDs are available now in sample and production quantities with standard lead times. XM-L EasyWhite LEDs are available in both standard CRI and high CRI (minimum 85 and 90) versions at multiple colour temperatures.

Wolfgang Dehen to become Osram CEO

Dehen left the Managing Board of Siemens AG at the end of March 2011. Furthermore, Martin Goetzeler has been appointed as Chief Operating Officer of Osram.

Leading up to the company's planned Initial Public Offering (IPO) in Autumn 2011, the Supervisory Board of Osram GmbH has appointed Wolfgang Dehen, 57, as new Chief Executive Officer and Martin Goetzeler, 48, to assume the position of Chief Operating Officer.

This came into effect on April 1, 2011. Wolfgang Dehen left the Managing Board of Siemens AG at the end of March 2011.

The planned forming of an Osram stock corporation provides for his nomination to the Osram AG board as President and CEO. "In Wolfgang Dehen we have secured the services of a first-class manager for Osram, with a wealth of experience in the IPO process and the Managing Board of a stock listed company", commented Siegfried Russwurm, Chairman of the Supervisory Board of Osram GmbH.

"Furthermore, Martin Goetzeler as COO stands for success and continuity in Osram's business operations. We shall consequently have at Osram a highly qualified management team with the firm

objective of joining forces with the Osram workforce to shape the future of the lighting market."

Since January 2008 Wolfgang Dehen has been CEO of the Energy Sector of Siemens AG. He previously held various positions in the automobile industry, including most recently serving as President and CEO of Siemens VDO Automotive GmbH.

Martin Goetzeler has stood down from his position as CEO of Osram GmbH and was simultaneously appointed Chief Operating Officer by the Supervisory Board. He is to retain this function after the forming of Osram AG as a member of the Managing Board. Klaus Patzak, currently Head of Corporate Finance Reporting and Controlling at Siemens AG, is designated as the Chief Financial Officer of Osram AG. Thomas Schaffer will take over new responsibilities within Siemens AG.

Fox Group signs fifth license for its SiC patents

The firm's key patents are for SiC substrates and Fox says non-exclusive licenses remain available.

The Fox Group has entered into a patent license agreement with a non-U.S. company for rights to patents in its portfolio.

This is the fifth non-exclusive and royalty-bearing license agreement Fox Group has signed for its patents related to SiC, a compound semiconductor substrate material. Details of the patent license were not disclosed.

"Having just signed the fourth license on February 14th, Fox Group is pleased to add this fifth license so soon thereafter," said Barney O'Meara, President & CEO. "Fox Group's key patents are for silicon carbide with low defect density, and our successful licensing activities confirm the value of our intellectual property. Non-exclusive licenses remain available, and we look forward to the balance of the industry taking licenses," said O'Meara.

SiC is used in the production of high performance power semiconductor devices and optoelectronics such as LEDs, lasers, RF transistors, detectors, MOSFETs, HEMTs, JFETs, BJTs, and Schottky barrier and PIN diodes, and is expected to play an increasingly important role in higher efficiency power conditioning systems for electric vehicles, photovoltaics, wind, and other renewable energy sources.

PARC orders Aixtron MOCVD system for lasers and LEDs

After delivery in the second quarter of 2011, the system will be used for the epitaxial growth of InGaAlN LEDs, laser diodes, and electronic devices.

Aixtron SE has a new order for a Close Coupled Showerhead (CCS) MOCVD system from PARC, a Xerox company, in Palo Alto, California, USA.

The system will include the full set of advanced features such as the in-situ multichannel pyrometer ARGUS, high temperature growth, and gap adjustment for optimum (Al)GaN conditions in a wide pressure range.

Placed in the fourth quarter of 2010, the order is for a CCS system capable of operation in the 3x2-inch configuration. After delivery in the second quarter of 2011, the system will be used for the epitaxial growth of InGaAlN LEDs, laser diodes, and electronic devices. A local Aixtron support team will commission the new reactor within a specially dedicated facility in PARC's electronic materials and devices research division.

"Our ongoing programs require a state-of-the-art MOCVD system with advanced features that enable our team to carry out R&D over a wide range of optoelectronic materials and devices," Jennifer Ernst, Director of Business Development at PARC, comments. The CCS system is widely deployed in industry and well suited to our needs. With it, we can expand our capacity and capabilities to develop and deliver new device technologies."

"We will be able to develop new processes in a commercial reactor that are compatible with a prospective scale-up to full production scale in due course. Working closely with the experienced Aixtron support team, our group expects to, for example, quickly optimize conditions for growth of GaN alloys with a high percentage of Al as required

for deep-UV optical emitting devices."

PARC has already developed LEDs and laser diodes in the visible and UV spectral regions.

Silicon and GaPN LEDs united on a single chip

Japanese researchers have designed an optoelectronic integrated circuit for use in one-bit digital counters.

Silicon-based semiconductor devices dominate the microelectronics industry and are used for the fabrication of high density integrated circuits comprising of memory and processing devices. However, silicon has an indirect band gap, which severely limits its use for fabricating photonic devices such as LEDs and lasers. To address this problem, researchers from Toyohashi University of Technology have developed an innovative solution by integrating silicon devices with LEDs. These LEDs are produced using direct band gap nitride compound semiconductors and these novel devices are called optoelectronic integrated circuits (OEICs).

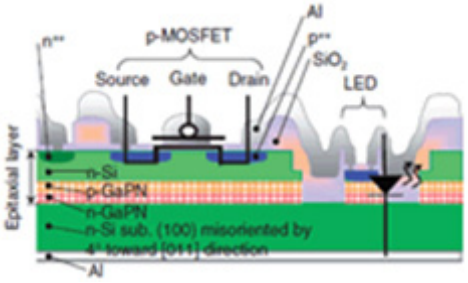


Figure 1. One-bit counter consisting of a p-MOSFET and GaPN LED

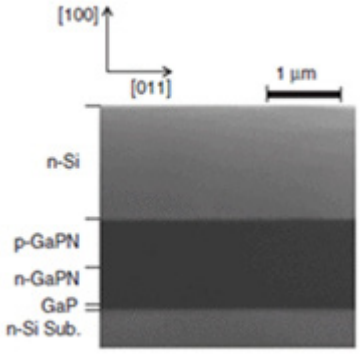


Figure 2. Transmission electron microscope image showing the n-Si/p-GaPN/n-GaPN/GaP/Si heterostructure.

Akihiro Wakahara and colleagues at Toyohashi Tech have demonstrated what they say is the first realisation of a one-bit counter circuit OEIC with an optical output consisting of silicon field effect transistors integrated with GaPN LEDs on a single chip. The monolithic integrated circuits were fabricated using lattice matched silicon/GaPN/silicon heterostructures grown on silicon substrates in a dual chamber MBE system. Notably, growth of the silicon capping layer at a high temperature of 850oC led to a dramatic reduction of the threshold voltage to -2.1 V and an increase of the channel mobility of the p-MOSFET to 82 cm2Vs. This improvement is attributed to a decrease in phosphorus incorporation during the growth of the capping layer.

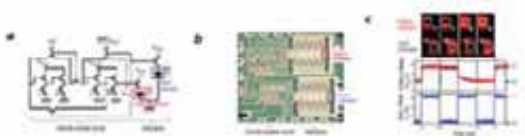


Figure 3. (a) Circuit diagram of the one-bit counter; (b) Optical image of an actual circuit; (c) Synchronisation of the LED emission with input and output circuit voltages

The one-bit counter circuit fabricated using the n-Si/p-GaPN/n-GaPN/GaP/n-Si heterostructure exhibited normal operation, where red light emission from the input and output indicators was in synchronisation with the input and output logical voltages.

Positive vibes reverberate through CS Europe

Compound semiconductor lasers and memories for making data communications greener, green laser pointers for picoprojectors and more advanced GaAs chips for tomorrow's smart phones were all discussed at CS Europe.

On 22 March 150 delegates from around the globe flocked to Frankfurt, Germany, to attend CS Europe and capture an overview of the state of

the compound semiconductor industry and find out where it is heading.

During this one-day meeting those attending could pick and choose from 18 talks that covered the broad spectrum of manufacturing activities occurring in the compound semiconductor industry.

Key note speaker for the event was the legendary MBE trailblazer Klaus Ploog, who reminded the audience of some of the hurdles that confront the industry – including the low efficiency of LEDs in the green, and droop that plagues nitride devices at high currents – plus opportunities in certain areas, including exotic compound semiconductor materials for memory.

The other speakers who spoke that day were:

· Jeff Shealy, Division Vice President of RFMD who described the role of GaN RF Power Technology for tomorrow's commercial and defense wireless applications
· Modulight's president, Petteri Uusimaa, who explained how to make a state-of-the-art visible red laser, what its characteristics are, and what applications it can serve
· Jan-Gustav Werthen, Senior Director,Photovoltaics at JDSU, who explained why there is an urgency for the world to make power grids digital (smart grids) and also described photovoltaic developments for electricity production from solar
· Otto Berger, Corporate Advanced Technology Director of TriQuint Semiconductor, who detailed 3G/4G requirements for wireless systems and the role GaAs and GaN devices will play in meeting them
· OMMIC's CEO, Marc Rocchi, who gave his take on what's needed from GaAs and GaN for tomorrow's wireless
· Alexander Bachmann, Marketing Engineer from OSRAM Opto Semiconductors, who outlined the company's recent progress on green InGaN laser diode development
· Christian Gartner, senior product engineer at OSRAM Opto Semiconductors, who considered the success factors for the deployment of solid state lighting
· Markus Behet, Europe Business Development Manager, Dow Corning Compound Semiconductor, who discussed SiC advances for power electronic applications
· Ulf Meiners, Chief Technical Officer, UMS and Mark Murphy, Director Marketing, RF Power & Base, NXP, who talked about high-performance compound semiconductors for infrastructure, automotive and defense applications
· Philippe Roussel, Project manager Power Electronics and Compound Semiconductors Yole Développement, who described the status and outlook of the GaN power electronics market
· Ertugrul Sönmez, who heads up business development at MicroGaN, who detailed the company's high-voltage GaN Devices and ICs for next-generation power management
· IQE's Roy Blunt, who covered standardization issues in compound semiconductors, which are an essential step for furthering the efficiency & profitability of the industry
· Mike Czerniak Product Marketing Manager, Exhaust Gas Management, Edwards, who spoke about the company's technology for reducing GaN emissions in the fab
· Thomas Uhrmann Business Development Manager at EV Group, who discussed the role of engineered substrates for future compound semiconductor devices
· Ian McKinlay, Senior Product Manager at Oxford Instruments Plasma Technology, who compared Batch and single wafer processing strategies for HB LED manufacture
· Mike Wale Director Active Products Research at Oclaro, who talked about 100G networks
· Giles Chappell Associate from McKenna Long & Aldridge LLP, who described the steps needed to ensure compliance with the new RoHS Directive

A more comprehensive account of CS Europe will appear in the April &May edition of Compound Semiconductor magazine.

SemiLEDs unveils new UHB GaN LED

With increased efficiency, reliability and the lowest thermal resistance in the market, the I-Do chip is ideal for small footprint, high performance applications.

SemiLEDs Corporation, a developer and manufacturer of LED chips and LED components, has revealed the new I-Do LED.

I-Do is an ultra high brightness LED and is the second generation of the I-Core AK series of LEDs from SemiLEDs. These chips are designed to provide further improvements in brightness, reliability and overall efficiency.

The I-Do LED features a new design with advantages in improved reliability, optimisation of current distribution and lower forward voltages at high current operations of 700mA and 1A. SemiLEDs says that the I-Do LED is not only more reliable, but significantly brighter as the creative design produces improved internal quantum efficiency.

In a white light package, a 45 mil I-Do chip can deliver up to 135 lm at 350mA with CCT of 5000-7000K, more than a 10% improvement over the previous generation. With increased efficiency, reliability and the lowest thermal resistance in the market, the I-Do chip is ideal for small footprint, high performance applications.

I-Do is available for sampling, with high volume production in April.

Low sales of LED chips prompts Cree to reduce financial targets

Revenue targets for Q3 fiscal year 2011 have been reduced to a range of $215 million to $220 million.

Cree, a leader in LED lighting, has revised financial targets for its fiscal third quarter ending March 27, 2011.

Revenue targets have been reduced to a range of $215 million to $220 million primarily due to lower sales of LED chips and LED components.

LED component demand is improving post-Chinese New Year, yet revenue is lower than originally targeted. It has taken longer to work through customer inventories than previously anticipated and pricing was lower than the company had previously forecast.

The LED chip business is also weaker than targeted due to more aggressive pricing and weaker demand.

Gross margin for the quarter is expected to be approximately 43%. The decline in gross margin targets is attributable primarily to increased pricing pressure in the LED chip product line.

Operating expenses are expected to be slightly lower than previously targeted.

“The LED components business appears to be turning the corner,” stated Chuck Swoboda, Cree’s CEO and chairman. “Despite the challenges we faced in Q3, distributor sell-through has improved and we target solid growth next quarter. Based on our preliminary outlook for Q4, we are currently targeting revenue to increase 10 to 12% in fiscal Q4 led by growth in LED components.”

The company held a conference call and web broadcast to discuss these updated targets.

Cree appoints Bruce Renouard as senior vice president of global sales

Renouard will be responsible for sales of LED chips, LED components, materials and power and RF components for the company.

Cree,a market leader in LED lighting, has appointed Bruce Renouard as senior vice president – sales and business development, effective March 21.

In this newly created position, Renouard will be responsible for sales of LED chips, LED components, materials and power and RF

components for the company. This position is part of Cree's ongoing investment in sales and marketing to further enable the LED lighting and power markets.

"As we continue to lead the LED lighting revolution and drive adoption into new applications, we are also focussed on enabling our customers," said Chuck Swoboda, Cree chairman and chief executive officer. "Bruce's demonstrated sales leadership and experience in selling integrated solutions around key components will be a great addition to the Cree management team."

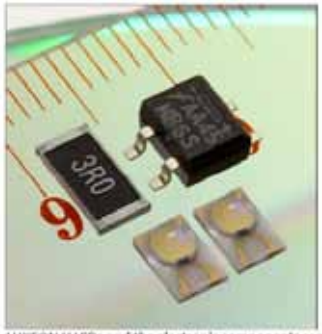
Renouard comes to Cree after nine years at Power Integration Corporation where he served as vice president of worldwide sales.

Lumileds' LUXEON H LED simplifies design of space constrained lighting

Initial applications are expected in the retrofit bulb market .The high voltage LED uses rectified AC and eliminates the need for a DC electronic driver.

Philips Lumileds is continuing to expand its LUXEON LED portfolio with its first high voltage emitter, the LUXEON H.

The new emitters are driven directly with rectified AC voltage rather than constant DC current. This high voltage architecture maximises space for additional thermal management, permitting an increase in the thermal limit for even the smallest bulbs. The 50 Volt LUXEON H flexibly supports both 110V and 240V solutions.



LUXEON H LEDs and the electronic components required for a system

Designed to meet the demands of space constrained retrofit bulbs, LUXEON H emitters deliver industry leading thermal performance and reliability as well as high quality, warm white light. Two colour temperatures are available, 2700K and 3000K, with typical CRIs of 83. Typical flux is 84 lumens and 90 lumens respectively for the two correlated colour temperatures. The LUXEON H emitters are identical in footprint to the compact LUXEON Rebel and LUXEON Rebel ES LEDs further simplifying implementation.

"Our thin film flip chip technology allows us to continue to develop innovative solutions, like the multijunction die in LUXEON H, for the illumination market," said Frank Harder, VP of Product Marketing for LUXEON. "The base of some bulbs is so small that it's impossible to fit both an electronic driver and a heatsink in the space. LUXEON H only requires a bridge rectifier and a resistor, both of which are very small, and the remaining space can be used for thermal management. And, because we don't use direct red die like most other HV solutions, LUXEON H offers consistent, stable colour from the instant the LED is powered and maintains its colour through its lifetime."

Initial uses of LUXEON H are expected in the retrofit bulb market where form factors for the bulbs are already defined and space is at a premium—especially so for the smallest bulb types ranging from the candelabra to the intermediate Edison, E10-E17 types. Philips Lumileds expects new solutions using LUXEON H to come to market during the second quarter of the year.

LUXEON H is in volume production and is available with standard lead times from Future Lighting Solutions.

The LUXEON H joins the recently released LUXEON S, the first product with Freedom From Binning, and LUXEON Rebel and LUXEON Rebel ES, widely used power LEDs.

United LED to ramp up manufacturing with Veeco MOCVD tools

The Chinese based JV has ordered a number of Veeco's K465i systems for its Jining City facility.

Veeco Instruments has announced that United LED Shan Dong Corp (ULED) a China-based joint venture between United Microelectronics Corp (UMC) and Epistar, has placed a multi-tool order for its TurboDisc K465i MOCVD Systems.

The systems will be installed at ULED's facility in Jining City, China for its high brightness light emitting diode (HB LED) manufacturing ramp.

Tzu-Chi Wen, Vice President, Epi factory of United LED, commented, "We are pleased to add Veeco systems to our production facility because of their demonstrated leadership in MOCVD technology. The K465i provides the process performance and lowest cost of ownership needed to advance ULED's position as a provider of LED devices for various lighting applications."

Bill Miller, Executive Vice President, Compound Semiconductor and head of Veeco's MOCVD Operations commented, "We are delighted that United LED has chosen Veeco's K465i systems for their manufacturing ramp. Our systems offer key advantages, including highest capital efficiency and excellent yields, which will help establish ULED as a leader in the growing China market."

Veeco says the K465i's very good uniformity and run-to-run repeatability is production-proven and extends its lead in capital efficiency, the number of good wafers per day for each capital dollar, for high volume LED manufacturers. The K465i provides ease-of-tuning for fast process optimisation on wafer sizes up to 8 inches and fast tool recovery time after maintenance.

Sunovia terminates stock options with ex CEO

The company has terminated the Stock Option Agreement dated December 20, 2005 and has changed its fiscal year date.

Sunovia Energy Technologies, a clean-tech company specialising in LED lighting and solar technologyhas changed its fiscal year from July 31 to December 31.

The change was effective from December 31, 2010 and was approved by the Board of Directors on February 9, 2011. The firm has also modified certain contracts with its founders and their affiliates.

"This change will simplify our financial and public reporting," said CEO Art Buckland of the move. "We are improving our processes and procedures at all levels of the Company, in all aspects of the business. This is just one example of an area where a simple change will bring the Company forward in that effort."

The Company will file an Annual Report on Form 10-K for the fiscal year ended December 31, 2010 and will commence quarterly reporting on the new calendar quarter in the first quarter of this year.

The Company also announced the termination of the Stock Option Agreement dated December 20, 2005, as amended and assigned, between the Company and Craca Properties, an affiliated company of Carl L. Smith, III, former CEO and a founder of the Company.

As disclosed in prior reports of the Company, the Option provided Craca Properties the right to acquire 500,000,000 shares of common stock of the Company at an exercise price of $.10 per share.

"Termination of the option allows the Company to provide incentives to employees through stock options in a more meaningful way," Buckland said. "This is an important step to motivating our employees to work hard through the challenges ahead. It is equally important to our effort to position the Company for additional investment."

Smith agrees that the strategy and the result are critical to the Company's success. "We need to keep our team motivated, and we need to be positioned to raise capital," he noted. "When it was granted, this option was primarily intended to be a defensive weapon if an unwanted takeover occurred. That is not a significant concern at this stage of the Company's progress."

Smith and the Company also agreed to terminate the Royalty Agreement dated as of December 20, 2005 between Sparx (an entity controlled by Smith) and Sologic (a predecessor in interest to the Company).

Smith and the Company further agreed that Smith would return to the Company a portion of the

shares committed by him in 2008 to be cancelled to reduce dilution from the issuance of stock to EPIR. As previously disclosed, Smith committed to cancel 4,495,000 shares at that time. A portion of the shares that would otherwise be returned to the Company as a result of this cancellation have been issued in settlement of certain consulting fees. The Company anticipates that approximately 3 million shares will be cancelled as a result of this transaction.

With these agreements, the Company and Smith have fulfilled or cancelled the contractual obligations between them and their related entities.

The Company and two of its officers, Matthew A. Veal, Chief Financial Officer, and Robert A. Fugerer, Chief Technology Officer, have mutually agreed to terminate the employment contracts between them. Both Veal and. Fugerer remain employed in those capacities.

"We are moving away from employment contracts for employees other than our CEO," said Tom Siegfried, an independent director of Sunovia. "The leadership of these officers in voluntarily cancelling their employment contracts is commendable and a sign of commitment to the Company and its long-term goals."

Beiji Haotian Technology upgrades power LED capacity with Aixtron

The Chinese LED chip manufacturer has ordered two AIX 2800G4 HT and three AIX G5 HT deposition systems.

Aixtron SE has an order for MOCVD reactors from new customer Beiji Haotian Technology Company.

The order for a total of five systems comprises two AIX 2800G4 HT deposition systems in the 42x2-inch configuration and three AIX G5 HT deposition systems in the 56x2-inch configuration. The Jiangsu, China-based company placed the order during the second quarter of 2010 and following delivery between the first and second quarter of 2011, the systems will be used for production of power chip LEDs.

The local Aixtron support team will commission the systems in a dedicated facility at a production plant in YiXing city, Jiangsu province, China.

JiaYe Yang, Vice President of Beiji Haotian Technology comments, "The close cooperation with Aixtron who have been working up our capabilities in epitaxy technology has resulted in a new large-scale investment for our LED epi business. This plan also involves further cooperation with Tsinghua University who will make a technical transfer from an Aixtron Planetary Reactor platform to our new systems. Due to the proven compatibility of these systems and the excellence of the Aixtron process transfer and service we see this will be a straightforward procedure. Aixtron's technology transfer engineers make up the most experienced team in this business."

Tsinghua University is involved in a new LED patent technology transfer and long-term cooperation agreement entitled the "Arctic Haotian high-power HB LED Chip Project" which will take place in the Jiangsu Yixing Economic Development Zone and provide long-term production, R&D and training support.

A major project investment of about 473 million yuan (about € 51.5m) for 1W high power chips is planned in the period up to May 2011. Phase II of the LED production project should be completed by the end of 2012 with an additional investment of 500 million yuan (about € 54.5m). This will include ten new MOCVD units and supporting production lines with a total of 567 thousand yuan (about € 62k) and a total investment for 1W high power chips of nearly 1.42 billion yuan (about € 155m).

Lumileds drives automotive lighting forward

The firm's SnapLED now has 'build out of the box' capability for automotive applications and is designed to significantly reduce engineering and development costs.

SnapLED, one of the automotive industry's most widely used LED for signalling applications, has been significantly improved by Philips Lumileds.

With a continued focus on reliability and

performance, engineers have raised junction temperature maximums, narrowed colour binning to levels imperceptible by the human eye, dual-binned for drive current to simplify the design process and make it easier to meet critical regulation requirements.

The firm has also implemented a new "Multi-Environment Over Stress Test" (MEOST) regimen to ensure SnapLED is the most reliable automotive LED.

SnapLED array for a rear combination lamp

"A 'build out of the box' approach to turn, tail, and stop lighting applications on vehicles is a major step forward for the auto industry and significantly reduces engineering and development costs," said Scott Kern, Strategic and Product Marketing at Philips Lumileds.

"We remove the need for re-testing and screening which can save our customers more than 5% of operational costs, reduce equipment and manpower needs, speed production and improve finished goods yields. We continue to lower system costs and barriers to adoption."

SnapLED's maximum junction temperature has been increased to 135°C, which Lumileds says is the highest in the industry for a mid-power LED. This widens the design envelope and gives engineers more flexibility in their design efforts as they create new lighting solutions.

Flux bin sizes, which were already quite small, have been reduced by as much as 67% so that flux variations within a bin are imperceptible to the human eye. Simultaneously, the forward voltage bin widths have been reduced by as much as 50%, making the use of low-cost, resistor-based driver circuits easier to implement. Also, SnapLED is designed to operate over a dynamic current range of 30:1, allowing for simplified, yet reliable, designs for both stop- and tail-mode operation.

LEDs in stop-tail signalling lamps tend to operate at the extremes of current limits, and most have difficulty meeting the performance and uniformity requirements without expensive electrical designs. With SnapLED's dual binning, flux ratios between different current levels and uniformity across the entire dynamic range are highly controlled. This precision makes it easier to implement a solution with confidence, without the need of retesting LEDs prior to assembly as the uniformity and flux performance are already narrowly defined.

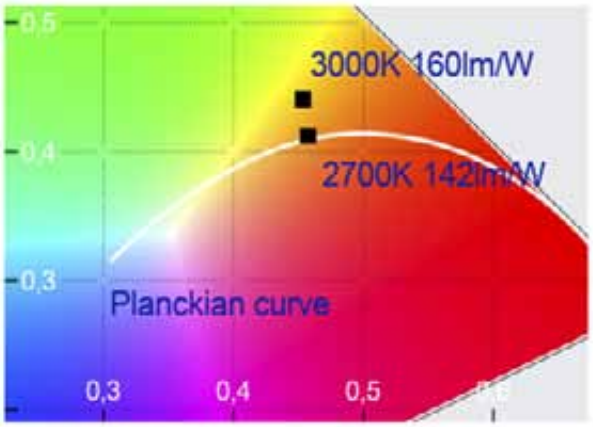
A new testing regime, Multi Environment Overstress Testing (MEOST) that exceeds the testing required by today's standards for automotive signalling LED sources has also been implemented for SnapLED. This test regime exceeds AEC-Q101, including simulations for extreme operational conditions as well as tests that far exceed datasheet guidelines which should ensure SnapLED LEDs will function reliably for the life of the vehicle.

Osram raises the efficiency bar for warm white LED

The peak value of 142 lm/W measured under standard conditions is achieved at a colour perception that very closely matches that of a classic incandescent lamp.

Osram Opto Semiconductors has set a new laboratory record of 142 lm/W for the efficiency of a warm white LED light source.

With a correlated colour temperature (CCT) of 2755 K the LED achieves a good colour rendering index (CRI) of 81. Measurements were taken under standard conditions; room temperature and pulsed mode at an operating current density of 350 mA/mm^2.



Bright warm white light with high efficiency is particularly important for lighting applications in the residential sector. The laboratory setup for a warm white LED shows the enormous potential of these energy-saving semiconductor light sources. The peak value of 142 lm/W measured under standard conditions is achieved at a colour perception that very closely matches that of a classic incandescent lamp (colour coordinates cx 0.46/ cy 0.41 on the Planckian curve).

“If we explore this technical approach further and allow deviations from the Planckian curve we should even now be able to achieve higher efficiency values of up to 160 lm/W for a correlated colour temperature of 3000 K (cx 0.45/ cy 0.44)”, said Norwin von Malm, Predevelopment Manager at Osram Opto Semiconductors.

“If we apply this approach to a 2 mm² chip we can improve efficiency by a further 10 to 15 percent for the same operating current. We would then expect 180 lm/W for a pure warm white LED and good colour rendering.”

The increase in efficiency was made possible by combining new procedures in thin-film and UX:3 chip technologies and in conversion. Development engineers at Osram Opto Semiconductors have benefited here from combined know-how in all aspects of the production process. These include epitaxial growth, thin-film chip architectures, conversion processes and package technologies.

Osram Opto provides LED lighting for three Beijing districts

In some parts of Beijing, LED modules for street luminaires with an output of 120W or 180W now replace the conventional 250W or 400W sodium vapour lamps, resulting in energy savings of up to 50%.

LED technology in street lighting is on the advance across the world. As part of the Chinese “10 cities 10,000 lights” project, three districts in the capital Beijing were equipped with LED street luminaires by the HBTechnology CAST Group, using OSLON SSL LED produced by Osram Opto Semiconductors.

They ensure that the busy streets are brightly lit and save up to 50% in energy compared with conventional luminaires.

In some parts of Beijing, LED modules for street luminaires with an output of 120W or 180W now replace the conventional 250W or 400W sodium vapour lamps. As a result, these urban districts achieve energy savings in street lighting of up to 50%.

For the metropolis of Beijing with its high energy consumption, this is of great importance. In addition to energy efficiency, light quality also played a major role in the decision for conversion. Dong Cheng, Chao Yang and Da Xing are urban districts bustling with life. For that reason, excellent illumination was required to increase safety for both drivers and pedestrians.

Photo: OSRAM / HBT
Three urban district in China’s capital Beijing now

benefit from LED street lighting, providing bright and homogeneous illumination of the busy streets.

The city planners decided in favour of the powerful OSLON SSL LED which are part of the 1-W class. With a compact size of only 3 x 3 millimetres, Osram says they are currently the smallest LED in their class and luminous efficacy on the market.

Even at higher flux rates, they work reliably and efficiently. Their good colour rendering index with natural appearance of colours and clearly contoured rendition of contrasts provides additional safety on Beijing's streets.

OSLON SSL LEDs have a beam angle of 80 degrees and are thus ideally suited for street lighting; the ideal beam angle for this application is 120 x 80 degrees. "In this way, the LEDs meet all of our technical requirements and we have no problems integrating them into the external lenses. The result is homogeneous and powerful illumination of the streets without liht pollution", explains Bing Hu, Managing Director of the HBTechnology CAST Group. The long lifespan of OSLON SSL LED also results in lower maintenance requirements, which might otherwise have obstructed the flow of traffic and generated additional costs.

Thanks to their capability of handling high-current loads, OSLON SSL LEDs can be used to realise particularly energy- and cost-saving lighting solutions. At an operating current of 350 mA, this light source achieves a typical brightness of 110 lm in ultra-white (5700 and 6500 K).

At an operating current of 350 mA and a colour temperature of 3000 K it achieves a typical efficiency of 82 lm/W and a brightness of 92 lm. Brightness is an impressive 156 lm (warm white) at an operating current of 700 mA. "This allows us to realise lighting applications requiring a lot of light by using fewer LEDs. If, as planned, Beijing converts all of its street lighting to LED, the savings potential is enormous", states Kai-chong Cheng, Marketing Director at Osram Opto Semiconductors in Asia.

China is the leading market in LED street lighting, representing approximately 50% of applications worldwide. The pilot project in the capital is to be followed by other cities.

Bridgelux announces appointment to its board of directors

George de Urioste will serve as chairman of the Board's audit committee and brings more than 30 years of experience in the semiconductor and enterprise software industries to the position.

Bridgelux, a developer and manufacturer of LED lighting technologies and solutions has announced that George de Urioste has joined its Board of Directors.

De Urioste will serve as chairman of the Board's audit committee and brings more than 30 years of experience in the semiconductor and enterprise software industries to the position.

"George's experience as CFO and COO in publicly held companies is well suited to Bridgelux's needs as we embark on our next phase of growth," said Bill Watkins, Bridgelux CEO. "His success in growing and managing world-class operations and teams will be instrumental to our success."

In addition to his related industry experience, de Urioste is a Certified Public Accountant. Prior to joining the Bridgelux Board, he served in 2008 as interim Chief Financial Officer and then interim Chief Operating Officer of Marvell Technology, a $3 Billion semiconductor provider of high-performance analogue and digital signal processing products for data storage, mobile and video communications.

During his CFO tenure there, the market capitalisation grew from $6 billion to $10 billion. De Urioste has also held COO and CFO responsibilities at Chordiant Software and was Chief Financial Officer at Remedy Corporation; both companies were publicly held during his tenure. More recently, de Urioste was a member of the Board of Directors and served for three years as the audit committee chairman at Saba Software.

Bridgelux dramatically advances its GaN-on-silicon LED technology

The firm has demonstrated what it says is the industry's first commercial grade performance for a silicon-based LED. Optimisation of the epitaxy process on 8-inch silicon wafers will make LED manufacturing compatible with existing automated semiconductor lines.

Bridgelux, a developer and manufacturer of LED lighting technologies has achieved a major breakthrough with the demonstration of 135 Lumens per Watt GaN-on-silicon based LED Technology.

The firm says this represents the industry's first commercial grade performance for a silicon-based LED.

When grown at scale, most LED epitaxial wafers use sapphire or silicon carbide substrates as the starting material. But large diameter sapphire and silicon carbide substrates are costly, difficult to process, and not widely available.

As a result, production costs have inhibited the widespread adoption of LED lighting in homes and commercial buildings. But growing GaN on larger, low-cost silicon wafers that are compatible with modern semiconductor manufacturing can deliver a 75% improvement in cost over current approaches.

The 135 Lumen per Watt performance was achieved at a CCT of 4730K using a single 1.5mm power LED operated at 350mA. These LEDs have extremely low operating voltages, requiring just 2.90V at 350mA and < 3.25V at 1 Amp. The low forward voltage and excellent thermal resistance of the devices make them ideally suited for high-performance, illumination-grade applications. Optimisation of the epitaxy process on 8-inch silicon wafers will make LED manufacturing compatible with existing automated semiconductor lines.

The move to a Silicon substrate will be a revolutionary step for the LED industry, and Bridgelux is well-positioned to take full advantage of the introduction of this technology. Over the past 5 years, Steve Lester, one of the industry's pioneers in LED Research and Development, has fostered a world-class team of Bridgelux materials scientists and chip design engineers dedicated to GaN-on-silicon R&D.

Concurrently, industry-wide research and development of GaN growth on silicon has increased rapidly. And as a result, the GaN on Silicon performance levels reported by Bridgelux today are comparable to state-of-the-art sapphire-based LEDs available 12-24 months ago. The company anticipates the delivery of its first commercially available GaN-on-silicon products over the course of the next two to three years.

Bridgelux, which maintains an asset-light operating model, will leverage its strong R&D and Intellectual Property position in LED epitaxy to jointly manufacture silicon based LEDs. The company is currently in discussions with a number of established semiconductor companies regarding the utilisation of the many fully depreciated 8-inch semiconductor fabrication operations available around the globe.

"Bridgelux's achievement is a significant reflection of the strength of our leadership in silicon materials and epitaxial process technology," said Bill Watkins, Bridgelux CEO. "The significantly reduced cost-structures enabled by silicon-based LED technology will continue to deliver dramatic reductions in the up-front capital investment required for solid state lighting. In as little as two to three years, even the most price-sensitive markets, such as commercial and office lighting, residential applications, and retrofit lamps will seamlessly and rapidly convert to solid state lighting."

LUXEON LEDs Are Industry's First to Light an ENERGY STAR Qualified 60-Watt Equivalent Retrofit Bulb

LUXEON power LEDs are lighting the world's first ENERGY STAR qualified LED replacement for a 60-watt incandescent bulb.

In production and available to consumers and professionals alike, the Philips AmbientLED

bulb (also sold professionally under the Philips EnduraLED brand) using 18 LUXEON Rebel LEDs has met or exceeded the quality and energy efficiency requirements for a 60-watt LED equivalent set forth by ENERGY STAR.

"LUXEON LEDs deliver the light, reliability, and efficacy required by retrofit bulb manufacturers to meet increasingly stringent standards worldwide," said Steve Barlow, EVP of Sales and Marketing at Philips Lumileds. "We are well beyond demo and prototype bulbs not only for 60-Watt equivalents but also for MR16s, PAR lamps, GU10, and other form factors that are widely used. Our sights are now set clearly on enabling replacements for 75-watt equivalent bulbs."

At operating conditions, which can reach 100°C or higher inside the LED, the LUXEON in an ENERGY STAR qualified solution must provide enough light to deliver at least 800 lumens, a color rendering index of 80, and they must be reliable enough to support a minimum three year warranty. In the case of the newly qualified AmbientLED, a six year warranty is offered for the LUXEON based solution.

Because there are so many different types and styles of bulbs, Philips Lumileds is continuously broadening its portfolio of LUXEON LEDs with different CRI, CCT, and light output characteristics in order to meet the needs that vary by bulb type and by geographic region.

LUXEON LEDs for retrofit solutions are available today from Future Lighting Solutions. Design resources, engineering resources and prototyping assistance are available from both Philips Lumileds and Future Lighting Solutions.

Medvedev impressed by Optogan's largest LED Site in Russia

European LED manufacturer Optogan welcomed Russia's President Dmitry Medvedev in the recently set up LED production plant in St. Petersburg.

During his official visit the President was able to convince himself of the luminous power produced by the German LED chips used in the Russian built LED lamps.

The recently opened St. Petersburg sister plant to the Bavarian based Landshut company, builds energy efficient LED components and light fittings to fulfil its rapidly growing domestic demand. These lighting elements are now already to be found in private, commercial and complete communal installations world-wide.

Optogan says President Medvedev was clearly impressed by the cutting edge technology and its production plant, and promised to support Optogan in his domestic market. Personally, the President complained that in his own residence every week a bulb needed changing. Clearly the LED technology has advantages here. The LED lamp is projected to last up to 50,000 hours rather than conventional technology which are claimed to last only 1000 hours.

President Medvedev during his visit at Optogan's LED production facility, St. Petersburg

"During the past year we have achieved remarkable results. Our LED production in St. Petersburg started in 2010 and is the largest in East Europe and CIS" reported Maxim Odnoblyudov the CEO of the Optogan group to the Russian President.

"A continual improvement of the technology and the placement of a complete production process in Russia will lead to a noticeable price reduction which, in turn, will lead to even stronger sales within the domestic market.", continued Odnoblyudov. To achieve this goal, Optogan will enter into co-operation with both national and international lighting manufacturers.

President Dmitry Medvedev together with the founders of Optogan Maxim Odnoblyudov, Vladislav Bougrov and Alexey Kovsh

Osram Opto to expand LED Capacity in Malaysia and Germany

The firm will convert and expand its chip manufacturing capabilities at its Penang and Regensburg plants and convert from 4 inch to 6 inch wafer production.

Osram Opto Semiconductors will be stepping up its production output significantly by converting its two chip manufacturing facilities to 6-inch wafers while expanding both plants.

A new production building is currently under construction in Penang, Malaysia, while in Regensburg, Germany, the available space is being reallocated. The two facilities will each be converting to the new manufacturing technology, introducing 6-inch wafers to replace the current 4-inch wafers. These measures are expected to almost double the chip production capacity for white LEDs by the end of 2012

With this move, Osram Opto is putting itself on track to cash in on the growth potential of international LED markets and the expansion measures at its Regensburg and Penang production plants will be decisive in securing its international market position. The Penang chip manufacturing plant, which opened nearly two years ago, has been pegged for further expansion and conversion to 6-inch wafers.

The chip plant is growing: new production areas are being created on the grounds of Osram Opto Semiconductors in Penang (Malaysia).

The total manufacturing area will be raised to around 25,000 sqm in 2012, creating some 400 additional jobs in the process. At the Regensburg plant, the available area is to be reallocated and InGaN production to be converted step by step from as early as the summer of 2011.

“By expanding our capacities for high-performance InGaN chips, we are consistently consolidating our market position. The LED market harbors great growth potential in many different fields of application and we intend to continue harnessing this,” said Aldo Kamper, CEO of Osram Opto Semiconductors, “The company is an important link in Osram’s LED technology value-added chain.”

The capacity expansion will primarily affect InGaN chips employing thin-film and UX:3 technology, which are required in the production of white LEDs. These will be manufactured on 6-inch wafers from the outset and not on wafers with a 4-inch diameter, from now on.

A larger chip surface boosts capacity: Osram Opto Semiconductors is converting its production facilities for InGaN chips to 6-inch wafers.

Optoelectronics CS Segment to Maintain Momentum Into 2011

Strategy Analytics says the compound semiconductor industry will see further growth in the next few months and anticipates that Philips Lumileds, Finisar, JDSU and Oclaro will continue to benefit from market conditions.

Strategy Analytics sees strength in the optoelectronics segment of the compound semiconductor industry.

This is based on December announcements of new products, financial results, new market entrants, equipment orders and capacity expansion.

The recently published "Compound Semiconductor Industry Review December 2010: Optoelectronics, Materials and Equipment," captures the product, technology, contract and financial announcements for optoelectronic companies such as Aixtron, Finisar, Philips Lumileds, Emcore, JDSU, Oclaro, Agilent and Soitech for December 2010.

"Green energy consumption and production trends are driving the adoption of light emitting diodes (LEDs), photovoltaic devices and the equipment to manufacture and measure these items," noted Eric Higham, Director of the Strategy Analytics GaAs and Compound Semiconductor Technologies Service.

"The December optoelectronic announcements serve as further evidence that this segment of the compound semiconductor industry will continue to grow in 2011."

Asif Anwar, Director in the Strategy Analytics Strategic Technologies Practice added, "The latest announcements show that the optoelectronics industry is undertaking capacity and technology improvements to sustain growth into 2011."

This viewpoint summarises December 2010 financial, product, contract and employment announcements from major optoelectronic material, device and equipment suppliers. Strategy Analytics categorises these announcements by material and equipment, laser, LED and compound photovoltaic activity.

Telecoms

GigOptix on the warpath with MA/COM and Optomai

GigOptix alleges that its former employees, now working at Optomai, violated confidentiality agreements by retaining and misusing confidential and proprietary information to launch competing company Optomai, which has now been acquired by M/A-COM.

On 25 April, GigOptix, a supplier of high performance electronic and electro-optic components that enable next generation 40G and 100G optical networks, announced that it has filed a lawsuit against Optomai, a start-up formed by five former GigOptix employees.

The lawsuit was filed in Santa Clara County Superior Court.

Since Optimai has now been acquired by M/A COM Technology Solutions, GigOptix has amended the lawsuit to name M/A-COM Tech as an additional Defendant. GigOptix alleges that, by acquiring Optomai and by selling Optomai's products, M/A-COM has improperly accessed and used GigOptix's proprietary information. As is the case with the other Defendants, GigOptix seeks damages and injunctive relief in connection with its claims against M/A-COM.

GigOptix alleges in the lawsuit that the former employees violated confidentiality agreements with GigOptix by retaining and misusing confidential and proprietary GigOptix information to launch a competing company.

According to allegations in the lawsuit, the former employees created Optomai, Inc. in 2009 and have

begun selling products that directly compete with GigOptix's products. GigOptix further alleges that Optomai used GigOptix technology and intellectual property to develop its products in violation of California law and that it is now selling its products as the "Optomai Optoelectronics" product line of MA-COM. GigOptix is seeking damages and injunctive relief.

GigOptix's Chairman of the Board and Chief Executive Officer, Avi Katz, stated, "GigOptix is committed to zealously protecting its intellectual property. We will take every step necessary to protect the technology we have developed and to ensure that our rights, the value we have created for our shareholders and business success are not compromised."

Sofradir reveals its new IRE-320S IR Imaging Engine

The high performance MCT-based SWIR camera has a 4-stage TE-cooled infrared detector and offers unique flexibility to meet the needs of any application or OEM requirement.

French firm Sofradir is introducing its new IRE-320S Infrared Imaging Engine. Based on a thermo-electrically cooled MCT infrared detector, the IRE-320S exhibits very high performance infrared imaging for short-wave infrared (SWIR) spectral range 0.75-2.5 µm with remarkable quantum efficiency (>90%).

Because of its versatility, the IRE-320S engine is ideal for easy integration into a wide range of SWIR imaging systems, delivering exceptional infrared imaging sensitivity and spectral performance.

IRE-320S High Performance Infrared Imaging Engine

The IRE-320S harnesses the full performance of the Sofradir Mars SW, a Mercury Cadmium Telluride (MCT) 4-stage TE-cooled infrared detector while offering unique flexibility to meet the needs of any application or OEM requirement.

Full frame rate is adjustable from 1 to 200 Hz and the integration time can be controlled for 3µs to 20ms (independently). Connectivity and interface logic are industry standards with NTSC/PAL video or 14-bit digital data for either uncorrected or corrected configuration modes. Camera communication occurs through a serial (RS-232) interface.

14-bit digital data can be streamed via LVDS or through optional Camera Link and/or Gigabit Ethernet. An IRIG time stamp capability is available as an option. The camera features a C-mount for lenses and camera customisations to meet any requirement. In addition, Sofradir is also offering a variety of software developer toolkits and command software modules for further flexibility.

M/A-COM Technology acquires Optomai

Optomai's product portfolio and expertise in GaAs and InP circuit design complements M/A-COM Tech's existing CATV/Broadcast and Point-to-Point/ Infrastructure businesses.

M/A-COM Technology Solutions (M/A-COM Tech) has acquired privately-held Optomai, Inc. Optomai is a fabless semiconductor company that develops high performance integrated circuits and modules for next generation 40 Gbps and 100 Gbps fibre optic networks.

Based in Silicon Valley, California, Optomai's product portfolio and expertise in GaAs and InP circuit design complements M/A-COM Tech's existing CATV/Broadcast and Point-to-Point/ Infrastructure businesses, and accelerates its penetration of the rapidly growing optical communications market. Financial terms of the transaction were not disclosed.

"With user demand for data driving exponential bandwidth growth, it is paramount that our telecom and datacom customers achieve high performance

with cost per bit efficiency," said Chuck Bland, Chief Executive Officer, M/A-COM Tech. "Optomai products are designed-in as innovative, compact, and cost-effective solutions that enable high-speed 40/100G networks, and the joined teams have the expertise to further expand our fibre optics business."

Optomai brings to M/A-COM Tech an accomplished team of business and engineering professionals with a proven track record in the optical communications industry. Optomai's comprehensive product portfolio includes 40G and 100G modulator drivers and transimpedance amplifiers for both line side and client side applications.

"M/A-COM Tech offers the quality brand and reputation of a top tier IC solutions provider, and the sales channel and operational scale to make Optomai products pervasive in the marketplace," said Vivek Rajgarhia, CEO of Optomai and now serving as General Manager of M/A-COM Tech's Optoelectronics business unit. "Together we will deliver significant value to our combined customer base."

Sofradir to show off "HOT" IR detector at SPIE Symposium

The detector, which uses Mercury Cadmium Telluride (MCT/HgCdTe) technology, is expected to generate strong interest from system manufacturers looking to increase power efficiency in military and space equipment.

Sofradir's HOT Scorpio TV format MWIR prototype is capable of operating at 150K (-123°C), and consumes less than 2W, about one-third the power of current industry standards. This makes its power consumption figures amongst the best for MCT IR detectors in the imaging industry.

The higher the temperature at which an IR detector can operate, the less power is required to cool it. Standard focal plane arrays (FPAs) made with MCT technology from Sofradir operate at around 90K (-183 °C); FPAs made with InSb technology operate around 77K (-196°C). By operating at 150K, the FPA in HOT Scorpio MWIR takes the power consumption and battery autonomy of IR systems a significant step forward.

"Sofradir is looking ahead to the opportunities that HOT Scorpio MWIR, which operates at 150K using less than 2W, will open up in systems aimed at optimising size, weight and power," said Philippe Bensussan, chairman and CEO of Sofradir. "We are delighted to be demonstrating the new prototype at SPIE 2011, one of the biggest defence, security and environment industry events and a leading showroom for innovative solutions that will equip military forces in the future."

HOT Scorpio MWIR responds to calls from military procurement agencies to reduce the weight of future combat equipment. Infantryman gear can weigh between 50lbs – 90lbs (22kg – 40kg) on average. Batteries contribute significantly to this weight. Thus, system engineers embrace any reduction in the power consumption of components that enables them to use smaller and lighter batteries or gain in battery autonomy.

The prototype is based on Sofradir's (MCT) cutting-edge technology, a cooled high performance IR technology that the company uses to produce more than 4,000 IR detectors a year.

Sofradir will demonstrate its HOT Scorpio MWIR at booth # 503 at SPIE 2011, one of the defence & security industry's leading meetings for optronics. The international conference brings together top researchers, scientists and engineers from the military, industry and academia. Programs cover the latest enabling technologies and applications in infrared, sensors, image analysis, and other systems and devices.

JDSU is Ciena's "Account Team of the Year"

The firm was recognised for its delivery of optical component and subsystem solutions that support Ciena's high-bandwidth transmission and ROADM switching equipment from 10Gb/sec to 100Gb/sec.

JDSU has been honoured with the "Account Team of the Year Award" by Ciena Corporation, a specialist in networking products. The award was presented to JDSU at Ciena's Annual Supplier Summit in Ottawa at the end of March.

JDSU earned the award based on its delivery of

optical component and subsystem solutions that support Ciena's high-bandwidth transmission and ROADM switching equipment needs from 10Gb/sec to 100Gb/sec.

"Receiving the Ciena Account Team of the Year Award is a significant recognition for JDSU," said Alan Lowe, president of Communications and Commercial Optical Products at JDSU. "It represents our commitment to providing unrivalled support and service to our customers in all aspects of their day-to-day interactions with JDSU."

Goodrich unveils super sensitive mil-hardened InGaAs camera

The uncooled 60Hz SWIR camera is lightweight and compact and ideal for persistent surveillance and other military, aerospace, and marine operations.

Sensors Unlimited subsidiary, Goodrich ISR Systems is introducing a 1.3 Mpixel InGaAs video camera, the GA-1280J-15A. Goodrich says it offer the highest sensitivity available in a military-hardened NIR-SWIR camera.

The new, high resolution J-Series SWIR camera features 1280 x 1024 pixels, with 15µm pitch and 60Hz full frame rate. Compact (less than 4.3 cubic in.) and lightweight (less than 125g), the camera easily fits on board most unmanned aerial or ground vehicle systems, hand-held, and mobile surveillance systems. For added convenience, the camera is also available in an OEM model which can be integrated into higher level systems.

The uncooled SWIR camera is available in two versions: one operates in the shortwave infrared from 0.9 µm to 1.7 µm spectral range; the other offers extended NIR-SWIR range from 0.7 µm to 1.7 µm. The cameras, which have no mechanical shutters, can image through fog, smoke, haze, or dusty conditions. From low-light to daylight, the rugged solid-state SWIR cameras are ideal for persistent surveillance and other military, aerospace, and marine operations.

Both OEM camera models integrate easily into existing gimbaled or handheld imaging systems, enabling visual verification of laser location and imaging during thermal crossover – the hours of sunrise and sunset – when the performance of traditional thermal imaging systems is degraded.

According to John Trezza, Vice President for Force Protection, Goodrich's ISR Systems' Princeton team, "The Goodrich high-resolution SWIR camera revolutionises the SWIR imaging market with a 1.3Mpixel imager at 15µm pitch, demonstrating Goodrich's continued leadership in the SWIR marketplace."

"Combined with Goodrich's InGaAs detectors, which offer the lowest dark current in the industry, this new camera opens up many new applications where high resolution and sensitivity in the SWIR are critical."

The J-series SWIR camera features include on-board automatic gain control and built-in non-uniformity corrections. The internal circuitry of the ROIC and the dynamic range processing on board the camera address the challenges of urban night imaging without blooming. Camera Link digital output provides intuitive plug-and-play video operation with high quality 12-bit images for digital image processing or transmission.

Avago expands portfolio with four new high-linearity LNAs

Two LNAs have bypass and shutdown functionality, lower current draw of WiFi and WiMAX data cards while two LNAs minimise component count for cellular infrastructure applications.

Avago Technologies, a supplier of analogue interface components for communications, industrial and consumer applications, has revealed four low-noise amplifiers (LNAs) to extend the RF performance and diversity of its LNA portfolio.

The new modules feature high linearity that improves an application's ability to distinguish between desired signals and spurious signals received close together. The MGA-6x606 LNAs target WiFi and WiMAX data cards, handsets and other portable devices, while the two-stage MGA-13x16 LNAs target GSM, CDMA and W-CDMA cellular infrastructure applications such as base station radio cards.

The new Avago easy-to-use Monolithic Microwave Integrated Circuit (MMIC) LNAs leverage the company's proprietary 0.25 mm GaAs Enhancement-mode pHEMT process to achieve leading low noise figures and high linearity. The 1.5-3.0 GHz MGA-64606 LNA and 2.5-4.0 GHz MGA-65606 LNA have switchable shutdown and bypass functionality that enables them to be bypassed during periods of high input signal power.

This feature reduces current consumption, conserving battery-life in portable devices. The MGA-64606 addresses GPS, WiMAX, WLAN, WiBro and DMB and other applications, while the MGA-65606 addresses WiMAX, Wireless Local Loop and other applications

For cellular infrastructure manufacturers, minimising the count of radio components is a key concern, particularly at the receiving side after the antenna. The 0.4-1.5 GHz MGA-13116 LNA and 1.5-2.5 GHz MGA-13216 LNA enable usage of a single LNA, instead of the two components normally required, while still delivering low noise with good input return loss, high linearity and high gain. Designers can achieve optimum performance with minimum matching at the input, output and the inter-stage between the two LNAs.

Additional MGA-6x606 Product Features

• Adjustable bias current
• High linearity in both LNA and bypass modes
• Low current consumption in bypass mode of less than 100 mA
• 2.0 by 1.3 mm SMT package

Additional MGA-13x16 Product Features

• Excellent isolation performance
• MGA-13116 exhibits 0.51 dB noise figure and 38 dB gain at 0.9 GHz
• MGA-13216 exhibits 0.61 dB noise figure and 35.8 dB gain at 1.95 GHz
• 4.0 by 4.0 by 0.85 mm 16-lead QFN package

U.S. Pricing and Availability

The MGA-64606 and MGA-65606 LNAs are priced at $0.73 each in 10,000 piece quantities, and the MGA-13116 and MGA-13216 LNAs are priced at $2.50 each in 10,000 piece quantities. Samples and production quantities are available now through the Avago direct sales channel and via worldwide distribution partners.

Infinera appoints new Vice President for Asia Pacific

Andrew Bond-Webster brings more than 20 years of experience in the terrestrial and satellite telecommunications industry across wide geographical markets and industry verticals to his new role at Infinera.

Infinera has appointed Andrew Bond-Webster as Vice President of Sales for Asia Pacific to accelerate the firm's focus on marketing Digital Optical Network solutions in the Asia Pacific region.

According to data from analyst firm Ovum, the Asia Pacific WDM market accounted for a total of $1.9 billion in revenue last year, with a forecast annual growth rate of 10% from 2010 to 2015. Infinera has achieved significant success in the region with major customers including Japan's largest service provider NTT and leading independent service provider Pacnet, headquartered in Hong Kong and Singapore and active throughout Asia. Bond-Webster will help Infinera broaden and deepen its focus in this important market.

Bond-Webster brings more than 20 years of experience in the terrestrial and satellite telecommunications industry across wide geographical markets and industry verticals to his new role at Infinera. His previous experience includes senior sales and marketing roles at technology suppliers and service providers in the Asia region, including Cable and Wireless and Equant Network Services.

"Infinera is the leading player worldwide in Digital Optical Networks and I am excited about the opportunity to take on this important role," said Bond-Webster. "My top priorities are to create further value for our existing customers, take advantage of new business opportunities and establish a good network of partners to help facilitate our growth. My goal is to drive and execute a business strategy that will help Infinera achieve sustainable long term revenue and margin growth across the region."

"Operators in the Asia Pacific region face the challenge to achieve faster and more cost-effective networks, and Infinera's solutions have the exemplary product quality and the digital features that can deliver competitive advantages to customers in the region," said Ron Martin, Infinera's Senior Vice President of Worldwide Sales. "With his excellent leadership skills, we are confident Andrew will help us drive the benefits of Digital Optical Networks further in the region."

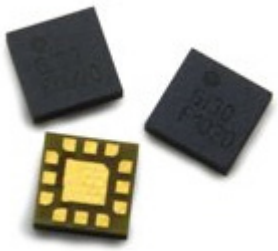
Based on the Digital Optical Networks architecture, Infinera optical systems deliver a range of digital features and functionalities, including Digital ROADM capabilities, Bandwidth Virtualisation to support the deployment of bandwidth to deliver any service between any two points on the network, and end-to-end Digital OTN services. The Digital Optical Networks paradigm enables customers to build fast, flexible and scalable networks for the 21st century, and achieve superior economics in their networks.

Avago's GaAs FEM enables WiFi and Bluetooth coexistence in mobiles

The firm's new highly-integrated Front-End Module (FEM) incorporates FBAR filtering, antenna switch and path coupler technology with limited noise rejection and signal loss.

Avago Technologies, a supplier of analogue interface components for communications, industrial and consumer applications, is introducing an FEM with robust filtering for 802.11 b/g/n WiFi and Bluetooth radios in handsets and mobile routers for tablets and other portable PC devices.

The new AFEM-S102 module integrates a Film Bulk Acoustic Resonator (FBAR) coexistence filter, SP3T antenna switch and TX path coupler in a small 2.2 by 2.2 by 0.55 mm package that is ideal for space-constrained applications. The 2.5-GHz module delivers superior out-of-band rejection enabling concurrent operation of WiFi and Bluetooth data-communication with cellular communication standards.



Avago's FEMs integrate multiple high-performance technologies to reduce PCB board footprint and simplify design for portable electronics applications. The AFEM-S102 module exhibits low insertion loss that combines with high noise rejection to meet stringent coexistence requirements and enable fewer interference issues between WiFi, Bluetooth and other radios.

Effectively leveraging Avago 0.25 µm GaAs enhancement-mode pHEMT process and its leading-edge proprietary FBAR filtering technologies, the module delivers 2.6 dB maximum insertion loss for the TX path and 35 dB rejection in the 2110-2170 MHz range.

"As smartphones and other portable electronics devices add more radio types and bands, coexistence requirements are getting more stringent," said James Wilson, director of marketing for wireless products at Avago.

"The best-in-class rejection and insertion loss of our proprietary FBAR technology enables OEMs to efficiently address these challenging radio environments. The easy-to-use AFEM-S102 front-end module was designed in conjunction with a leading handset designer for their reference design, specifically to meet the coexistence requirements for WiFi and Bluetooth applications."

Avago FBAR technology delivers steeper roll-off

and lower insertion loss than ceramic or SAW filters and other competing technologies, and does so in a more compact form factor. Low insertion loss reduces power amplifier current and improves receiver sensitivity and dynamic range, resulting in extended battery life and talk time and better signal quality for handsets. FBAR technology makes ultra-small, high-Q filters possible at a fraction of their usual size, and allows integration with other radio components.

Additional AFEM-S102 Product Features

* All RF ports matched to 50 ohms for simplified design
* TX, RX, BT and ANT ports DC blocked
* -18dB TX directional coupling
* -30° to +85° C operation

U.S. Pricing and Availability

The AFEM-S102 front-end module is priced at $1.00 each in 10,000 piece quantities. Samples and production quantities are available now through the Avago direct sales channel and via worldwide distribution partners.

Samsung says Skyworks provides superb quality

Skyworks says it is the first semiconductor company to be honoured with Samsung's "Best Quality" award for 2010.

Skyworks Solutions, an innovator of high reliability analogue and mixed signal semiconductors enabling a broad range of end markets, has received the 2010 Best Quality award from Samsung for excellence in overall product quality, supply-chain efficiency, and a proactive approach to preventing quality issues.

Skyworks says it is the first semiconductor company to be awarded this honour and was selected from over 200 suppliers. Samsung, a global market leader in high-tech electronics and Android-based mobile devices, leverages multiple analogue and RF solutions from Skyworks' broad product portfolio.

"We congratulate Skyworks on winning our 2010 Best Quality Award," said quality management at Samsung. "Skyworks' focus on total customer satisfaction and continuous improvement has been instrumental in helping Samsung deliver quality products for today's demanding mobile device market."

"Skyworks is honoured to receive this recognition from Samsung," said Nien-Tsu Shen, vice president of quality at Skyworks. "This award reflects our ongoing efforts to ensure a quality mindset exists throughout our systems and business processes companywide. We believe quality is a competitive differentiator and we remain committed to the never-ending quest for perfect quality and complete customer satisfaction."

GigOptix wins $750,000 order for 100G DWDM modulator drivers

The firm 's latest drivers deliver more bandwidth for use in smartphone usage, IPTV and cloud services, as well as other video and data intensive applications.

GigOptix, a supplier of electronic and electro-optic components for fibre-optic systems, has a $750,000 purchase order for its 100G quad-driver for use by a telecom customer in its 100G DWDM (Dense Wavelength Division Multiplexing) networking systems.

The order will be delivered in the second and third quarters of 2011.

GigOptix's GX62450 100G DP-QPSK (Dual Polarization Quadrature Phase Shift Keying) driver is designed to be plug-in compatible with industry available 100G Multiplexer and Mach-Zehnder Modulators.

The GX62450's GPPO connectorised form factor ensures optimal RF coupling to the 100G optical modulator inputs and also occupies less board-level real estate than comparable surface mounted device solutions.

Padraig O'Mathuna, Vice President of Marketing,

commented, “GigOptix is very proud to have received this order for our next generation 100G drivers, which underscores our industry proven 100G solutions as the broadest portfolio of its kind. 100G is quickly becoming an industry reality driven by increased demand for more bandwidth due to smartphone usage, IPTV and cloud services, as well as other video and data intensive applications. “

“Next generation wired and wireless networks will require high-speed optical links to enable the content delivery demanded by consumers. In fact Cisco is predicting a compounded annual growth rate for IP traffic of 34% through 2014. We see robust demand for our 100G products in 2011 and expect the 100G market to be one of the major growth engines for our company going forward,” concluded O’Mathuna.

GigOptix and DBSI trustees resolve differences

As part of the settlement, the trustees have agreed to the cancellation and return of the existing warrants to purchase 660,473 shares of GigOptix stock.

GigOptix, a supplier of high performance electronic and electro-optic components that enable next generation 40G and 100G optical networks, has entered into a settlement with the trustees of the DBSI Liquidating Trust and the DBSI Estate Litigation Trust.

The settlement arises out of potential claims related to the bankruptcy of DBSI, Inc.

Affiliates of DBSI, Inc. were investors in a predecessor of GigOptix, which resulted in them becoming stockholders of GigOptix. DBSI, Inc. was the beneficial owner of the investment held by its affiliates. In November 2008, DBSI, Inc. filed for bankruptcy.

The DBSI Liquidating Trust now holds the shares of GigOptix stock and warrants to purchase 660,473 shares of GigOptix stock. The warrants have a weighted average exercise price of $32.35 per share with a range of exercise periods that expire between December 31, 2011 and April 23, 2017.

An affiliate of the DBSI Liquidating Trust, the DBSI Estate Litigation Trust, has been evaluating various potential claims which it might assert against a number of entities, including GigOptix and certain affiliated parties. GigOptix’s management has engaged in discussions with the trustee regarding whether the DBSI Estate Litigation Trust has any claims against GigOptix. GigOptix has disputed the existence of any such claims, and intended to vigorously defend any claims made.

The settlement resolves the disputed claims and completely eliminates all potential litigation. As part of the settlement, the trustees have agreed to the cancellation and return of the existing warrants to purchase 660,473 shares of GigOptix stock. In exchange, GigOptix has agreed to issue to the DBSI Liquidating Trust two warrants which will not be exercisable for a period of six months from the date of issuance; one warrant for 500,000 shares of GigOptix stock which will have a term of three years and an exercise price of $2.60 per share, and the other warrant, also for 500,000 shares of GigOptix stock, which will have a term of four years and an exercise price of $3.00 per share (together, the “Warrants”).

The Warrants may be exercised on a “cashless” exercise basis. The trustees have also agreed to release their claims against GigOptix, its subsidiaries, directors and employees.

GigOptix’s Chairman of the Board and Chief Executive Officer, Avi Katz, stated, “I am happy to put this matter behind us. Although we believed that the trustees’ claims would not have been successful, we were eager to avoid the legal expense, waste of management time and bandwidth and the risk that is always associated with litigation. I am pleased we were able to resolve this issue with this significant GigOptix stockholder without any out of pocket cash costs.”

Nujira Files 100th envelope tracking patent

The firm says it now has the world’s most extensive and complete portfolio of patents filed or granted for PAs including those that are GaN based.

Nujira has filed its one hundredth patent covering

envelope tracking and the implementation of efficient wideband power amplifier (PA) transmission systems which include GaN based PAs.

This, the firm says, gives it the world's most extensive and complete portfolio of patents filed or granted.

Nujira's patent portfolio covers energy efficient RF transmitters in cellular handset, wireless infrastructure and digital broadcast applications across the US, Asia and Europe.

"Envelope Tracking is becoming the power optimisation technology of choice for high efficiency PAs across a wide range of applications. We continue to extend our IPR platform to maintain our leadership position in Envelope Tracking, and will defend it forcefully," said Tim Haynes, CEO of Nujira.

"Nujira's patent portfolio includes blocking IPR for anyone trying to develop commercially viable Envelope Tracking Power Amplifiers for 3G and 4G handsets, base stations and digital TV transmitters. "

Haynes continued, "As Envelope Tracking is adopted, we are seeing increased activity both from start-ups and established industry players around Envelope Tracking. We've been actively working on the technology since 2002, and our first patent was filed more than 8 years ago. Given the depth and breadth of our IPR portfolio, it's hard for us to see how people can work around all of our patents, and we will be keeping a close watch for any possible infringements."

Envelope Tracking dynamically modulates the power supply of an RF PA in line with the signal amplitude. The high bandwidth, fast tracking performance of Nujira's ET implementation ensures that the PA is always operating in compression, resulting in high efficiencies even for signals with a wide dynamic range, such as 20 MHz LTE channels.

Whilst this principle has been known and actively studied since the 1930's, Nujira has been the first to successfully address the challenge of tracking the transmitted signal accurately in commercial products for 3G, 4G and Digital TV applications.

Opnext quarterly revenues battered by Japanese tsunami

The shortfall in expected revenues is attributable to a ten-day interruption in the Company's module manufacturing operations in Japan following the earthquake and tsunami on March 11, 2011.

Opnext, a designer and manufacturer of optical modules and components, expects revenues for its fourth fiscal quarter ended March 31, 2011 will be approximately $95.3 million, as compared to the original guidance for the quarter of $97.0 million to $102.0 million.

Opnext reported revenues of $97.1 million for the third quarter ended December 31, 2010 and $76.8 million for the fourth quarter ended March 31, 2010. The shortfall in expected revenues from the Company's earlier guidance is attributable to a ten-day interruption in the Company's module manufacturing operations in Japan following the earthquake and tsunami on March 11, 2011.

Opnext's module assembly facility in Totsuka, Japan suffered minor disruption as a result of the March 11 earthquake and, while shipments of subassemblies to contract manufacturers and shipments of finished goods to customers from inventory each resumed on March 18, 2011, production at this facility was not reinstated until March 21, 2011.

The Company's chip production facility in Totsuka suffered minor damage which has been repaired and the Company is in the process of recalibrating and verifying the proper operation of the equipment at this facility prior to restarting full production, which is expected to resume by the end of April 2011.

Opnext's industrial and commercial production facility located in Komoro, Japan was undamaged and production at this facility resumed shortly following the earthquake. The Komoro facility is also being used to process pre-existing wafers from the Totsuka chip production facility pending full restoration of the Totsuka facility.

Opnext also continues to work with its suppliers affected by the earthquake and tsunami and

related subsequent events to address component availability and, in certain instances, the Company is exploring alternative sources of supply. In addition, Opnext continues to be impacted by the planned power outages in the Totsuka area and the Company is in the process of installing backup power capability to permit continuous operation.

Opnext cautions that its anticipated revenues for its fourth fiscal quarter ended March 31, 2011 are preliminary and remain subject to completion of the financial statements for such quarter; consequently, the preliminary revenues are subject to change.

Opnext plans to review its fourth fiscal quarter results in further detail and discuss its full fiscal year results and business outlook during its regular quarterly earnings conference call for investors in May 2011. The date and time of the conference call will be announced separately.

B&W Tek, appoints new vice president of Sales and Marketing

The firm has taken on Michael Kayat as VP who will try to promote the company's products and services, in particular to the photonics instrumentation industry.

B&W Tek, an advanced instrumentation company producing optical spectroscopy and laser systems has appointed Michael Kayat as the new Vice President of Sales and Marketing at their headquarters in Newark, Delaware.

Kayat will be responsible for leading global sales and marketing activities for the company's broad range of products and services.

"Dr. Kayat will be a great addition to our team," says Sean Wang, CEO at B&W Tek. "His expertise and skill set are the perfect fit for B&W Tek as we are becoming a more predominate player in the photonic instrumentation industry. We're very excited to have him onboard."

Before joining B&W Tek, Kayat was Vice President and General Manager of DeltaNu, a division of Intevac Photonics. He previously served as Vice President of Sales and Marketing with Ocean Optics, as President of the ICC division at UTEK Corporation and as Director of Sales at SMaL Camera Technologies, which was acquired by Cypress Semiconductor. Kayat received his Ph.D. in physics from the University of Leicester and MBA from Pepperdine University.

Anadigics CEO Mario Rivas and SVP Greg White resign

The firm has now appointed Ron Michels as CEO and Tom Shields as COO and John Van Saders as SVP.

Anadigics has announced the resignation of President and Chief Executive Officer Mario Rivas and Senior Vice President Greg White. The reason for the resignations is not known.

The Company also announced that its First Quarter 2011 revenue guidance remains on track with previous revenue guidance of $42 - $44 million.

Ron Michels, who was the SVP, Chief Technology and Strategy Officer, will assume the responsibilities of the CEO, Tom Shields, who currently serves as EVP & CFO, will assume the additional post of COO and John Van Saders, who was the VP Advanced Technology, will serve as SVP RF Products.

Lew Solomon, Chairman of the Board of Directors, said, "Mario has been instrumental in Anadigics return to profitability during 2010 and we wish him well in his future endeavours. We are grateful to him for his efforts and success at helping Anadigics better realise the Company's potential."

" The Board is confident moving forward under the leadership of Ron Michels, a proven Anadigics executive respected by his peers and our customers, and one of the key executives driving our successful turnaround. We remain focused and in a strong competitive position given the Company's world-class organisation, momentum with customers, targeted product families, and product roadmap."

Michels, 57, joined Anadigics in 1987 and was SVP/ General Manager of Broadband Products during the period of 2005 – 2009. Prior to that, he served and

has served in several management and executive positions during that time. Prior to joining Anadigics, he held various engineering and management positions in Lockheed Electronics, New Jersey Public Broadcasting, and K & M Broadcasting.

Michels earned his Bachelors degree in Electrical Engineering from the New Jersey Institute of Technology. He holds several U.S. Patents, has authored a number of publications in the area of RF communications and serves on the Lehigh University Electrical & Computer Engineering Advisory Board.

Shields, 51, joined Anadigics in 1999 and has been the Executive Vice President and Chief Financial Officer of the Company since January 2006. He had previously served as Senior Vice President and Chief Financial Officer of the Company from July 1999. Prior to joining the Company, Shields served as Vice President and Controller of Fisher Scientific Company from 1997 to 1999. From 1994 to 1997, Shields served as Vice President and Controller for Harman Consumer Group. From 1986 to 1994, Shields served in various positions with Baker & Taylor. Shields received his B.S. and M.B.A. degrees from Fairleigh Dickinson University. Shields has been a member of the national Board of Directors for TechAmerica (formerly American Electronics Association) since 2005.

Van Saders, 52, is a long term veteran of Anadigics. He had previously served as VP Advanced Development since 2007. From the period of 2001 to 2006, he served as the VP, Engineering and Manufacturing for ASIP, an optoelectronics startup which later merged with T-Networks. He originally joined Anadigics in 1990 as a design engineer, serving in several management and executive product development positions. He earned a Masters degree in Electrical Engineering (Communication Theory) from NJIT and holds a Bachelors degree from Stevens Institute of Technology in Optical Physics. He has several patents in circuit design and optical processing, and has authored a number of technical publications.

Regarding their new roles, President and Chief Executive Officer Ron Michels stated, “Anadigics is a great company with innovative technology and talented people. I am looking forward to working more closely with the team. We will work hard to make sure we keep the confidence and trust of our customers during this transition and beyond.”

Advanced Photonix Promotes Rob Risser to COO

With over eighteen years in the optical field and industry knowledge, combined with his financial and strategic expertise, Risser brings valuable experience and background to the COO position.

Advanced Photonix has promoted Robin Risser, currently the Chief Financial Officer to Chief Operating Officer and member of the Board of Directors.

Richard Kurtz President and CEO of Advanced Photonix, stated, “Our rapidly expanding sales pipeline in our fast growth areas of high speed optical receivers and Terahertz is driving our need to implement organisational changes to best respond to these opportunities. After reviewing the skills and market knowledge necessary to be the COO of API we found the ideal candidate to fulfil the role in Rob Risser, our current CFO.”

“With over eighteen years in the optical field and industry knowledge, combined with his financial and strategic expertise, Rob brings valuable experience and background to the COO position. We need to build on our strong internal management talent pool in conjunction with new external management expertise. Rob will also continue to serve as our CFO while we conduct a search for his replacement. Having worked with Rob for the past six years I know he will be instrumental in helping API grow to the next level in the shortest possible time frame.”

Rob Risser commented, “I would like to thank the Board of Directors for this vote of confidence and embrace the challenge of accelerating API’s growth.”

3S Photonics booming with 40% growth in turnover

The firm has increased its turnover for the first half of 2011 fiscal to €25 million.

3S Photonics, a provider of optical products and solutions for lasers, sensing & telecom marketshas announced a turnover of €25 million for the first half of its 2011 fiscal year.

This represents a 40% growth in turnover compared to the same period in the 2010 fiscal year when considering the post divestiture product portfolio. With results far outweighing company expectations, the operating income, which was negative in the first half of the 2010 fiscal year, reached €1.05 million.

“Thanks to the excellent results achieved in the first half of our 2011 fiscal year, we are facing the second half of the year in a very comfortable position and with a certain piece of mind,” commented Alexandre Krivine, President & CEO of the 3S Photonics.

“This result can, of course, be partially explained by favourable market conditions but it also demonstrates the success of our diversification strategy into the terrestrial pump market and of our cost reduction efforts. Furthermore, it is testimony to the continued trust our customers have in the quality of our products. Our teams can be proud of this recognition and now face two important challenges: increasing output through technological innovation to support the growth of the company and continuing to offer the same level of quality and reliability. These are two important assets that have enabled the 3S Photonics Group to become one of the leaders in this market. »

The 3S Photonics anticipates a consolidated IFRS turnover of between €50 and 55 million for its full fiscal year 2011 whichwill close on June 30th 2011.

Oclaro slashes Q3 revenue guidance by 8%

The firm now expects to hit $116.5 million rather than $123 million to $131 million for Q3 fiscal 2011.

Oclaro, a provider of optical communications and laser products, has announced it currently expects revenues for the third quarter of fiscal 2011, ended April 2, 2011, to be approximately $116.5 million.

This compares with revenue of $120.3 million in the second quarter of fiscal 2011, ended January 1, 2011, and compares with the estimate of $123 million to $131 million the Company provided on January 27, 2011.

The revenue shortfall from the previous estimate resulted primarily from inventory corrections among certain of the Company’s telecom customers that began during the quarter and continued through the end of the quarter. The Company also expects a correlation between this lowered revenue estimate for the quarter, and the estimated level of gross margins and Adjusted EBITDA for the quarter.

The Company currently has a cautious short term view of revenues for its quarter ended July 2, 2011, however it remains confident in the solid fundamentals of its business. This confidence is based on an expected book-to-bill ratio of approximately 1:1 in telecom for the third fiscal quarter, with particular booking strength late in the quarter, as well as scheduled new product introductions and the Company’s belief in the fundamental underlying demand for broadband.

Oclaro cautions that its anticipated revenue results are preliminary and based on the best information currently available and are subject to completion of the financial statements for the third quarter of fiscal 2011. The Company will announce its financial results for the third quarter of fiscal 2011 on April 28, 2011.

Avago launches LNA modules for base transceiver applications

The firm’s low noise amplifiers are claimed to deliver best-in-class noise performance and high linearity in a compact package.

Avago has introduced the ALM-11x36 series oflow-noise amplifier (LNA) modules for tower-mounted amplifiers (TMA) and base transceiver stations (BTS) applications.

The ALM-11x36 LNAs are claimed to deliver best-in-class noise performance and high linearity within a compact package.

The modules can replace large discrete and surface-mount component counts in conventional designs, shortening design cycle time and providing board space savings.

The Avago ALM-11x36 LNA modules have low noise and high linearity, achieved through the use of the company's proprietary 0.25um GaAs Enhancement-mode pHEMT process.

Their bypass isolation eliminates the possibility of oscillation issues, and the modules also feature low bypass insertion loss and high input and output return loss.

In addition, the ALM-11x36 LNAs are equipped with a failsafe bypass function, which is especially critical for TMA applications to enable the LNA bidirectional bypass path during the absence of DC power supply.

All matching components are fully integrated within the modules and the 50ohm RF input and output pins are already internally AC coupled.

Avago says this makes the modules easy to use as the only external parts required are DC supply bypass capacitors.

The LNAs deliver optimum performance across a wide range of bands, with the ALM-11036 module covering 776-870MHz, the ALM-11136 module covering 870-915MHz, the ALM-11236 module covering 1,710-1,850MHz and the ALM-11336 module covering 1,850-1,980MHz.

All the modules come in a 7.0 x 10.0 x 1.5mm package and the same pin-out configuration, and are therefore suitable for common platform designs.

Feel the force of the Quantum Dots

Scientists can now precisely synthesise nanocrystalline materials by systematically tuning their quantum confining behaviour by using semiconductor quantum dots. This development shows potential in the optoelectronics sector including LEDs, lasers, telecoms and detection applications.

The global market for quantum dots (QDs) in 2010 was worth an estimated $67 million in revenues. This market is projected to grow to over almost $670 million by 2015 according to Reportlinker.com.

Optoelectronics represents one of the greatest market sectors. This area, says Reportlinker.com, was launched in 2010, and is expected to increase at a 128.4% compound annual growth rate to reach a value of $310 million in 2015.

The established market in the biomedical sector was valued at $48 million in 2010 and this sector is expected to increase at a 30% CAGR to reach a value of $179 million in 2015.

Among the many subsets of nanomaterials, quantum dots are unique. At dimensions typically below 10 nm, nanocrystalline semiconductors, metals, and magnetic materials can all exhibit extraordinary quantum confinement phenomena.

At these dimensions, their physical size encroaches upon the fundamental quantum confinement dimensions of orbiting electrons that are uniquely prescribed by their atomic nucleus. Within the regime of these critical dimensions, QDs exhibit distinctly different behaviour from their bulk form, which manifests itself, for example, in distinctly different optical, electronic and magnetic properties.

Today, scientists can precisely synthesise nanocrystalline materials at these dimensions and systematically tune their quantum confining behaviour. As a result, there is currently enormous interest in exploiting and capitalising on the unique properties exhibited by QD materials.

As a harbinger for future business developments, colloidal QD-bioconjugates are among the first wave of commercial product applications stimulating market interest. Primarily, these have quickly established a niche market in the life sciences and biomedical communities, where they provide unrivalled cellular imaging and therapeutic detection capabilities.

Other promising prototype developments of semiconductor QDs, now on the commercial-horizon, include a new generation of flash memory devices, nanomaterial enhancements for improving the performance of solid-state white-LED lighting and a core technology used in flexible solar panel

coatings.

Since their simultaneous discovery in Russia and the U.S. almost 30 years ago, semiconductor QDs, until quite recently, have resided exclusively in the domain of solid state physics, where they have been fabricated using expensive and sophisticated MBE or CVD equipment.

However, in a relatively short time frame, this situation has changed dramatically with the recent commercial availability of colloidal QDs synthesised by less expensive wet-chemical processes.

Practically, the availability of QDs in a colloidally dispersed form will help demystify these somewhat esoteric materials. Most importantly, colloidal-QDs now provide access to a much broader audience, which promises to further widen their potential market exploitation.

Current and future applications of QDs impact a broad range of industrial markets. These include optoelectronic devices such as LEDs, lasers, optical components used in telecommunications and security applications such as covert identification tagging or biowarfare detection sensors.

Anadigics PAs enable Shanghai Qianjin CATV products

The firm's GaAs based MESFETs are optimised for delivering analogue and digital video, as well as high-speed data services, over advanced hybrid fibre / coax (HFC) networks.

Shanghai Qinajin, a leading CATV infrastructure manufacturer in China, is using Anadigics' hybrid line amplifiers in its products.

The migration to high definition television, video on demand, and high speed internet has resulted in many CATV systems operating in a fully-loaded spectrum. These hybrid line amplifiers have been optimised to ensure high quality video in these environments and provide outstanding ruggedness to minimise costly truck rolls.

Anadigics is shipping production volumes of its CATV hybrid line amplifiers to Shanghai Qianjin Electronics. These amplifiers are used in Shanghai Qianjin Electronics' NOR860T-2 two-way and NOR860T-4 four-way optical receivers, which are optimised for delivering analogue and digital video, as well as high-speed data services, over advanced hybrid fibre / coax (HFC) networks.

"Working closely with Anadigics, we have developed our optical receiver products for both established and emerging CATV markets," said Wang Guang Hai, President at Shanghai Qianjin Electronics. "We made the decision to select Anadigics as a key supplier for our optical node products due to its hybrid line amplifier performance and reliability advantages, as well as exceptional customer support."

"We are extremely pleased that Shanghai Qianjin Electronics has selected Anadigics' hybrid line amplifiers for its optical receiver product line," said Michael Canonico, Vice President of Worldwide Sales at Anadigics. "Our hybrid line amplifiers lead the industry in ruggedness and reliability, helping service providers to minimise costly field repairs. We look forward to working closely with Shanghai Qianjin Electronics on the design of future CATV infrastructure products."

A report published by Strategy Analytics, in November 2010, forecasts that hybrid amplifier blocks will show steady growth through 2014. The report details that the fastest growing CATV infrastructure segment will be amplifiers for high-definition capable networks, with a forecasted compounded average annual growth rate (CAAGR) of nearly 43% from 2009 to 2014.

"With high-definition television, video on demand, and high data rate internet, CATV systems are increasingly operating in a fully-loaded spectrum," said Joseph Cozzarelli, Senior Director of Broadband RF Products at Anadigics. "Anadigics' hybrid line amplifiers offer industry-leading linearity and exceptionally low noise figures to provide minimum signal degradation. This level of performance coupled with the extreme ruggedness of our hybrid line amplifiers, ensures the highest quality video delivery while minimizing costly downtime and service calls from cable plant equipment failures."

The modules have low composite triple beat (CTB),

composite second order (CSO), cross modulation, and noise figure distortion characteristics for optimal performance in a fully-loaded spectrum.

With a positive slope cable equivalent, their controlled gain limits minimise lot-to-lot variation and ensure uniformity.

They also have a high tolerance to electro static discharge (ESD) and line voltage surge for enhanced ruggedness in outdoor applications. The technology uses Anadigics' GaAs MESFET process for a high mean-time-to-failure (MTTF).

Finisar to recommended cash offer to acquire Ignis

Finisar will use Ignis' laser in its Gbps tunable 300-pin and tunable XFP product lines. It estimates that the combined worldwide market for these products will be approximately USD $250 million in calendar 2011 and will grow to approximately USD $400 million in 2015.

Finisar Corporation and Ignis have entered into a transaction agreement under which Finisar will make a recommended voluntary public cash offer to acquire all of the outstanding shares of Ignis not currently owned by Finisar.

Finisar will purchase for NOK 8 per share (~ $USD 1.43), or an aggregate purchase price of up to approximately USD $76 million.

On March 21 and 22, 2011, Finisar acquired an aggregate of 18.3 million Ignis shares from certain existing Ignis shareholders, for NOK 8 per share in cash, or an aggregate purchase price of USD $26 million. These purchases bring Finisar's total ownership to approximately 25.7 million shares (approximately 32.6% of the outstanding Ignis shares on a fully-diluted basis).

"Ignis has developed many innovative new technologies and currently offers multiple industry leading products that are focused on attractive growth markets," said Eitan Gertel, Chief Executive Officer of Finisar.

"This acquisition represents an extension of our vertical integration strategy. Ignis has developed, amongst other of its product technologies, a tunable laser that is integrated with a modulator and a semiconductor optical amplifier and that Finisar believes has the highest performance currently available in the market. The Ignis tunable laser will be used in Finisar's industry leading 10 Gbps tunable 300-pin and tunable XFP product lines. Finisar estimates that the combined worldwide market for these products will be approximately USD $250 million in calendar 2011 and will grow to approximately USD $400 million in 2015."

"This acquisition will also enable us to offer our customers a number of new 40/100 Gbps products based on advanced optical device integration technologies from Ignis' various business units. We are very excited about this acquisition and look forward to working with the Ignis employees to grow our combined business."

"Our unique technologies and innovative solutions are the base of the product platform we offer to a wide range of markets and customers around the world. We have developed a strong collaborative relationship with Finisar and its employees over the years and believe that our two companies share a common culture focused on innovation and serving the needs of our customers. Finisar represents a strong strategic fit for Ignis," said Thomas Ramm, Chief Executive Officer of Ignis.

The offer price represents a premium of 58.4% over the closing share price of Ignis on March 21, 2011, the last trading day prior to Finisar's public announcement of its intention to make the offer, and a premium of 61.5% over the adjusted volume weighted average market price for the three month period preceding the announcement.

Certain Ignis shareholders, including all members of its management and board owning shares, have committed to accept the offer subject to certain conditions. The shares which have been committed on these terms represent approximately 19.7% of the outstanding shares of Ignis on a fully-diluted basis and, together with the shares currently owned by Finisar, would total approximately 52.3% of the outstanding shares of Ignis on a fully-diluted basis.

USD $14 million of the consideration to be paid to certain of these shareholders will be subject to an

escrow arrangement related to Ignis' acquisition of SmartOptics Holdings AS in December 2010 and will be released to the former SmartOptics shareholders only upon the achievement of certain financial and other milestones related to the ongoing operations of the SmartOptics business.

Finisar has been informed by Ignis that another party has recently made an offer to acquire Ignis and that, after considering both offers, the board of directors of Ignis has adopted a resolution to recommend Finisar's offer to its shareholders.

An offer document setting forth in detail the terms of Finisar's offer will be published and distributed to all Ignis shareholders as soon as practicable following review and approval by the Oslo Stock Exchange, which is expected to be obtained in late March or early April. The Ignis board will issue a formal statement regarding Finisar's offer as soon as the offer document is available.

The completion of the offer will be subject to the satisfaction or waiver by Finisar of customary conditions, including acceptance of the offer by the holders of at least 67% of the outstanding Ignis shares on a fully-diluted basis. The transaction is not currently expected to require approval by competition or antitrust authorities in any jurisdiction. The offer will not be subject to any financing conditions and will be funded from Finisar's existing cash resources. Subject to the various closing conditions, the offer and resulting purchases are expected to close early in Finisar's first fiscal quarter ending July 31, 2011.

Ignis reported revenues of approximately $USD 12.2 million for its quarter ended December 31, 2010, or USD$15.8 million on a pro forma basis, including the operations of SmartOptics, which was acquired in December 2010.

Finisar expects the acquisition to be dilutive to its non-GAAP earnings per share by approximately $0.02 per share in its first fiscal quarter ending July 31, 2011 but, subject to the achievement of anticipated synergies, to be accretive within one year following the closing.

Ignis has entered into a transaction agreement with Finisar which, among other things, specifies the offer process, imposes restrictions on certain actions by Ignis outside the ordinary course of business, and contains customary non-solicitation provisions. The transaction agreement also provides that the board of directors of Ignis may withdraw its recommendation only if it receives a competing offer that the board considers to be more favorable to Ignis's shareholders than Finisar's offer. Under certain circumstances, including the withdrawal of the board's recommendation and the subsequent lapse of Finisar's offer, Ignis would be required to pay a break-up fee of USD $1.5 million to Finisar.

In connection with the transaction agreement, Finisar has agreed to provide Ignis with a bridge financing facility under which Ignis may borrow up to USD $3 million after April 15, 2011 for working capital purposes. Loans under the facility will bear interest at the rate of 5% per annum, will be secured by certain assets of Ignis and will be payable on December 31, 2011.

SEB Enskilda is acting as Finisar's financial advisor in the transaction and as the receiving agent for the offer, and DLA Piper is acting as Finisar's legal advisor in the transaction.

First Securities AS is acting as financial advisor to Ignis's Board of Directors, and Wiersholm is acting as Ignis's legal advisor in the transaction.

Mobile phone consumers prioritise battery life and ease of use

Strategy Analytics latest report "Battery Life and Ease of Use Most Important Factors for New Phone Buyers," assesses the importance of 18 high-level factors that cellphone consumers consider when purchasing.

Consumers in the US and Western Europe rate ease of use, long battery life and a 'trusted manufacturer' as their top three purchase priorities when it comes to buying a new mobile phone.

The Strategy Analytics Wireless Device Lab report, "Battery Life and Ease of Use Most Important Factors for New Phone Buyers," assesses the importance of 18 high-level factors that cellphone consumers consider when purchasing.

"A phone that is lightweight and fits well in the owner's pocket or purse are also serious considerations for consumers in Western Europe," commented Paul Brown, a Director in the Strategy Analytics User Experience Practice. "US consumers place greater emphasis on choosing a phone from an operator that will provide them with strong coverage where they live."

Kevin Nolan, Vice-President at Strategy Analytics, added, "Before purchasing, Smartphone owners are more likely to be looking for the latest in new features, as a preferred operating system and the ability to download applications. Basic phone owners simply want their next phone to be easy to use."

Measure and manipulate charged species in GaAs with STM

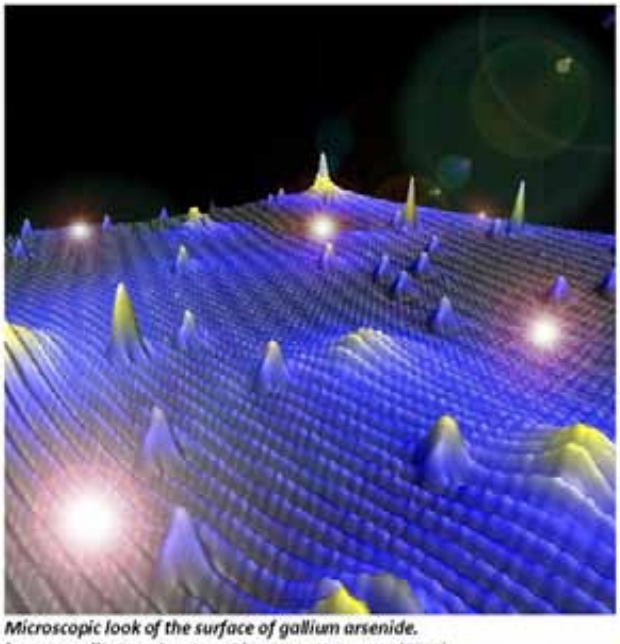
Scanning Tunnelling Microscopy (STM) can be used to position charged vacancies and adatoms on the surface of a semiconductor, suggesting a new and direct method for quantifying the charge of defects and adsorbates at surfacs.

The scaling of transistors to nanometre dimensions requires more precise control of individual dopants in semiconductor nanostructures. This is because statistical fluctuations in dopant distributions can significantly impact device performance.

Proposals for next-generation quantum- and spin-based electronics also rely on the tuning of the charge, spin and interactions of dopant atoms with local electric fields.

Using a scanning tunnelling microscope (STM), researchers at Ohio State University have demonstrated how to control the binding energy and ionization state of individual acceptors in p-doped GaAs .

Charged species such as native dopants, vacancies and adatoms directly influence the acceptor binding energy via the Coulomb interaction. In addition, a combination of defect- and tip-induced band bending can be used to remotely tune the acceptors' ionization state.



Microscopic look of the surface of gallium arsenide.
image credit: Donghun Lee, Ohio State University (2011)

This microscopic image of the surface of gallium arsenide (GaAs) shows how the arrangement of atoms on the GaAs surface affects its electric field. The image illustrates the manipulation of individual atoms to allow for very precise tuning of the characteristics of GaAs-based transistors.

The scientists found that by applying voltage pulses with the STM tip, charged vacancies and adatoms can be positioned on the surface. These experiments suggest a new and direct method for quantifying the charge of adsorbates (e.g. adatoms or molecules) as well as defects (e.g. vacancies, antisites, interstitials) at semiconductor surfaces.

Qualcomm continues to dominate share of smartphone applications

According to Strategy Analytics, both Qualcomm and Samsung registered triple-digit unit shipment growth in 2010, despite their contrasting approaches to the smartphone applications processor market.

Smartphone applications processor revenue showed 77 percent year-over-year growth to reach $4.52 billion in 2010, according to, "Smartphone Apps Processor Market Share: Qualcomm's Revenue Share Reached 41 Percent in 2010",

from Strategy Analytics' Handset Component Technologies service.

This 2010 market surge helped most applications processor vendors grow in terms of both revenue and unit volume.

Qualcomm led the overall applications processor market with 41 % revenue share, followed by TI with 27 % and Samsung with 19 %. Also, the baseband-integrated applications processors continued to gain share, accounting for 74 percent of total 2010 smartphone applications processor revenues.

"Strategy Analytics recognises Qualcomm as a top-tier supplier in the smartphone applications processor market in 2010, due to its active participation in the multiple software ecosystems and its highly integrated Snapdragon processors," noted Stuart Robinson, Director of the Handset Component Technologies service.

He added, "In our view, Qualcomm has a two-to-three year advantage over most of its competitors in terms of integration; and is ideally situated for further share gains from on-going radio technology shifts, such as HSPA+ and LTE."

"With strengthening product portfolios and increasing competition, 2011 is shaping into an interesting year for the applications processor market," commented Sravan Kundojjala, Senior Analyst. "According to Strategy Analytics, applications processor vendors should build competitive barriers by investing in integration, graphics processing technologies, multi-core processors and software expertise. Otherwise, they risk becoming commoditised, since the entry barrier is relatively low for new vendors to enter into the ARM-based chip ecosystem."

US smartphone market competition set to intensify

Strategy Analytics says that the US market for Nokia smartphones is set for recovery while demand for Samsung products continues to increase.

Strategy Analytics analysis of the US smartphone market indicates that with Microsoft's assistance, Nokia can be expected to recover its recent market share losses. Samsung will make even stronger market share gains.

The Strategy Analytics Wireless Smartphone Strategies (WSS) service predicts that Nokia's smartphone market share in the US can rebound to 10 % by 2015, with strong marketing support from Microsoft. Samsung's smartphone share is forecast to grow even more impressively, to 21 %, over the next 4 years.

Both scenarios are discussed in the report, "A Third Ecosystem in the US: Samsung still set for growth, but what role for WP7?"

While Nokia embarks on its recovery in the US, Samsung's operator relationships, existing overall handset share of 30% and proven experience with Android and Microsoft, all point to substantial smartphone share growth.

Tom Kang, Service Director for the Strategy Analytics Wireless Smartphone Strategies service (WSS), said, "Samsung has established a good track record in the US and is poised for further growth in smartphone market share. Samsung can also choose the best balance between Android and WP7 for its products."

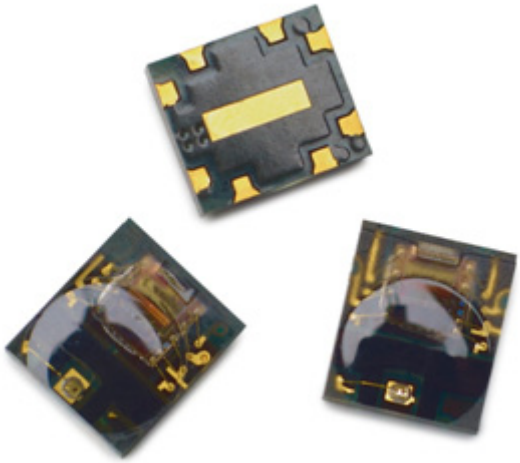
Martin Bradley, Associate Director, added, "Samsung can benefit from the enhanced WP7 ecosystem arising from the Microsoft / Nokia partnership in the US. However, if Microsoft's support to Nokia is highly effective in improving Nokia's share, Samsung could consider a more targeted approach for WP7 within its portfolio. Microsoft marketing dollars can determine the economics of operating system choices for vendors in the WP7 ecosystem."

Avago revolutionises miniaturising of motor encoding systems

The Avago AEDR-850x reflective encoders integrate an LED light source, photodetecting and interpolator circuitry, and the three channels in a single package in a compact footprint.

Avago Technologies, a supplier of analogue interface components for communications, industrial and consumer applications, has introduced what it says is the market's smallest three-channel reflective encoder.

The new AEDR-850x encoders feature built-in interpolation for high-resolution measurement that is ideal for a wide range of applications, including closed-loop stepper motors, miniature motors, printers, copiers, card readers, insulin pumps and other types of industrial, consumer and medical equipment.



A standard reflective encoder module contains two digital output channels for direction sensing, with another module required for indexing purposes. For motion feedback applications requiring high-resolution measurement, an external interpolation device had previously been necessary.

The Avago AEDR-850x reflective encoders integrate an LED light source, photodetecting and interpolator circuitry, and the three channels in a single package with a 3.95mm by 3.40mm by 0.95mm footprint. With high resolution encoding of 304 lines per inch (12 lines per mm), the compact, highly-integrated modules enable a new level of miniaturization for applications where size and space are primary concerns.

"The integrated third-channel, compact size and high-resolution encoding performance of the Avago AEDR-850x modules is truly revolutionary, enabling smaller motor encoding systems than ever before possible," said Hassan Hussain, general manager of the Motion Control Products Division at Avago. "These innovative modules cut design costs and save PCB board space for our customers, and expand the reach of our reflective encoder offerings into the industrial automation and medical segments."

The AEDR-850x encoders offer interpolation of up to 4 times and enable various resolution designs by changing the codewheel size. The optical-based modules are significantly less susceptible to EMI compared with Hall Effect devices. With an absolute operating temperature range of -20° C to 85° C, the rugged encoders are suitable for commercial and industrial operation environments.

The module is TTL compatible, allowing outputs to be interfaced directly with most of the signal processing circuitries and requires a single 5V supply.

U.S.Pricing and Availability

The Avago AEDR-8500 reflective encoder is gated 90º, the AEDR-8501 encoder is gated 180º and the AEDR-8502 encoder is ungated 360º. The encoders are priced at $6.75 each in 100 piece quantities. Samples and production quantities will be available in April 2011 through the Avago direct sales channel and via worldwide distribution partners.

Avago names Artimar Ltda as representative for South America

Artimar has extensive experience in the semiconductor industry as an exclusive representative for high-technology and market-leading semiconductor manufacturers.

Avago Technologies, a supplier of analogue interface components for communications, industrial and consumer applications, has named Aplicacoes Eletronicas Artimar Ltda as exclusive representative for Avago products in South America.

Artimar, as it is known in the South American market, has over 48 years of experience in the semiconductor industry as an exclusive representative for high-technology and market-

leading semiconductor manufacturers focusing on demand creation and customer service excellence.

Artimar is a well-structured company that will support, develop, and work to increase Avago market share in Brazil and the rest of South America.

Goodrich introduces compact multifunctional SWIR InGaAs camera

The line-scan camera is suited for machine vision, sorting and solar inspection.

Goodrich ISR Systems, a division of Sensors Unlimited, has introduced a compact SU1024LDM line-scan camera features high resolution, 1024-pixel imaging in the shortwave infrared (SWIR).

Its square pixels are ideal for inspection of polished silicon blocks, ingots, or wafers, hot glass bottles, and for use on continuous-process lines that apply transparent coatings which can be 'seen' in the SWIR spectral region.

The innovative square pixel design ensures that the pixel height is sharply defined by a metal mask, providing better uniformity of response and improved measurement accuracy for the object being imaged.

The SU1024LDM is compact and robust (only 3-in. x 2.9-in. x 2.4-in. deep - 76 mm x 74 mm x 61 mm), and has mounting points on 4 of its 6 sides, making it easy to integrate into a processing line or machine vision system. Goodrich's new camera features a 14-bit base Camera Link interface, flexible triggering, and line rates up to 46,000 per second for its 1024 pixel width.

The SU1024LDM offers high quantum efficiency, wide dynamic range, and integrate-while-read acquisition. For added flexibility, the ruggedized housing supports an operating temperature range of -10 to +50 degrees C. An optional 50 mm f/1.4 lens designed specifically for the SWIR is also available.

In solar applications, the new InGaAs line-scan imager detects cracks, occlusions, inclusions, and mis-alignments before further processing, eliminating the waste and expense of manufacturing defective solar wafers or cells. Other applications include high-speed imaging of free-falling molten glass, fast absorption or emission spectroscopy for combustion research, moisture, lipids, proteins, or other molecular vibration bands in the SWIR, and on-line sorting of agricultural materials, food products, recycled plastic pellets, and pharmaceutical products.

Avago Technologies announces dividend

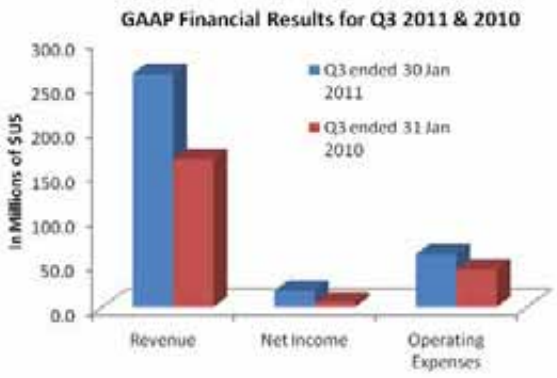
The board has approved a quarterly interim cash dividend of $0.08 per ordinary share.

Avago, a supplier of analogue interface components for communications, industrial and consumer applications, has announced that its Board of Directors has approved a quarterly interim cash dividend of $0.08 per ordinary share.

Finisar quarterly revenues shoot up 57.6% to $263.0 million

The revenue growth was driven primarily by demand for 40 Gbps transponders, wavelength selective switches (WSS) and ROADM line cards.

Finisar Corporation, a technology leader for subsystems and components for fibre optics communications, has announced financial results for its third quarter ended January 30, 2011.



"In our just completed third quarter, our revenues were a record $263.0 million, exceeding the revenue guidance of $247.0 to $262.0 million that we provided at the time of our second quarter earnings release. This revenue growth was driven primarily by demand for our 40 Gbps transponders, wavelength selective switches (WSS) and ROADM line cards. Our non-GAAP earnings per diluted share was a record $0.47, at the top end of our prior guidance of $0.45 to $0.47 per share, and would have been $0.48, except for the impact of our common stock offering in December 2010. However, one of the benefits of the offering is that our cash balance at the end of the quarter was over $300 million," said Jerry Rawls, Finisar's executive Chairman of the Board.

"Our revenues for WSS/ROADM line card products grew 22.7% from the second quarter," said Eitan Gertel, Finisar's CEO. "We continue to execute on our new product development programs, including tunable XFP, to generate a significant pipeline of products, which we expect will enable us to win new opportunities with customers and expand our market share."

GAAP revenues increased from $166.9 million in the third quarter of the prior year to $263.0 million, up 57.6%. Compared to Q3 2010, the sale of 10 Gbps or faster products increased by 74.7% to $50.3 million. The sale of less than 10 Gbps products increased by $19.2 million, or 25.7%.

The sale of WSS/ROADM line card products increased by $28.5 million, or 148.9%, while the sale of products for analogue and CATV applications decreased by $1.9 million, or (33.2)%.

Gross margin increased from 31.0% in the third quarter of the prior year to 32.0%. Operating income decreased to $24.7 million, or 9.4% of revenues, from $36.1 million, or 15.0% of revenues, in the preceding quarter.

The decrease in GAAP operating income was primarily the result of a charge of $3.5 million in the third quarter representing the adverse judgment amount due related to the previously disclosed patent litigation with Emcore as compared to a gain of $2.5 million in the preceding quarter related to a patent settlement with Source Photonics.

A non-cash charge of $5.9 million in the third quarter for induced conversion expense related to the exchange of convertible notes for common stock and a $620,000 non-cash charge in the third quarter for acceleration of the amortization of previously paid fees associated with the original issuance of the exchanged portion of the notes were also imposed. Operating income increased $15.5 million compared to operating income of $9.1 million, or 5.5% of revenues, in the third quarter of the prior year.

Net income from continuing operations was $18.8 million, or $0.22 per diluted share, compared to $33.8 million, or $0.39 per diluted share, n the preceding quarter and $5.6 million, or $0.08 per share, in the third quarter of the prior year. Cash and cash equivalents totalled $310.2 million at the end of the third quarter compared to $184.9 million at the end of the preceding quarter.

On December 27, 2010, Finisar completed a common stock offering for net proceeds of approximately $117.9 million. In addition, during the quarter, Finisar repaid approximately $17.3 million of bank debt associated with its Asian subsidiaries.

Under Finisar's $70.0 million secured credit facility with Wells Fargo Foothill, LLC, no borrowings were outstanding and $66.6 million was available to borrow at the end of the third quarter.

In several privately-negotiated transactions completed during the quarter, Finisar exchanged an aggregate of approximately $42.2 million of its outstanding 5% Convertible Senior Notes due 2029 for approximately 3.9 million shares of the Company common stock, based on the conversion price of the notes of approximately $10.68 per share, plus a total of approximately 188,000 additional shares, including approximately 16,000 shares issued in

payment of accrued and unpaid interest. At the end of the quarter, there was approximately $57.9 million in principal amount of the notes remaining outstanding.

Subsequent to the end of the quarter, Finisar exchanged an aggregate of an additional $17.8 million of the notes for approximately 1.7 million shares of the Company common stock, based on the conversion price of the notes of approximately $10.68, plus a total of approximately 75,000 additional shares including approximately 8,000 shares issued in payment of accrued and unpaid interest. After such additional exchanges, there was approximately $40.0 million in principal amount of the notes remaining outstanding.

Outlook

During the fourth quarter ending April 30, 2011, the Company will be impacted by the full three months of the annual price negotiations with telecom customers that typically take effect on January 1, the 10-day long shutdown at certain customers for Chinese New Year in February, the adjustment of inventory levels at some telecom customers, particularly for products which had previously been on allocation and long lead times, including WSS and ROADM line cards, and a slowdown in business in China overall.

Primarily as a result of these factors, the Company indicated that it currently expects revenues for the fourth quarter to be in the range of $235 to $250 million. On a GAAP basis, operating margin is expected to be in the range of approximately 10 to 12%.

Weighted average fully-diluted shares are expected to increase from 93.4 million in the third quarter to approximately 98.0 million in the fourth quarter due to the shares issued in the common stock offering that closed on December 27, 2010 and options exercised during the third quarter being outstanding for the full fourth quarter.

Finisar discussed its financial results and current business outlook during its regular quarterly conference call.

JDSU expands portfolio of 40 and 100G components

The firm's InP based optical transmission and vertically-integrated products support customers deploying 40G and 100G networks.

JDSU has announced the release of new 40G and 100G optical components, providing a cost effective solution for network equipment manufacturers high speed data transmission requirements.

"This is the latest step in the continuous expansion of our transmission components portfolio. These new additions allow us to work collaboratively with our customers as they are developing new solutions to meet the explosive demand for bandwidth," said Tom Fawcett, senior director of transmission products at JDSU.

The latest offerings from JDSU's transmission components portfolio include:

* 40G and 100G QPMZ modulators supporting DP-QPSK coherent detection

* 40G and 100G Coherent Receivers supporting DP-QPSK coherent detection

* 40G DDMZ Modulators supporting DPSK and RZ-DQPSK direct detection

JDSU's ability to leverage in-house fabrication capabilities in InP, planar lightwave circuits (PLCs) and lithium niobate materials enables high performance and cost competitive component solutions across these various data formats and data rates. This in turn allows the service providers to deploy 40G and 100G optical links in a cost effective manner wherever increased bandwidth is required in the network.

The new modulators and receivers grow further JDSU's broad optical portfolio for high speed transmission, which currently provides solutions for 10G, 40G and 100G client and line-side applications.

Avago announces three resignations from its board of directors

The departures are due to a re-organisation of the board resulting from the recent secondary offerings of the firm's ordinary shares by its sponsor shareholders. The board has decided not to fill the vacancies created by their resignations.

Avago, a supplier of analogue interface components for communications, industrial and consumer applications, has announced that James A. Davidson, David M. Kerko and Bock Seng Tan have tendered their resignations from its board of directors, which was effective March 9, 2011.

The departure of these directors is due to a re-organisation of the Board resulting from the recent secondary offerings of the firm's ordinary shares by its sponsor shareholders.

Davidson and Kerko were director designees of Silver Lake and KKR, respectively, and Bock Seng Tan was originally the director designee of Seletar Investments.

Following the sale of Avago ordinary shares in a secondary offering in February 2011, under the terms of Avago's Second Amended and Restated Shareholder Agreement, Silver Lake and KKR are each currently entitled to designate only one member to the Board. Seletar ceased to be entitled to designate a member to the Board following its sale of Avago ordinary shares in a secondary offering in December 2010.

Davidson, Kerko and Bock Seng Tan were nominated for re-election to the Board at the Company's upcoming Annual General Meeting of Shareholders (the "AGM"), scheduled to take place on March 30, 2011. However, in connection with their resignations from the Board, each of them has withdrawn as a candidate for re-election as a director at the 2011 AGM. The Board has decided not to fill the vacancies created by their resignations.

"Jim, Bock Seng and David have served Avago well as directors during their tenure on our Board, and I thank them for their valuable contributions to the Company," said Hock Tan, President CEO of Avago.

Opnext demonstrates InP tunable TOSA at OFC/NFOEC

The firm's tunable transmitter optical subassembly (TOSA) features an internally designed tunable laser that delivers wavelength stability.

Opnext, a provider of high speed optical communications technology demonstrated its integrated Tunable TOSA during OFC/NFOEC, the industry's largest optical communications conference between March 8 and 10 in Los Angeles.

The demonstration highlighted automatic wavelength tuning designed to deliver stable wavelength control.

"Opnext's Tunable TOSA has been specifically designed to help customers reduce wavelength inventories and address their wavelength needs and time-to-market requirements," said Tadayuki Kanno, President of the Opnext module business unit. "Using our own, in-house designed Tunable TOSA, we're bringing the Opnext quality that our customers have come to expect in all our products."

Opnext's Tunable TOSA, developed in collaboration with Hitachi's Central Research Laboratory (CRL), is a hybrid design that combines the tunable laser and InP-MZ (Mach Zehnder) chips to offer optical shutter functionality.

The Tunable TOSA delivers system performance to address mode-hopping for optimized wavelength stability in a variety of DWDM applications. In addition, the Tunable TOSA design will flexibly support negative chirp or zero-chirp DWDM applications to replace DWDM-XFP or 300-pin tunable transponders.

"Network equipment manufacturers are rapidly deploying tunable XFPs over 300-pin transponders because they are smaller and more cost effective," said Ovum's VP and Practice Leader Daryl Inniss. "We project tunable XFPs to grow at a compounded annual growth rate of over 50% from 2010 through 2013; they represent one of the fastest growing market segments in the optical component space."

Working samples of Opnext's Tunable XFP are scheduled to be available in June, with mass production planned for late fall.

Bell Labs showcases next-generation InP optical transmission technologies

The research arm of Alcatel-Lucent showcased the InP photonic integrated circuits (PICs) at OFC and NFOEC in California.

The Bell Labs division of Alcatel-Lucent has demonstrated what it claims is the first fully-integrated optical Orthogonal Frequency Division Multiplexing (OFDM) generator that is based on InP PICs. This is a key step forward in making OFDM systems that are cost and power efficient enough for practical use.

The scientists also demonstrated a range of optical technology advances at the optical industry's annual Optical Fibre Communication Conference and Exposition (OFC) and National Fibre Optic Engineers Conference (NFOEC) in Los Angeles, California.

The next-generation optical innovations showcased by Bell Labs at OFC/NFOEC address some of the most pressing challenges facing the optical industry: satisfying exponential growth in demand for network capacity and higher data rates while contending with increasingly severe technical limitations and cost constraints.

The solutions presented by Bell Labs feature a range of novel techniques that make it possible to transmit data at significantly higher bit rates and over significantly longer distances than what is possible today.

They accomplish this by applying higher-order signal modulation to achieve greater spectral efficiencies and heightening the sensitivity of optical receivers to a point approaching their fundamental limit. The technology exploits new multimode transmission to increase the capacity of optical networks by orders of magnitude.

Doubling spectral efficiency, they have achieved a per line transmission rate of 256 Gb/s over a distance of 400 kilometres. The rate achieved in this experiment is more than twice that which is achievable today with the 100 Gb/s systems that are just coming on the market. The solution makes use of a high powered electronic circuit that converts analogue signals to digital and employs a sophisticated 64-QAM modulation (Quadrature Amplitude Modulation) scheme

The technology has reduces the number of photons needed to transmit information by half and achieved a record degree of sensitivity by applying an advanced 16-ary-pulse-position-modulation scheme.

The firm says this is the first ever demonstration of transmission over a new multimode fibre type that has the potential to increase the capacity of a single fibre strand by an order of magnitude. This demonstration takes advantage of advanced fibre design, digital signal processing, and sophisticated mode or core coupling.

Bell Labs has demonstrated the first fully-integrated optical Orthogonal Frequency Division Multiplexing (OFDM) generator that is based on photonic integrated circuits using InP. This is a key step forward in making OFDM systems that are cost and power efficient enough for practical use.

Finally, Bell Labs presented specifications for new transport network protocols that will enable enterprises to more easily access large scale data processing capabilities (High Performance Computing) while facilitating outsourcing of their computing infrastructure (Cloud Computing).

Bell Labs demonstrated how network service providers will be able to maintain contracted levels of service for business applications delivered from the cloud using the new protocol specifications in conjunction with high speed wavelength-switched optical network connections that can be configured on the fly.

These innovations represent significant advances in the evolution of optical transmission over the mid to longer term by being able to accommodate demand for increasingly higher transmission speeds required to meet rapidly increasing demand for bandwidth.

Emcore exhibits external cavity laser platform at OFC 2011

The firm demonstrated its tunable XFP technology (TXFP) based on its patented ClearLight technology at the conference.

Emcore Corporation, a provider of compound semiconductor-based components, subsystems, and systems for the fibre optics and solar power markets, demonstrated its new tunable XFP product at the OFC / NFOEC conference in Los Angeles, California between March 8-10, 2011.

The firm demonstrated its tunable XFP technology (TXFP) based on its patented ClearLight external cavity laser platform. Emcore is currently shipping pilot production quantities of the TXFP, and is ramping domestic and off-shore production.

“Emcore’s TXFP was designed with the goal of enabling our customers to dramatically reduce size, power consumption, and operating expenses thus replacing legacy 300-pin transponders,” stated Hong Q. Hou, Emcore’s CEO. “Our TXFP offers industry-leading performance with both negative and zero chirp options.” The TXFP incorporates the fourth generation of Emcore’s external cavity laser technology, deployed in worldwide fibre networks since 2004.

James A. Tegnelia joins board of directors at Emcore

The former director of the Defence Threat Reduction Agency (DTRA), is a Class C director andwill stand for re-election at the Company’s 2012 annual meeting of shareholders.

Emcore Corporation, a provider of compound semiconductor-based components, subsystems, and systems for the fibre optics and solar power markets, has announced that its Board of Directors has elected James A. Tegnelia to join the Board as a Class C director.

Tegnelia currently lectures at the University of New Mexico and Georgetown University and is a member of the Defense Science Board. From 2005 to 2009, Tegnelia was the Director of the Defence Threat Reduction Agency (DTRA), Fort Belvoir, VA. DTRA safeguards America’s interests from weapons of mass destruction.

Prior to his selection to lead DTRA,Tegnelia was the VP, Department of Defence Programs, Sandia National Laboratories. Tegnelia has also served as the assistant undersecretary of defence and acting deputy undersecretary of defence in the Office of the Undersecretary of Defence for Research and Engineering, where he oversaw program manager activity on the JSTARS radar and ATACMS missile, and as the deputy director and later acting director of the Defence Advanced Research Projects Agency (DARPA).

Tegnelia has also held various executive leadership positions in the defence industry, including VP of Business Development, of the Electronics Group at the Martin Marietta Corporation, executive VP and deputy director of Sandia National Laboratories, VP, Business Development, for the Energy and Environment Sector of Lockheed Martin Corporation, and president of Lockheed Martin Advanced Environmental Systems.

Tegnelia earned a bachelor’s degree in physics from Georgetown University, a master’s degree in engineering from George Washington University, and a Ph.D. in physics from The Catholic University of America. His awards and decorations include the Bronze Star Medal, the Civilian Meritorious Service Medal, and the Senior Executive Service Meritorious Service Award.

“We are extremely pleased and excited about Dr. Tegnelia joining our Board of Directors,” commented Reuben F. Richards, Jr., Emcore’s Chairman of the Board. “We expect Dr. Tegnelia to play a significant role in Emcore’s expansion of its product portfolio in the Defence, Aerospace and Homeland Security markets.”

Tegnelia was elected to fill a Board vacancy and began service as a director immediately upon his election on March 2, 2011. As a Class C director, he will stand for re-election at the Company’s 2012 annual meeting of shareholders.

Emcore to demonstrate VCSEL and PIN based products at OFC

Leveraging its next generation the firm intends to continue market growth with its Infiniband 56Gb/s FDR, 120 Gb/s ethernet CXP active optical cables and 14Gb/s optical sub-assemblies.

Emcore Corporation will demonstrate two new interconnect products at OFC including a 56Gb/s FDR and a 120 Gb/s CXP active optical cable for high performance computing (HPC), high-end Ethernet router and switch applications.

High performance computers, telecommunication routers, storage networks, grid and cloud computing systems require higher speed interconnects to support the increasing performance requirements. These FDR and CXP active optical cable products provide the highest aggregated level of data throughput in a compact, lightweight form-factor capable of supporting the bandwidth needs of these next generation systems.

The 14Gb/s TOSA/ROSA products enable our customers to support the latest 16X Fibre Channel data-rate as market demand transfers from 4-8 Gb/s transceivers to 14 Gb/s optical transceivers.

“Emcore is the industry leader in active optical cable sales,” commented Jaime Reloj, Emcore’s VP of Business Development. “Leveraging our next generation VCSEL and PIN we will continue to grow the market and demonstrate the same quality, reliability, on-time delivery and competitive pricing our customers have come to expect.”

Emcore’s complete line of Datacom products will be on display including high-bandwidth, parallel optical interconnect products including the DDR and QDR cables for 4x 20Gb/s and 40Gb/s Infiniband and PCIe applications as well as optically pluggable SNAP12 solutions for up to 75Gb/s telecommunications routers, backplane and proprietary high-speed interconnect applications.

Skyworks ramps production of precision analogue ICs

Cisco, Motorola and others are leveraging the firm’s broad product portfolio of GaAs based products for network infrastructure and other consumer applications.

Skyworks Solutions is ramping production of various precision analogue ICs in support of several customers launching fibre to the curb (FTTC), fibre to the home (FTTH), cable set-top boxes and wireless video systems.

Cisco and Motorola, among others, are leveraging Skyworks’ industry-leading power amplifiers, LNAs, gain blocks, attenuators, pin and varactor diodes, as well as switches to enable greater network reliability.

“Consumer demand for anytime, anywhere Internet access is creating exciting new growth avenues for Skyworks as carriers make significant investments in their networks to support wider adoption of new, lucrative services,” said David Stasey, VP of analogue components at Skyworks. “Skyworks is delighted to be supporting multiple new markets with differentiated solutions that enable a host of wireless applications for today’s consumer.”

According to the Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, mobile data traffic is expected to grow at a compound annual growth rate (CAGR) of 92 percent from 2010 to 2015.

About Skyworks’ Attenuators

Skyworks offers a broad selection of GaAs digital attenuators, PIN diode voltage variable attenuators, and silicon fixed attenuator pads for infrastructure, test and measurement, and other high-performance microwave applications up to 40 GHz. High attenuation accuracy allows precise power control. Skyworks’ featured attenuators include: the AA103-72LF, AA104-73LF and AA116-72LF.

About Skyworks’ PIN and Varactor Diodes

Skyworks’ diode product offering includes PIN, Schottky, varactor and limiter diodes for a wide variety of microwave applications including WLAN, infrastructure, handset, SATCOM (LNB/DBS-CATV), automotive, military, test and measurement, metering, medical, and RFID. The discrete silicon and GaAs semiconductors are available as die, plastic packaged, surface mount (SMT) and ceramic hermetic packaged devices. Frequency ranges include low frequency, HF, VHF, UHF, L band, S band, C band, X band, KU band, K band,

and Ka band. Skyworks' featured diodes include: the SMV1255 Series and SMS7621 Series.

About Skyworks' Power Amplifiers, Low Noise Amplifiers and Gain Blocks

Skyworks' broad selection of PAs and LNAs are designed for cellular applications and diverse markets such as wireless infrastructure, WLAN, automotive, test and measurement, energy management and other high-performance microwave applications. Skyworks' LNAs meet the needs of cellular infrastructure, WLAN, WiMAX, ISM, and all applications requiring LNAs from DC to 6 GHz, making the devices dual-band capable. The MMIC products are offered in enhancement mode (E Mode LNA) and depletion mode (D Mode LNA) pHEMT amplifiers achieving sub 1 dB noise figure for better Rx sensitivity, and high-linearity performance. Skyworks' featured devices include: the SKY6501X Series, SKY65152-11 and SKY65404-21.

About Skyworks' Switches

Skyworks' broad selection of GaAs switches for diverse markets such as WLAN, handset, wireless infrastructure, SATCOM (LNB/DBS–CATV), automotive, test and measurement, energy management, and other microwave applications are available in many different configurations including broadband, high power, high isolation, low insertion loss enabling higher transmit power, reflective, and non-reflective. The lead-free, RoHS-compliant and Green high quality products are available for applications including antenna transmit/receive (T/R) switches for use in cellular handsets and WLAN systems, synthesizer switches for infrastructure needs, and many other high volume, high performance requirements.

Avago expands portfolio of 10 to 120 Gigabit fibre optics

The firm's products, which incorporate VCSEL technology, are suited to data centre, storage, computing and consumer applications. The technologies developed with partners and customers will be demonstrated, at the 2011 Optical Fibre Conference (OFC).

Avago Technologies has announced availability of multiple new solutions in its innovative portfolio of 10 to 120 Gigabit fibre optics.

The comprehensive set of optical solutions, which covers both advanced embedded parallel modules and industry-standard pluggable modules, enables designers to differentiate their products and solve interconnect bandwidth challenges.

New Avago optical solutions and demonstrations at OFC include:

* Sampling availability of its small-footprint MiniPOD embedded parallel optical transmitters and receivers that enable bandwidth of up to 120 Gigabits per second (Gbps)

* Announcement of the world's first QSFP+ 40G-iSR4 pluggable parallel optic transceiver module for 40 Gigabit Ethernet applications and high-density 10 Gigabit applications, along with a demonstration of the technology using new Top-of-Rack (ToR) data centre switches from leading manufacturers

* Demonstration of "the world's first" multi-Gigabit consumer optical interconnect

* Demonstration of a 25-Gbps VCSEL integrated into an SFP+ platform interoperating with the latest Avago 40-nm Serial/Deserializer (SerDes) core

"Avago is here at OFC demonstrating our innovative optical portfolio and our intentions to bring fiber optic solutions from the data centres of today to the consumer and home computing applications of tomorrow," said Philip Gadd, VP and General Manager of the Fibre Optics Product Division at Avago. "We differentiate ourselves by serving as a technology partner – helping customers differentiate themselves, and their products, leveraging our world-class engineering, innovative technology in lasers, photodetectors and CMOS ICs, and unrivalled supply chain expertise."

Avago embedded parallel optics allow fibre optic interfaces to be located close to an ASIC or FPGA and the firm says they deliver the world's highest bandwidth. These benefits are leveraged in applications such as next-generation supercomputers powering scientific research breakthroughs, as well as for high-performance routers, switches and other data centre equipment enabling cloud computing, server virtualisation and

video-on-demand.

Avago says its MicroPOD embedded parallel optics are the world's smallest 120-Gbps optical transmitters and receivers. They offer 12 transmit or receive channels at up to 10.3125 Gbps while consuming only 125 mW per channel. MicroPOD modules deliver high performance in both air-cooled and water-cooled environments, and are in production today powering the world's fastest supercomputers.

MicroPOD devices have an 8.2-mm by 7.8-mm footprint with an LGA electrical interface for ultra-dense embedded solutions, while the new MiniPOD arrays have a 22-mm by 18.5-mm footprint with a 9-mm by 9-mm MegArray connector for simplified embedded solutions and ease of manufacturing. Avago is announcing sampling availability of the MiniPOD interconnects, which feature a low-cost, removable fibre cable connection and a pluggable electrical connection that provide flexible cable management at installation, simplifying design and lowering cost for switching and supercomputing applications.

In a joint collaboration with VIA Labs and DisplayLink, Avago is demonstrating what it claims is the world's first multi-gigabit consumer optical interconnect. This demonstration shows High-Definition (HD) video streaming through a USB 3.0 Active Optical Cable. This optical interconnect surpasses the limitations of existing copper interconnects in the computing and consumer electronic space, allowing longer distances at higher speed data rates while still maintaining low cost and low power.

Avago is expanding its portfolio of Multi-Source Agreement compliant pluggable optics with a new four-channel, parallel, QSFP+ transceiver for 40 Gigabit Ethernet applications with the added capability of interoperating with IEEE 10GBASE-SR compliant products.

The transceiver integrates four data lanes in each direction with each lane operating at 10.3125 Gbps. This provides an aggregated bandwidth of 40 Gbps for short-range, multi-lane data communication and interconnect applications. The device allows optical interoperability with any 10 Gigabit Ethernet transceiver, compliant to the IEEE 802.3ae 10GBASE-SR specifications, of form factors such as SFP+, XFP and X2.

Avago is demonstrating connectivity between 10GBASE-SR (SFP+) and the new QSFP+ 40G-iSR4 module over 100 meters of OM3 multi-mode fibre. Using new ToR data centre switches from a leading switch vendor, the demonstration connects two high-performance servers with 10GbE SFP+ network interface cards and shows real-time streaming of multiple HD movies simultaneously.

Avago recently announced two new mini-SFP+ (mSFP) fibre-optic transceivers that enable increased port density in Ethernet and storage equipment. The AFBR-54D7APZ transceiver addresses 8-Gbps Fibre Channel for storage applications and the AFBR-703SNZ transceiver targets next-generation 10-Gbps Ethernet equipment designs. Both pluggable modules increase port density by 30 percent over industry-standard SFP+ transceivers, while delivering the same data-transmission performance.

A third demonstration at the Avago booth shows its best-in-class, high-temperature 25-Gbps 850-nm VCSEL integrated into an Avago high-volume SFP+ production platform operating over 100 metres of OM3 multi-mode fibre. The SFP+ is interoperating with the latest Avago 40-nm SerDes core.

Avago Application-Specific Integrated Circuits (ASICs) integrate the SerDes cores, increasing the bandwidth of data communication for servers, routers and other networking, computing and storage applications. Avago recently announced demonstration of its first 28-nm SerDes core with industry-first 30-Gbps performance.

Avago unveils "market's first" optical transceiver platform at 14-Gbps

The firm's new 16 Gigabit fibre channel SFP+ and four-channel QSFP+ modules increase throughput and port-density in storage and networking applications.

Avago Technologies, a supplier of analogue interface components for communications, industrial and consumer applications, has announced sample

availability for two new fibre-optic transceivers with 14.025-Gbps throughput per lane.

The new transceivers incorporate Avago's 850-nm VCSEL technology and PIN detector technology. This combination insures that the multi-rate SFP+ module is compliant with FC-PI-5 and 16/8.5/4.25 Gigabit Fibre Channel specifications. The SFP+ module's transmitter and receiver can operate at different data rates, as is often required during Fibre Channel speed negotiation.

The new SFP+ transceiver addresses 16 Gigabit Fibre Channel switches, host bus adapters, RAID controllers and tape drives, as well as inter-switch and inter-chassis aggregated links. The four-channel QSFP+ transceiver targets switch and router interconnects for data communications and telecommunications, data aggregation and backplane applications, and proprietary protocol and high-density link applications. The modules are the first in the Avago 14-Gbps optical transceiver platform, offering increased port-density for systems compared to 8-Gbps Fibre Channel optics.

"Avago leverages a unique collection of core technology and design expertise to bring new performance standards and innovative form-factors first to market, as is the case with our 14-Gbps platform," said Victor Krutul, director of marketing for the Fibre Optics Products Division at Avago.

"Our new 16 Gigabit Fibre Channel SFP+ and four-channel QSFP+ modules are already winning designs with top systems manufacturers in high-density applications. We are looking to build on this early success by adding more new solutions to our 14-Gbps platform."

The hot-pluggable QSFP+ module is compliant with the QSFP+ SFF-8436 specification. The QSFP+ transceiver reduces power dissipation per lane by 50 percent compared to 8-Gbps Fibre Channel technology. The Avago 14-Gbps platform has the potential to address Infiniband FDR applications as well.

In a related announcement at OFC, Avago introduced new solutions in its innovative portfolio of 10 to 120 Gigabit fibre optics and provided details on demonstrations in the Avago booth that highlight customer technology partnerships and bringing optics to new markets.

The 14-Gbps SFP+ and QSFP+ transceiver modules are currently sampling, with production expected in mid-2011. Samples are available through the Avago direct sales channel and via worldwide distribution partners.

RFMD expands portfolio of 5GHz WiFi FEMs mobile devices

The Front End Modules (FEMs) for handsets, smartphones and tablets address a wide range of high-performance applications and target explosive growth in WiFi end markets.

RF Micro Devices, a designer and manufacturer of high-performance radio frequency components and compound semiconductor technologies, has expanded its industry-leading 5GHz WiFi product portfolio to include three new 5GHz high-band WiFi front end modules (FEMs) with integrated power amplifiers (PAs).

The three new 5GHz FEMs - the RF5686, the RF5506, and the RF5516 -- deliver industry-leading high power and high linearity and are optimized for the rapidly growing smartphone and tablet markets.

The global WiFi market is growing rapidly and is forecast to represent a greater than $1 billion total addressable market (TAM) by 2014. Adoption of dual-band WiFi (2.4GHz/5GHz) in handsets is estimated to increase from approximately 25% of all handsets in 2011 to approximately 50% of all handsets in 2012, with increasing emphasis on the 5GHz band for use in 3G/4G smartphones. The anticipated growth in tablet devices is also forecast to support 5GHz FEM adoption, as mobile WiFi chipsets for tablets increasingly adopt dual-band functionality.

To satisfy the growing market demand, RFMD has developed industry-leading FEMs with high levels of integration, small package sizes, and best-in-class linearity performance. RFMD offers a broad portfolio of highly integrated FEMs that include the PA, the switch, filtering, baluns and an optional low noise amplifier (LNA) for both single-band (2.4GHz or 5GHz) and dual- band (2.4GHz/5GHz) operation. RFMD's WiFi product portfolio also includes

discrete PAs, switches and switch/LNA products that support integrated chipset solutions.

Bob Van Buskirk, president of RFMD's Multi-Market Products Group (MPG), said, "RFMD forecasts the WiFi market will expand significantly as dual-band adoption increases and as volume expands across a variety of end markets, including smartphones, tablets, home automation, WiFi TV, automotive and personal computing. Because carrier requirements continue to demand higher power levels, this is placing an even greater focus on product performance and increasing the reliance on RFMD's core technology and product development capabilities."

Samples and production quantities of the RF5686, RF5506, and RF5516 are available now through RFMD sales representatives and through the RFMD online store at www.rfmd.com. Product brochures are available and can be downloaded from RFMD's website or by contacting RFMD at 336-664-1233.

Slow 3G growth hurts mobile revenue in India and China

Strategy Analytics says unless there is a serious commitment to deploying 3G and 4G networks and corresponding value added services, it is hard to see anything but long-term revenue stagnation for emerging market operators.

Mobile subscriptions in the developing countries of Asia continue to grow dramatically, as operators like Bharti Airtel of India and China Mobile tap new consumer segments.

However, revenue growth has been failing to keep pace. As noted in a new report from Strategy Analytics Emerging Markets Communications Strategies (EMCS) service, "Emerging Asia: Slow 3G Growth Clouds Revenue Outlook," average annual revenue growth from 2001 through 2015 is forecast to lag subscription growth by more than 10 percentage points. Without a boost from new services offered on 3G networks, revenue will start to stagnate in the next few years.

Price competition is one factor that is holds down revenue. In the hypercompetitive Indian market, for example, Bharti Airtel offers voice calls for as little as 1.2 cents per a minute, while in nearby Sri Lanka, an imposed price floor keeps operators from cutting prices below a penny a minute. Expansion into rural areas also reduces revenues.

"Operators really must expand beyond the city in order to grow," notes Tom Elliott, Director of EMCS. "Yet, people in the country typically do not have as much money to spend on communication, which hurts the top line."

For many operators, including AIS in Thailand, which now receives more than 10 percent of its service revenues from non-messaging data services, the ability to promote services beyond voice and SMS has been a key to revenue enhancement. However, AIS and the other Thai operators have been unable to expand high-speed services beyond a few limited areas because 3G spectrum auctions have been delayed for years.

According to Susan Welsh de Grimaldo, Director of Strategy Analytics Mobile Broadband Opportunities (MBO) service, "Unless there is a serious commitment to deploying 3G and eventually 4G networks and corresponding value added services, it is hard to see anything but long-term revenue stagnation for emerging market operators."

Mobile handset semiconductor market to approach $82 billion in 2015

Smartphones are expected to make up 45.3% of all handsets shipped by 2015 and semiconductor revenue associated with accelerometers and/or gyros will exceed $300 million by 2014.

In 2010, the value of semiconductors used across all mobile handsets exceeded $55 billion, and smartphones are a semiconductor manufacturer's dream come true.

These devices contain the latest semiconductor technology, shrunken-down to fit in your shirt pocket. It should not come as any surprise that mobile phone semiconductor component revenue will exceed $80 billion in 2015, a compound annual growth rate of 10.8%, according to In-Stat.

"While most handset component markets are growing in revenue, a few face significant challenges," says Allen Nogee, Principal Analyst. "For example the baseband semiconductor content of non-smartphones is slowly decreasing, as all costs are being wrung out of non-smartphone chips, and volume increases are not enough to compensate for the loss per device. Bluetooth semiconductor revenue in handsets is another area that is actually shrinking, as the Bluetooth function is integrated with other functions."

Recent In-Stat research found that over 60 semiconductor companies worldwide produce semiconductor components for mobile phones. Revenue from smartphone processors -- Wi-Fi, GPS, touchscreen controllers, gyros, and pico projectors -- will grow much faster than the average.

Smartphones are expected to make up 45.3% of all handsets shipped by 2015 and semiconductor revenue associated with accelerometers and/or gyros will exceed $300 million by 2014.

Recent In-Stat research Handset Components: Worldwide Trends and Forecasts looks at the major components of a cellular phone (including smartphones), and includes a comprehensive listing of the component makers and a discussion of the market in each area. Additionally, each section contains a semiconductor 5-year revenue forecast.

Among the companies included in this report are: AMD/ATI Technologies, Anadigics, Analog Devices, Apple, Atheros, Atmel, Beceem, Broadcom, Cavium, Chongyou Technology, Corning, CSR/ SiRF Technology, Cypress, Datang Telecom Technology, DiBcom, ElanTech, Elpida Memory, Freescale Semiconductor, GCT Semiconductor, Hisilicon Technologies, Hynix, Icera Semiconductor, IDT/Leadis Technology, Imagination Technology, Infineon Technologies, Intel, Kionix, LG Electronics, MagnaChip Semiconductor, Marvell, Maxim, MediaTek, Micron, MicroVision, National Semiconductor, NEC, Newport Media, Numonyx, Nvidia, Oki Semiconductor, OmniVision, Panasonic, Qualcomm, Ralink, Renesas Technology, RFMD, Samsung, Sandbridge Tech, Spreadtrum Communications, ST-Ericsson, STMicroelectronics, Synaptics, Telegent Systems, Texas Instruments, Toshiba, TriQuint, VIA Telecom, Wolfson Microelectronics.

CEA-Leti joins venture to develop III-V on silicon technologies

The French firm will use its IP and expertise in silicon, microelectronics and microsystems to expand the Alcatel-Lucent and Thales partnership in III-V Lab. The joint venture will target applications in telecoms, industrial control, environmental testing, defence, security and space.

Alcatel-Lucent Bell Labs, Thales and French firm CEA-Leti have announced that CEA-Leti has joined the III-V Lab in a move to strengthen the industrial research capabilities of the R&D centre.

Claiming to be Europe's most advanced in the field of III-V semiconductors, the new public-private partnership will combine III-V semiconductor and silicon technologies, opening up new research perspectives and dynamics. The enlarged III-V Lab will include more than 130 researchers, technicians, and doctoral candidates.

The new partnership leverages the respective expertise of the three players in silicon, microelectronics and heterogeneous integration, to bring specific benefits in the integration of the incomparable speed, power and optical capabilities of III-V components on silicon CMOS integrated circuits.

The partners also aim to develop smarter, smaller components with innovative features by heterogeneously integrating active III-V components (optical, microwave, high-power components) with silicon circuits and microsystems. The production of III-V components on silicon substrates and in silicon microelectronic manufacturing should also reduce costs.

CEA-Leti, a global research centre in micro- and nanotechnologies should reinforce the capabilities of the III-V Lab. Established in 2004 by Alcatel and Thales, the III-V Lab has already enabled the rapid development of a common platform for dual-use optoelectronic and microelectronic technology for markets addressed by the two groups such as telecom, space, defence and security.

CEA-Leti will significantly broaden the scope of

the lab's targeted applications by combining its IP and expertise in silicon, microelectronics and microsystems and in heterogeneous integration.

Focusing on practical applications for the combined potential of semiconductors and silicon, the III-V Lab will focus on four primary areas of research and markets. Firstly, in ntegrated photonic circuits that combine the active and passive functions of III-V and silicon for high-speed telecommunications and data transfer.

The JV will also focus on high-power and microwave GaN-based microelectronics to increase the power density, robustness, energy efficiency and compactness of telecommunication, avionics, satellite, defence, energy and transport systems.

A new generation of cost-effective, compact, ultra-sensitive, highly-selective gas sensors for use in security, industrial process control, and environmental monitoring will also be developed.

Finally, the collaboration will also study thermal and near-infrared imagery for security and defence applications. The lab will develop new types of detectors with increased resolution while reducing overall cost and speeding their adoption in the industrial-quality control, transportation and environmental markets.

"We really look forward to the new partnership with CEA-Leti as their excellence in silicon will bring some exciting collaboration opportunities for the III-V Lab," said Gee Rittenhouse, head of Research at Alcatel-Lucent Bell Labs. "III-V semiconductors have already made a strong impact in optical telecommunications, providing several innovative breakthroughs, and the integration in a silicon microelectronic platform is on our roadmap to further improve performance, cost and energy consumption."

"As the third partner in the III-V lab, Leti adds deep expertise and essential silicon capabilities to our existing strengths in III-V semiconductors, opening broader opportunities for innovation. Thales will be provided stronger competitive advantages through the III-V Lab, thanks to the early availability for system developments of new components with breakthrough performances." said Marko Erman, SVP Research & Technology at Thales. "Combining these complementary technologies is unique and working together with Leti, we will create a world leading centre for developing these advanced devices."

"This innovative joint venture is a unique model of partnership for joining competences, technologies and ambitions, and it will enable the partners to accomplish things they couldn't do alone," said Leti CEO Laurent Malier. "Each of us brings very specific and complementary expertise to our pursuit of common goals. Moreover, each partner can capitalise on the developments and transfer new technologies to our customers. The new III-V Lab will be a strong source of value creation".

III-V Lab is located south of Paris in what will become the heart of the Paris Sud Saclay project, a major science and technology park that will combine research organisations, universities, Grandes Ecoles and corporate facilities.

Oclaro Expands 40G Portfolio with Third Generation Coherent Solutions

The company has revealed its third generation PM-QPSK transponder and has brought to market a new 40G receiver and modulator designed for coherent modulation.

Oclaro, a provider of optical communications and laser solutions has revealed its third generation 40G PM-QPSK transponder, the MI 5000XM, featuring an integrated modulator, receiver and what it claims is the industry's first single-chip ASIC solution for enabling coherent detection.

The company also announced the sampling of a new coherent receiver and 40G PM-QPSK modulator that enable customers to build their own coherent-based transponders or line cards for delivering higher performance and longer reach in the fiber optic network. For more information, customers should visit Oclaro at this week's OFC/NFOEC show in its private customer suites located in booth #2156 and 2160.

There are three dominant 40G modulation

formats generally used in networks today: DPSK (Differential Phase-Shift Keying), DQPSK (Differential Quadrature Phase-Shift Keying), and PM-QPSK (Polarization-Multiplexed Quadrature Phase-Shift Keying). PM-QPSK coupled with coherent detection and digital signal processing provides a cost-effective way for optical signals to reach longer distances with compensation for large amounts of optical impairments such as chromatic dispersion and polarization mode dispersion.

The solution also provides a stepping stone to future 100G networks that will be based entirely on coherent detection. Oclaro is a volume shipper of 40G DPSK line side 300-pin transponders and claims to be the first company to deliver a coherent transponder solution incorporating the MUX, A/D and DSP functions in a single ASIC chip developed in partnership with ClariPhy Communications.

The company says it is well positioned to become the leading supplier for 100G deployments. Moving forward, Oclaro will continue to deliver products for all 40G modulation formats and will provide customers the flexibility of purchasing complete transponder solutions or individual components.

"The explosive growth of the Internet is driving an insatiable 'need for speed' in the core network — and this is where Oclaro is focused," said Andy Carter, Chief Technology Officer at Oclaro. "This third generation of 40G coherent solutions will allow service providers to deploy highly scalable and flexible future-proof architectures and this is just the next step towards delivering the 100G speeds that will be required in the future."

The Third Generation Coherent Transponder

Oclaro extends its family of "plug-and-play" transponder solutions, offering customers a rapid time to market with an optimised coherent solution. The MI 5000XM is claimed to deliver best in class OSNR performance, lowest power consumption and highest chromatic and polarization mode dispersion tolerance in the industry. The transponder is designed to work both in dispersion managed and un-managed solutions and can support distances up to 3000km without dispersion compensation. The MI 5000XM, part of the Oclaro plug-and play 40G portfolio, can be used directly on blades already designed for an Oclaro transponder module; it uses an industry standard i2c command-set and provides fully autonomous set-up and control.

Integrated 40G Receiver and Lithium Niobate Modulator

For companies that wish to build their own coherent transponders, Oclaro is now sampling a coherent receiver and the new Lithium Niobate PM40 modulator, which was based on the Oclaro PM100 modulator launched in September 2010 to support 100Gb/s optical network applications. Oclaro designed the Lithium Niobate PM40 on a less complex chip technology to deliver significantly lower product costs to the customer.

The Lithium Niobate PM40 modulator and 40G integrated receiver are sampling today to customers and general availability is planned for summer 2011. The MI 5000XM transponder will be sampling next month with general availability planned for the second half of 2011.

Infrared imaging specialist Sofradir appoints new VP of Technology

David Billon-Lanfrey will spearhead developments in infrared imaging to address evolving needs in military, space & commercial applications.

Sofradir, a developer and manufacturer of advanced infrared (IR) detectors for military, space and industrial applications has appointed David Billon-Lanfrey as VP of R&D, technology & products.

He is replacing Philippe Tribolet who died in November 2010 aged 51.

As the new head of the technology department at Sofradir, Billon-Lanfrey, 40, will oversee a team of 100 that includes world-class engineers in metallurgy, semiconductor materials, microelectronics, optoelectronics, micromechanics, cryogenics and other specialty areas in physics and chemistry.

These segments are all necessary for the development of infrared detectors that cover the entire spectrum from visible to VLWIR (very long wavelength infrared). His promotion from within the company ensures a smooth continuation of R&D

projects and product developments for customers underway.

"David is taking over the helm of our technological developments at a challenging time, when defence budgets are shrinking and the need to satisfy SWaP (reduce system size, weight and power) requirements for military applications is even more pronounced. He is also stepping into the shoes of Philippe Tribolet, a pioneer in infrared technologies, who was a dear colleague and friend," said Philippe Bensussan, chairman and CEO of Sofradir.

"We congratulate David on his new role. His expertise, knowledge and vision of infrared technologies will build upon our tradition of making best-in-class shortwave, midwave and longwave IR detectors and further advance our product portfolio."

Prior to Billon-Lanfrey's new role as VP of R&D, technology and products at Sofradir, he headed the R&D optronics characterisation team at the company for five years. He was responsible for expanding the team, its role and improving its expertise.

Before that, he served for 12 years as project manager for R&D and product development, where he contributed to developing the SADA II product for the US market. Billon-Lanfrey is a graduate of optronics at Joseph Fourier University in Grenoble, one of the leading health, science and technology universities in France.

"I am delighted to lead the formidable R&D and technological teams at Sofradir and the researchers at DEFIR, our joint lab with CEA/LETI," said David Billon-Lanfrey. "They have already introduced a huge number of innovations into our processes and products to the benefit of our customers today. And the ability to push the boundaries in performance of our IR detectors has yet to reach its limit due to the versatility of our Mercury Cadmium Telluride technology that can be used to produce IR detectors in every waveband. That puts us in a truly enviable position."

Sofradir has provided defence equipment manufacturers with innovative and advanced performance IR products for thermal imagers, missile seekers, and other surveillance, targeting and homing infrared equipment for nearly 25 years. It also develops high-grade IR detectors that are increasingly being used in equipment to observe the Earth and deep space, monitor the environment and climate change, and provide imaging data for weather satellites. The company delivered 27 flight models for space missions in 2010, a ten-fold increase over previous years.

CyOptics Introduces Receivers for 40 & and 100Gbps Coherent Systems

The compact PM-QPSK InP devices integrate two matched 90° optical hybrids, four high speed balanced detector pairs and four differential linear TIAs with manual and automatic gain control.

CyOptics, a manufacturer of Indium Phosphide (InP) optical chip and component technologies, has announced the availability of its 40Gbps and 100Gbps Polarisation-Multiplexed Quadrature Phase-Shift-Keying (PM-QPSK) Integrated Coherent Receivers.

For use in 40G and 100G coherent DWDM transmission systems, these optical receivers expand CyOptics' growing portfolio of component solutions leveraging monolithic and hybrid Photonic Integrated Circuits (PICs).

The RX-PMQPSK-40 (40Gbps) and RX-PMQPSK-100 (100Gbps) Coherent Receivers integrate two matched 90° optical hybrids, four high speed balanced detector pairs and four differential linear TIAs with manual and automatic gain control.

The very compact surface-mount package of 40mm length and less than 7mm height also integrates the polarisation splitters for signal and local oscillator. The receivers make use of CyOptics' extensive portfolio of high speed InP based balanced photo-detectors (PDs) and Silica Planar Lightguide Circuit (PLC) device technology for the 90° hybrid mixers.

They also leverage the firms' automated precision-robotic integration platform for mounting the balanced PDs directly onto the PLC chip to provide a highly integrated optical sub-assembly with high performance in a very small footprint. The Receivers adhere to the Optical Internetworking Forum Implementation Agreement.

"Our new 40G and 100G coherent Receivers address the needs for very compact component solutions of Transponder and line card manufacturers alike," said Stefan Rochus, VP of Marketing and Business Development at CyOptics. "CyOptics is uniquely positioned to combine all of the critical InP and PLC device technologies together with our automated high precision manufacturing platform to deliver a high performance and low cost coherent receiver solution."

CyOptics is ramping production for both the 40G and 100G receiver now and anticipates general availability in June 2011.

RF Electronics

RFMD revenues slump to $213.3 million

Apart from seasonality, the firm's financial results were adversely affected by declining revenue at RFMD's largest customer.

RF Micro Devices, a designer and manufacturer of high-performance radio frequency components and compound semiconductor technologies, has reported financial results for its fiscal 2011 fourth quarter, ended April 2, 2011.

RFMD's March 2011 quarterly revenue declined approximately 18% year-over-year and approximately 23% sequentially to $213.3 million, primarily as a result of seasonality and declining revenue at RFMD's largest customer. On a GAAP basis, gross margin equalled 35.4%, quarterly operating income totalled $13.2 million, and quarterly net income was $24.1 million, or $0.08 per diluted share.

During the quarter, RFMD generated approximately $31.4 million in free cash flow, retired $35.5 million principal amount of convertible debt and repurchased approximately 1.7 million shares of common stock.

RFMD Strategic Highlights:

* RFMD's PowerSmart power platforms recognized as the industry's most innovative device of 2011 by Compound Semiconductor magazine

* RFMD's Cellular Products Group (CPG) commenced volume production of new, higher margin 3G/4G solutions, including RFMD's PowerSmart power platforms and RFMD's RF724x family of ultra high efficiency 3G/4G PAs

* CPG secured multiple design wins for high-performance, silicon-based switches and switch filter modules across the world's leading smartphone and tablet manufacturers

* RFMD's Multi-Market Products Group (MPG) commenced production of new GaN-based products for high-power military radar and CATV applications

* MPG secured major design wins across multiple growth markets, including wireless infrastructure, Smart Energy, high-performance WiFi for smartphones and tablets, and point-to-point radio for cellular backhaul

Business Outlook:

RFMD expects June quarterly revenue to be flat to down 5% sequentially, as 8-12% growth in RFMD's core business is offset by declining sales of legacy products. The company expects to further diversify its revenue base, with its largest customer approaching 15% of revenue in the June 2011

quarter.

RFMD anticipates its transceiver products will be immaterial to financial results in the June 2011 quarter and thereafter and expects June quarterly gross margin to increase approximately 100 basis points, driven by continued customer diversification and improved product mix. The firm expects to return to sequential growth beginning in the September quarter.

Bob Bruggeworth, president and chief executive officer of RFMD, said, "RFMD's strategic restructuring, announced three years ago, is now complete and driving diversified growth opportunities for RFMD. Sales in our Multi-Market Products Group grew by more than 30% in fiscal 2011 over fiscal 2010 and in our Cellular Products Group sales to customers outside our largest customer grew by more than 50% during the same period. In the June quarter we anticipate transceiver products will be immaterial to financial results and we expect to achieve our most diverse quarter of customer mix in RFMD's history as a public company."

"Looking forward, we expect RFMD will take full advantage of global secular growth trends and grow faster than our core markets. This will enable broad improvement in our financials, supporting margin expansion, operating leverage, earnings growth, continued strong free cash flow, and superior return on invested capital," he continued.

Dean Priddy, CFO and vice president of administration of RFMD, said, "RFMD is executing on its growth strategy. Revenue in our core business, which excludes transceiver revenue, is expected to grow approximately 8-12% sequentially in the June quarter, driven by exciting new product cycles and technologies. This should drive gross margin expansion beginning in the June quarter.

"With all major growth drivers intact, we have the confidence to actively put RFMD's superior free cash flow to use. During the March quarter, we repurchased approximately 1.7 million shares of common stock and retired $35.5 million principal amount of convertible debt due in 2012. In addition to the ongoing optimisation of our capital structure, RFMD will continue investing in the R&D and customer-facing resources necessary to outpace the growth rate in our markets."

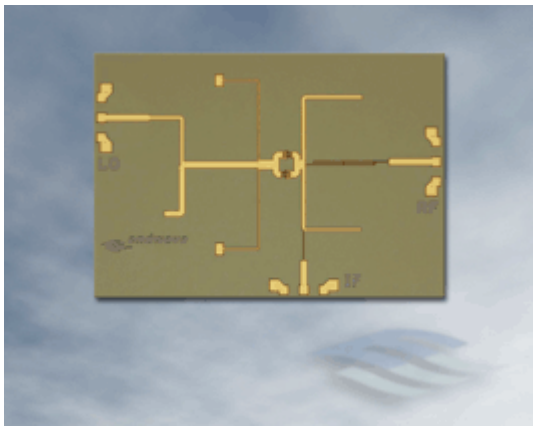
RFMDconducted a conference call discussing the recent results and business outlook. A telephone playback of the conference call is available by dialling 303-590-3030 and using pass code 4432787#.

Endwave unleashes sub-harmonically pumped mixer MMIC

Performing between 67 and 97 GHz, the mixer is suited for use in communications system in order to eliminate the unwanted effects of LO self-mixing, which occurs in many fundamental frequency mixers.

Endwave Corporation, a provider of high-frequency RF MMIC devices and integrated subsystems, has released a new sub-harmonically pumped mixer (2 x LO) MMIC.

Designed and manufactured in cooperation with WIN Semiconductor Corporation's 0.1 µm PHEMT process development, model EWM9002ZZ offers a broadband frequency performance of 67 - 97 GHz with LO to RF isolation of over 30 dB and a conversion loss of 12 dB.



The device, which can be used both as an upconverter or downconverter, also delivers RF return loss at better than 10 dB, LO drive level of +15 dBm, and is highly repeatable.

Subharmonic mixers are often used in communications system in order to eliminate the unwanted effects of LO self-mixing, which occurs in

many fundamental frequency mixers. EWM9002ZZ has the advantage of high RF to LO isolation and LO noise cancellation across a very broad frequency band.

The device utilises anti-parallel connected PHEMT diode pairs to mix the second harmonic of a fixed-frequency LO with the input signal, and is well suited for E-band point to point microwave radio applications, W-band defence electronics and commercial communications systems.

Endwave also offers key products for the LO chains, such as our EWX4201 multiplier and EWP4102ZZ driver amplifier.

Each die is visually inspected to Mil-STD-2010. The mechanical measurements of the die are 1.815 x 1.295 x 0.05 mm.

Bare die prices at 1000 pieces are $45.00. Delivery is available directly from Endwave.

Hittite releases compact tuneable filters covering 4 to 19 GHz

The band-pass MMIC filters are ideal for pre-selection in multi-band communication systems, wideband radar, and in test and measurement equipment.

Hittite Microwave Corporation, a supplier of complete MMIC based solutions for communication & military markets has introduced three new SMT packaged MMIC Band-Pass Tuneable Filters.

These are ideal for pre-selection in multi-band communication systems, wideband radar, and in test and measurement equipment. Tuneable over a 4.0 GHz to 19.0 GHz frequency range, these three new, ultra-compact, varactor-tuned, MMIC filters are inherently stable and their small physical size and insensitivity to environmental conditions provide a superior alternative to competing resonant cavity and MEMS solutions.

The HMC892LP5E, HMC893LP5E and the HMC897LP4E are tuneable band-pass filters with two independent voltage controls for adjustment of passband frequency and bandwidth.

The HMC892LP5E filter centre frequency is adjustable from 4.0 GHz to 7.7 GHz while the HMC893LP5E and HMC897LP4E filter centre frequency is adjustable over an octave bandwidth of 4.8 to 9.5 GHz, and 9.0 to 19.0 GHz, respectively.

Pass-bandwidth for the HMC892LP5E and HMC893LP5E is adjustable to ±3% of filter centre frequency. Return loss for the HMC892LP5E, HMC893LP5E and the HMC897LP4E is better than 10 dB across the operating frequency and the wideband rejection is at least 30 dB out to 40 GHz.

The HMC892LP5E and the HMC893LP5E are available in compact, RoHS compliant 5 x 5 mm QFN SMT plastic packages and are specified for operation from -40 °C to +85 °C.

The HMC897LP4E is available in a compact, RoHS compliant 4 x 4 mm QFN SMT plastic package. Samples and evaluation PC boards for all SMT packaged products are available from stock and can be ordered via the company's e-commerce site or via direct purchase order.

Skyworks releases positive annual sustainability report

The firm has also joined the EICC, an alliance of leading electronics companies working to improve environmental and working conditions throughout the information and communication technologies supply chain.

Skyworks Solutions, an innovator of high reliability analogue and mixed signal semiconductors enabling a broad range of end markets, has released its 2010 Sustainability Report, a voluntary non-financial public document that addresses the company's commitment to sustainable business practices.

The report highlights annual improvements and provides an overview of the company's initiatives in multiple areas, from its environmental efforts and labour practices, to its health and safety programs, ethics policies and stewardship activities.

In 2010, Skyworks improved energy efficiency by 28 %, water efficiency by 19 % and hazardous waste efficiency by 13 % when compared to 2009. Virtually 100 % of Skyworks' products sold were Restriction of Hazardous Substances (RoHS)-compliant and more than 70 % of these exceeded regulatory requirements for voluntary halogen-free industry standards.

Skyworks has also recently joined the Electronics Industry Citizenship Coalition (EICC), an alliance of leading electronics companies working to improve environmental and working conditions throughout the information and communication technologies supply chain. Skyworks has long aligned its sustainability efforts to the EICC's Code of Conduct, which establishes guidelines for performance and compliance across a broad range of areas.

Membership in the Coalition allows Skyworks the opportunity to take its commitment to the next level - participation in the further development and implementation of standardised programs and tools to aid the industry in its efforts towards sustainability.

"Skyworks recognises that smart, sustainable business practices make good business sense," said Bruce J. Freyman, senior vice president of worldwide operations at Skyworks. "We are proud of our efforts and look forward to making further sustainability improvements within our own programs and supply chain and through our participation with the EICC."

TriQuint's achievements are hard to beat

The RF solutions supplier and technology innovator has been recognised for its innovation and popularity with awards and nominations.

TriQuint Semiconductor, has announced its focus on innovative technology and brand influence has been recognised by industry leading magazines for its impact and success.

The international recognition comes from Compound Semiconductor Magazine in Europe, EE Times Magazine in North America and China Electronic News in China.

Research and Development- Presented March 22, 2011 at the CS Europe Conference in Frankfurt, Germany, the 2011 CS Industry Awards recognise success and development along the entire value chain of the Compound Semiconductor industry from research to completed devices, focusing on the people, processes and products that drive the industry forward. TriQuint earned the R&D award for its leadership driving a team to create highly-evolved, high power GaN devices operating in the 300-500 GHz range.

"The CS Industry Awards recognise the vision and contributions of compound semiconductor companies across the industry. Recipients like TriQuint Semiconductor are enabling global manufacturers to realize the potential of 3G and 4G wireless technology," said Stephen Whitehurst, Chief Operating Officer, CS Europe.

"TriQuint has been a gallium nitride pioneer since 1999 and continues to lead through its work in support of DARPA's 'NEXT' GaN* program that is setting new performance benchmarks for advanced, high power microwave circuits. It's therefore so appropriate that TriQuint would be one of our inaugural recipients," he concluded.

Most Popular Semiconductor Brand– Presented March 16, 2011 at the Conference on Green Manufacturing in Shanghai, China, The China Electronic News (CEN) Award nominees are compiled by the editors of the magazine and voted on by readers. For the second consecutive year, TriQuint was named a top ten "Most Popular

Semiconductor Brand in China" in recognition of its sales revenue, product performance and service, localisation efforts in China as well as brand recognition and influence.

China Electronics News published the list to recognise outstanding multinational companies in the China semiconductor market. CEN's Vice President, Yun Zhu Di, commented "TriQuint's CAGR from 2005 to 2010 was 70% and they achieved a new revenue milestone of US$150 million. TriQuint is a deserving recipient of this award. We look forward to seeing TriQuint's ongoing commitment and investment to further develop the market and to their future achievements in China."

Company of the Year Finalist– Announced March 14, 2011, The EE Times Annual Creativity in Electronics (ACE) Awards celebrate the creators of technology who demonstrate leadership and innovation in the global industry and shape the world we live in. TriQuint is named a finalist in the "Company of the Year" category by the editors of EE Times Magazine. Winners will be announced at the seventh annual EE Times ACE Awards recognition event on May 3, 2011 in San Jose, California.

"We are laser-focused on delivering products that improve the performance and lower the cost of our customers' applications, and are truly honoured that our commitment to innovation, product quality, and customer service is being recognised internationally by the industry," said Ralph Quinsey, CEO and President of TriQuint Semiconductor.

TriQuint wins "Best Global Partner" award for 4th year on the trot

The company has been awarded by ZTE with this annual award for its quality, delivery, cost and service performance during 2010.

TriQuint Semiconductor, a developer and supplier of RF products has received ZTE Corporation's "Supplier of the Year" award for 2010.

ZTE is a leading Chinese manufacturer of wireless communication system equipment and annually recognises top suppliers who exhibit superior quality, delivery, cost and service performance. TriQuint has achieved top supplier recognition for the fourth consecutive year and is ZTE's largest provider of power amplifiers for mobile devices.

Zeng Zhaoxiang, Vice General Manager of ZTE Kang Xun, said, "TriQuint is the leading GaAs semiconductor manufacturer in the world and the largest strategic partner to ZTE for mobile phone power amplifiers. We've developed a solid partnership throughout the years with close alignment between top management. Again in 2010, TriQuint exhibited good Quality, Delivery, Cost and Service Performance (QDCS) with outstanding technical support and service. ZTE appreciates TriQuint's strong support of many of ZTE's projects."

"TriQuint has experienced tremendous growth over the past three years in part because of strong relationships with key customers such as ZTE. We pride ourselves on working closely with our customers to deliver innovative radio frequency solutions that lower the cost and improve the performance of our customers' applications. We are honoured to accept this award from ZTE and look forward to continuing a mutually prosperous relationship for years to come," said Tim Dunn, Vice President Mobile Devices at TriQuint.

TriQuint supplies a variety of radio frequency solutions to ZTE, including power amplifiers, SAW filters, and multi-function integrated modules for all wireless communication standards, including GSM/GPRS, EDGE, CDMA, WCDMA and TD-SCDMA.

Goodrich wins U-2 multi-spectral sensor upgrade contract

These upgrades will add multi-spectral imaging capability to the U-2 platform, providing significantly more utility in imagery for use in defence applications.

Goodrich Corporation has been awarded a contract to deliver two upgraded Senior Year Electro-Optical Reconnaissance Sensors (SYERS) to the United States Air Force (USAF) for use on the U-2

platform.

These upgrades, known as SYERS-2A, will enhance the U-2 functionality by adding extra multi-spectral imaging capability to the platform, providing significantly more utility in discerning imagery.

Multi-spectral sensors capture images at specific frequencies across the electromagnetic spectrum. These images can be used for threat analysis on the ground and on buildings, by detecting and showing changes not readily apparent to the human eye.

“The U-2 sensor upgrade will provide the USAF with further multi-spectral capability, fully supported by Goodrich,” said Andrew Chrostowski, Vice President, Goodrich’s Intelligence Surveillance and Reconnaissance (ISR) Systems business.

The SYERS sensor flown on the U-2 ISR platform operated by the 9th Reconnaissance Wing is manufactured at the Goodrich ISR Systems location in Chelmsford, Massachusetts.

RFMD awarded for most innovative CS device in industry

Compound Semiconductor magazine has awarded RFMD for its PowerSmart power platforms. These devices feature an RF configurable power which deliver multiband, multi-mode coverage of all cellular communications modulation schemes up to 4G LTE 64QAM.

RF Micro Devices has been awarded by Compound Semiconductor magazine for its PowerSmart power platform (RFRD6460) as the compound semiconductor industry’s most innovative device of 2011.

The award was presented on March 22, 2011, by Compound Semiconductor magazine during the 2011 CS Industry Awards in Frankfurt, Germany.

RFMD’s revolutionary PowerSmart power platforms feature an RF configurable power core that delivers multiband, multi-mode coverage of all cellular communications modulation schemes, up to 4G LTE 64QAM. PowerSmart power platforms also include all necessary switching and signal conditioning functionality in a compact reference design, providing leading device manufacturers a single scalable source for the entire cellular front end.

The PowerSmart power platforms enable designers of smartphones and tablets to eliminate months of development time and cover broader segments of the market with a single design, while saving considerably on size, current consumption and R&D cost, versus competitive offerings.

Bob Bruggeworth, president and CEO of RFMD, said, “We are extremely pleased that Compound Semiconductor magazine has recognised RFMD’s PowerSmart as the compound semiconductor industry’s most innovative device of 2011. RFMD is sharply focused on expanding our leadership in compound semiconductors into multiple markets, and we believe PowerSmart is at the forefront of a technology shift to converged front ends in multi-mode, multiband smartphones.

“In addition to our GaAs-based PowerSmart technology, RFMD’s efforts in GaAs-based concentrated photovoltaics and GaN-based high power amplifiers are serving to extend the role of compound semiconductors in the world’s fastest growing markets.”

“Compound Semiconductor is proud of the CS Industry Awards and the overwhelming response from the compound semiconductor industry,” said Richard Stevenson, Editor. “We feel it is important to highlight the technological achievements within the industry, such as RFMD’s PowerSmart. These categories and products represent key areas of innovation in the chip manufacturing process.”

RFMD recently commenced volume production shipments of the RFRD6460 PowerSmart power platform in support of the Samsung Galaxy S 2 family of 3G/4G smartphones and tablets and the LG Optimus 3D. The Company has a strong intellectual property position in support of PowerSmart, with multiple patent applications in process.

Microelectronics segment of CS industry flattening

Strategy Analytics says although RFMD and Skyworks have reported decreasing quarterly revenue growth, results from some CS wafer suppliers were very strong, boding well for growth throughout 2011.

After a strong rebound in the first part of 2010, Strategy Analytics finds revenue growth in the microelectronics segment of the compound semiconductor industry flattened in the final quarter.

The firm's latest report, "Compound Semiconductor Industry Review January 2011: Microelectronics," captures product, financial, contract and technology announcements for microelectronic companies such as RFMD, Skyworks, Hittite Microwave, Anadigics, Freescale Semiconductor, Microsemi and Cree for January 2010.

"Overall, the compound semiconductor industry rebounded strongly in 2010, thus slowing growth at some of the major suppliers in the fourth quarter should not be viewed with concern," noted Eric Higham, Director of the Strategy Analytics GaAs and Compound Semiconductor Technologies Service. "The January announcements show significant product development activity that will serve to strengthen growth in 2011."

Asif Anwar, Director in the Strategy Analytics Strategic Technologies Practice, added, "Results from some of the wafer suppliers were very strong and this also bodes well for growth throughout 2011."

This viewpoint summarises January 2011 financial, product, contract and employment developments from major GaAs and silicon suppliers addressing a variety of commercial and military applications using GaAs, GaN, SiC, and complementary metal-oxide-semiconductor (CMOS) technologies.

Emcore introduces 1MHz to 40GHz fibre optic transport

The development should allow operators, systems integrators and OEMs to deploy a single platform to handle all of their optical transport needs over the industry's widest frequency range.

Emcore Corporation, a provider of compound semiconductor-based components, subsystems and systems for the fibre optics and solar power markets, has expanded its Optiva Platform to support analogue fibre optic signal transmission from 1 MHz to 40 GHz.

Optiva is a modular, plug-in card-based system for transporting a wide range of video, audio and data signals over fibre optic cable. Emcore recently announced new capabilities for the Optiva Platform, including fibre optic links for frequency references from 1 MHz to 100 MHz, IRIG/1PPS, IF, L-Band, S-Band, C-Band, X-Band, Ku-Band, Ka-band and Ultra-Wideband (50 MHz - 40 GHz).

The addition of satellite RF and analogue microwave signals allows integrators to leverage the total capabilities of Optiva, while also realising a significant cost savings over installing multiple single purpose products.

Emcore is also introducing a new fan-cooled Optiva chassis in a 19" 3U rack mount enclosure, with industry leading plug-in module density, supporting 16 hot-swappable modules and dual redundant power supplies. Optiva products support the industry-standard SNMP Ethernet interface, enabling simple integration into existing monitoring and control systems.

"The introduction of these new fibre optic transport modules allows customers to further leverage the versatility and cost-effectiveness of the SNMP-managed Optiva Platform. This, in turn, allows operators, systems integrators and OEMs to deploy a single platform to handle all of their optical transport needs over the industry's widest frequency range," said Ron Logan, Emcore's Vice President of Photonic Systems. "Leveraging Emcore's unique RF photonic wafer-fab and vertical integration, Optiva enables a low-cost, high-performance fibre-optic solution for Satcom earth stations," he added.

Accel-RF ships reliability test systems to customers in Asia

The two systems were shipped to both government research and commercial entities and will be instrumental in the development of compound semiconductor device performance characterisation in Asia.

Accel-RF Corporation, a provider of turn-key RF reliability testing systems for compound semiconductor devices, has shipped and installed two advanced semiconductor reliability test systems to customers in Asia.

The systems were delivered in Q4 of 2010 with installation completed in early January 2011. Shipped to both government research and commercial entities, these systems will be instrumental in the development of compound semiconductor device performance characterisation in Asia.

"Following our successful entry into the European Union last year, Accel-RF is excited to begin distributing our products to customers in Asia," says Roland Shaw, President and Founder of Accel-RF. "It is exciting for us at Accel-RF to be part of the advancement and evolution of reliable RF/microwave compound semiconductors worldwide," adds Shaw.

Service and first-line hardware support of these systems will be performed by Amtechs Corporation in Japan and SE Technologies in Taiwan. "As a manufacturer of advanced test instruments, Accel-RF's technical staff will always be partnered with our customers." Shaw continues, "Our distributors in Asia for sales, service, and first-line support have a track record of extraordinary support with our market-space and their technical expertise is exceptional."

Accel-RF has been selling RF Reliability Test Systems in the US since 2004. After successful expansion to Europe in 2009, successful penetration in Asia is a testament to market acceptance and compelling value. "Global expansion for complex equipment like ours has to be done carefully and with individual attention," adds Shaw, "I am proud to say that even with this major expansion effort we have maintained a very close relationship with all of our customers."

Lasers

James Coleman honoured with SPIE Technology Achievement Award

He helped to develop a new class of laser for optical fibre pumps using strained compound semiconductors, resulting in a worldwide expansion of fibre optic systems.

James J. Coleman from the University of Illinois at Urbana-Champaign, USA, is the 2011 recipient of the SPIE Technology Achievement Award.

He was recognised for his seminal contributions to the methods, designs, and demonstrations of selectively grown discrete and monolithically integrated compound semiconductor lasers and photonic devices.

"I am very familiar with the large body of truly innovative and world-class research that Professor Coleman has produced," said Joe C. Campbell, Lucien Carr Professor of Electrical and Computer Engineering at the University of Virginia.

"His work to demonstrate the use of strained layer materials in a new class of semiconductor lasers for optical fibre pumps resulted in a worldwide expansion of fibre optic systems owing to the use of fibre amplifiers. It is hard to fully describe the impact of these events on the communications technology, (and) Professor Coleman's role in these events was essential and pivotal," he concluded.

Coleman is a member of SPIE, and is a long-time contributor to several SPIE conferences. He served as a conference program committee member for the Active and Passive Optical Components for Communications conference for seven years.

The SPIE Technology Achievement Award is given annually to recognise outstanding technical

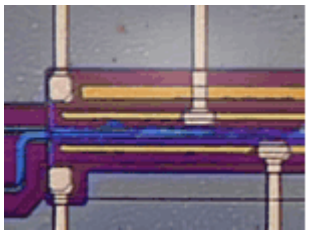
accomplishment in optics, electro-optics, photonic engineering, or imaging. The recipient(s) shall have contributed significantly to the advancement of one or more of these areas with specific demonstration(s) or application(s). An honorarium of $2,000 will be presented.

ODIS' new laser is a work of art

The VCSEL uses the firm's POET technology which unites both electronic and optical elements onto a single chip.

OPEL Solar International says its U.S. affiliate company, OPEL Defence Integrated Systems ("ODIS") has demonstrated laser operation for the first time in a new integrated device as part of its Planar Optoelectronic Technology ("POET") process.

POET creates high-performance devices by fusing light and electronics together on a single chip. Specifically, POET is a semiconductor-manufacturing technology that enables the monolithic fabrication of integrated circuit (IC) chips containing both electronic and optical elements.



By offering components with dramatically lowered cost, together with increased speed, density, and reliability, POET could potentially allow ODIS to fundamentally alter the landscape for a broad range of applications, such as tablet computers and smartphones.

Based on a proprietary Group III-V materials structure, the pulsed VCSEL operates at 980nm with a 12μm diameter vertical cavity surface and an output power of 1.7mW. In tandem with ODIS' previously-announced integrated detector - an HFET device - the laser enables inter-circuit optical connections between electronic devices for on-chip applications.

"This has proven, for the first time, an end-to-end technology for on-chip integration of photonic circuits can manipulate light signals on the same semiconductor framework as electronic signals," noted Leon M. Pierhal, CEO of OPEL. "This technology has the potential to overcome the constraints of copper interconnects in silicon-based chips, and it further validates the years of development invested in ODIS, as reflected in the potential market applications for POET technology, as well as its overall importance to our stakeholders."

Pierhal continued, "Let us keep in mind that this is the baseline laser that will serve as the foundation device from which greater enhancements are projected and in the process of development."

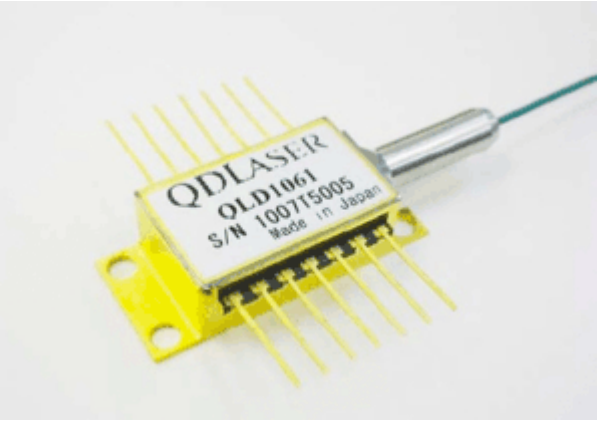
ODIS has also proven a number of other optoelectronic devices, including HFETs, optical thyristors, oscillators, and super-radiant light emitting devices, all able to be monolithically fabricated via the POET process. These devices are currently being validated for scale-up by a third-party fabrication facility.

The POET platform is also the basis for other ODIS projects, under various governmental agency grants, to provide next-generation optoelectronic devices. These include optical code division multiple access devices for avionics systems, combined RF/optical phased arrays, optoelectronic directional couplers, and ultra-low-power RAM.

QD Laser commercialises 1064-nm DFB Laser

The Japanese firm says its latest module exhibits excellent single-mode oscillation and is suited to a variety of applications in CW or pulsed operations.

QD Laser is commercially releasing its latest technology innovation, the QLD1061, a single-mode distributed feedback (DFB) laser module emitting at a wavelength of around 1064 nm.



Recently, semiconductor lasers with near-infrared (NIR) wavelength band of around 1064 nm have been very popular in many applications including fibre lasers for material processing, LIDAR, frequency conversion for generating exotic wavelengths and gas sensing. To expand the application area, single-mode lasers with stable operation have been highly required.

The QLD1061 offers strong fibre output power (> 30 mW) and narrow spectral linewidth (< 10 MHz) with stable single-mode oscillation The DFB laser chip is packaged in a standard 14-pin butterfly laser module with an optical isolator. The module has an output pigtail using a polarization maintaining fibre.

The design of the laser chip in the QLD1061 is based on DFB laser technology usually used in telecom applications, where quite high wavelength stability is required. Reliable packaging including a built-in optical isolator also contributes to the stability. In continuous-wave (CW) operation, the QLD1061 provides high side mode suppression ratio (SMSR) even when changing the output power in a wide range of operating temperatures.

In pulsed operation, a stable short pulse train between 50 ps and 100 ns is generated with low amplitude noise and low timing jitter maintaining high SMSR. These characteristics of the QLD1061 are different from conventional wavelength-stabilised lasers such as a fibre grating based external cavity laser.

From the evaluations of prototypes of the QLD1061 by global innovative companies, QD Laser says it has received many positive responses. The QLD1061 is very suitable for variety of applications in CW or pulsed operation, for example, an injection seeder of a fibre laser and a wavelength sweeper for sensing.

QD Laser hopes the QLD1061 will contribute to a performance improvement and market expansion of many systems with NIR wavelength range semiconductor lasers.

QD Laser will exhibit the QLD1061 on :

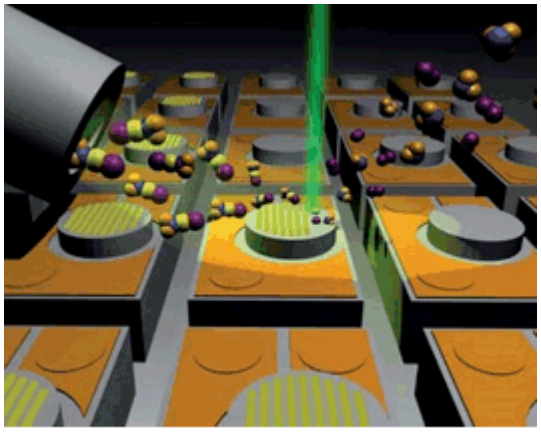
May 23–26, 2011 LASER World of PHOTONICS, Munich, Germany (Booth # B1-310)

Electron beams stabilise polarisation in VCSELs

Empa researchers used an electron microscope to stabilise the polarisation of light emitted by a vertical cavity surface emitting laser (VCSEL) thereby improving its operation.

Electron microscopes use focussed electron beams to make extremely small objects visible. By combining the instrument with a gas-injection system material samples can be manipulated and surface structures measuring only nanometres across can be “written”.

Now, Empa researchers, together with scientists from EPFL have used this method to improve lasers.



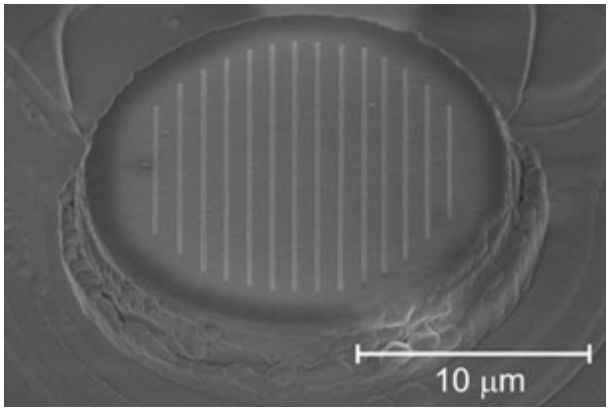
The principle of the local deposition process which is induced with a focussed electron beam (FEBIP) involves molecules from a gas-injection system being deposited on the sample surface in a reversible manner. The focussed electron beam dissociates adsorbed gas molecules. The resulting

non-volatile compounds remain permanently on the sample.

The VCSEL is a semiconductor laser which is often used in data transmission for short-distance links like Gigabit Ethernet. With upper and lower Distributed Bragg Reflectors (DBRs), they are based on III-V semiconductors and commonly include GaAs and AlGaAs.

These lasers are very popular in telecommunications because they consume little energy and can be simply fabricated in volumes of many tens of thousands on a single wafer.

However, VCSELs can exhibit a particular weakness. Because of the cylindrical structure in which the lasers are built up on the wafer, the polarisation of the emitted light can sometimes change during operation. Polarisation is a property of certain waves, such as light waves, and it describes the direction of oscillation. A stable polarisation is necessary in order to reduce transmission errors and to use VCSELs in future silicon photonics.



SEM micrograph of a polarisation grating on a VCSEL (vertical cavity surface emitting laser).

The team led by Empa researcher Ivo Utke, together with scientists from the Laboratory of Physics of Nanostructures at EPFL, have used a method called FEBIP (focussed electron beam induced processing) to stabilise polarisation.

"We've written flat grating structures on the VCSELs with an electron beam," says Utke in describing their solution, "and the gratings were effective in stabilising the polarisation."

Small, minimally invasive, direct FEBIP is suitable for prototyping nanocomponents, in order to solve specific questions and problems in applied nanoelectronics, nanophotonics and nanobiology. Suitable gas molecules are injected close to a sample which is already in the microscope's vacuum chamber. These adsorb on the sample in a reversible manner.

The focussed electron beam, which normally serves to make objects visible, now instead induces chemical reactions of the adsorbed gas molecules, but only at the spot where the beam strikes the surface. The resulting non-volatile molecular fragments then remain permanently on the sample while the volatile fragments are removed by the vacuum system.

"With the help of a precisely positioned electron beam, it's possible to remove or apply surface structures with nanometre precision and in virtually any desired three-dimensional shapes," explains Utke. "FEBIP could soon become a true nanofabrication platform for rapid prototyping of nanostructures in a minimally invasive way, without necessitating the large investment of a clean room."

This research has recently been published in the paper "Polarisation stabilisation of vertical cavity surface emitting lasers by minimally invasive focused electron beam triggered chemistry" by Utke *et al* in*Nanoscale*, as an advanced online publication. DOI: 10.1039/C1NR10047E.

NIST/JILA physicist wins award for contributions to laser technology

Two of recipient Steven Cundiff's contributions include the development of the "dark pulse" laser and a GaAs-based terahertz radiation laser.

Steven Cundiff, a physicist at the National Institute of Standards and Technology (NIST), has received the 2011 William F. Meggers Award from the Optical Society of America (OSA).

The Meggers Award recognises outstanding work in spectroscopy, the study and measurement of interactions between light and matter. Meggers was

a prominent scientist who worked at NIST (then called the National Bureau of Standards) from 1914 to 1958 and is considered by many to be the founder of the American field of spectroscopy.

Cundiff, a Fellow of JILA, a joint institute of NIST and the University of Colorado Boulder, is cited for "contributions to the field of ultrafast spectroscopy of semiconductors, including multidimensional Fourier transform techniques, and for contributions to the development of femtosecond frequency comb technology."

In previous studies he was involved in, samples made of thin layers of GaAs were hit with a continuous series of three near-infrared laser pulses lasting just 100 femtoseconds each. Trillions of excitons (excited electrons and the "holes" they left behind) were formed as they jumped to higher-energy vibration patterns.

The researchers identified a subtle coupling between pairs of excitons with different energy levels. The experimental data matched advanced theoretical calculations of the electronic properties of semiconductors, confirming the importance of the collective exciton behaviour—and dramatically demonstrated the superiority of those calculations over simpler models of semiconductor behaviour.

Cundiff was also key to the development of the "dark pulse" laser, which contrary to a typical pulsed laser, excels at not producing light. This type of laser, made of III-V quantum dots, is envisioned as a tool for benign communications and measurements based on infrared light frequencies. The laser's ultrashort pulses span just 90 picoseconds (trillionths of a second), making the device suitable for measurements on short timescales. Dark pulses might be useful in signal processing because, unlike bright pulses, they generally propagate without distortion.

Cundiff also helped to develop a GaAs-based terahertz radiation laser that is unusually efficient and less prone to damage than similar systems. The technology might be useful in applications such as detecting trace gases or imaging weapons in security screening and can be used to detect many substances that have unique absorption characteristics at these wavelengths.

U-L-M releases VCSEL and PIN products for 16G Fibres

With this development, U-L-M aims to meet the roadmaps of optical data communication standards, especially addressing FDR Infiniband and 16 Gbps Fibre channel.

U-L-M Photonics, a subsidiary of Philips, has released a new product family for the upcoming generation of Datacom solutions. These include 14 Gbps VCSEL and PIN products supporting a variety of array configurations.

The datarate of this new product family exceeds the current 10 Gbps speed limit, which has been present in the industry for nearly 10 years. With this development, U-L-M aims to meet the roadmaps of optical data communication standards, especially addressing FDR Infiniband and 16 Gbps Fibre channel.

The firm's14 Gbps solution, has low power consumption. The increase in bandwidth is achieved at low operating current densities, comparable to the firm's 10 Gbps platform, which addresses both the tight power budget as well as stringent reliability requirements.

"The release of the 14 Gbps products affirms U-L-M Photonics' world leading technical compentence in VCSEL industry as well as our strategic ambition to support the roadmaps of our valued customers as a dedicated component supplier", said Martin Grabherr, General Manager of U-L-M Photonics. "We understand the need of our customers across the world, and U-L-M Photonics is working on the consecutive steps already".

Qualification lots will be available in July 2011.

Fast 850nm VCSEL could revolutionise data communications

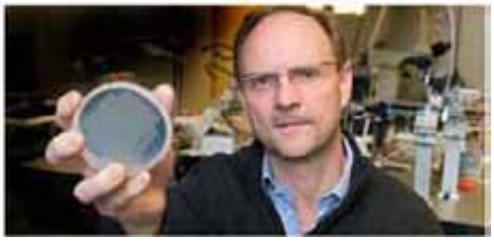
Researchers hope their development will see the power consumption of a complete optical link, between circuits in a computer (including drive electronics and receiver) will be no more than 100

fJ/bit.

Researchers at Chalmers have shown that a surface emitting laser, a cheaper and more energy-efficient type of laser for fibre optics than conventional lasers, can deliver error-free data at a record speed of 40 Gbit/s.

The break-through could lead to faster Internet traffic, computers and mobile phones.

Today's commercial lasers can send up to 10 Gb of data per second (Gbit/s) through optical fibres. This applies to both conventional lasers and to surface emitting lasers. Researchers at Chalmers University of Technology have managed to increase the speed of the surface emitting laser four times, and see potential for further capacity increase.



Up to 100 000 lasers can be fabricated and tested before we cut the wafer into chips, says Anders Larsson. PHOTO: J-O Yxell

This research will create great opportunities, not only for different types of local networks and supercomputers, but also for consumer electronics. By using multiple (parallel) channels computer cables with a total capacity of several hundred Gbit/s can be constructed.

"The market for this technology is gigantic. In the huge data centres that handle the Internet there are today over one hundred million surface emitting lasers. That figure is expected to increase a hundredfold," says Anders Larsson, who has developed the high speed laser together with his research group in optoelectronics.

Unlike a conventional laser the light from a surface emitting laser is emitted from the surface of the laser chip (not from the edge), like in an LED. The gain is the ability to not only fabricate, but also test, the lasers on the wafer (a 75 mm wide substrate of semiconductor material of industrial type) before it is cut into individual chips for assembly.

The lasers work directly where they sit on the wafer. Conventional lasers work only after partition. The ability to test up to 100 000 lasers on a wafer reduces the cost of production to one tenth compared with conventional lasers.

The laser volume is smaller. It requires less power without losing speed. The energy and power consumption is a tenth of what a conventional laser requires at 40 Gbit/s – only a few hundred fJ/bit. If Anders Larsson and co-workers succeed in their development he expects that the power consumption of a complete optical link, between eg circuits in a computer (including drive electronics and receiver) will be no more than 100 fJ/bit.

"The laser's unique design makes it cheap to produce, while it transmits data at high rates with low power consumption," Larsson sums up.

The combination is unique, and opens up to a large-scale transition from electrical cables to optical cables in computers, and to side equipment, as a substitute for USB cables, for instance. Electric wires can handle up to a few Gbit/s. One can easily imagine dramatic performance gains in mobile phones and other electronics ahead. Most imminent are applications in supercomputers and the type of large data centres run by Google, eBay and Amazon.

"Here we are heading for a power catastrophe. The data centres represent a few percents of America's entire electricity consumption," continues Larsson.

The next step for the Chalmers researchers is to modify the design and refine the ways to control the laser, to increase speed and reduce power consumption even further.

"We strive to meet market demands ten years from now," says Larsson, who estimates that we by 2020 will need energy-efficient cables that can handle 100 Gbit/s per channel.

The research is performed at the Chalmers research centre FORCE. It is funded by Swedish Foundation for Strategic Research, SSF, and by the EU through the project VISIT. Participating companies in the European project are IQE Europe (UK), VI Systems (Germany) and Intel (Ireland). Informal partners in the project are Tyco Electronics

and Ericsson (both Sweden). The findings are published in Electronics Letters from IEEE Explore.

Further details of this research are described in the paper "*40 Gbit/s error-free operation of oxide-confined 850 nm VCSEL"* by P. Westbergh *et al,* Electron. Lett, 2010, vol. 46, no. 14, pp. 1014-1016.

Finisar purchases Aixtron MOCVD tool for VCSEL production

The AIX 2800G4-R MOCVD system will be used for next generation production of vertical cavity surface emitting lasers (VCSELs)

Aixtron SE today announced a new order for an MOCVD reactor from Finisar Corporation.

Finisar is engaged in the manufacture of fibre optic subsystems and components for communication applications.

The Sunnyvale, California based company placed the order for one AIX 2800G4-R MOCVD system. Following delivery in the second quarter of 2011, it will be used for the production of VCSEL devices. The local Aixtron support team will commission the new reactor by working with Finisar engineers in their Allen, TX facility.

Curt Barratt, General Manager of Finisar Allen, comments, "Finisar is seeing great demand for its VCSEL products. We have just completed an exhaustive search for the equipment set that will not only fulfil our current product demand, but also manufacture our next generation products. The AIX 2800 G4-R system meets these requirements and will be a valuable addition to our manufacturing capabilities."

With over 20 years of experience, Finisar is a global provider of optical communications subsystems and components that enable high-speed voice, video and data communications for networking, storage, wireless, and cable TV applications.

Solar

Intel to aid MiaSolé CIGS ramp to 150MW

MiaSolé and Intel have entered into solar manufacturing consulting agreement which will enable MiaSolé to scale to high volume manufacturing in a cheaper, faster, and better way.

MiaSolé, a leading manufacturer of CIGS thin-film photovoltaic solar panels, has entered into an agreement with Intel's Technical Manufacturing Services practice.

Under this agreement, Intel will provide customised manufacturing services and systems, strategic consulting, operational knowledge and training to MiaSolé as the company ramps its manufacturing facilities in 2011 and 2012.

"The engagement is part of Intel's broader strategy to partner promising high tech innovation with Intel's world class manufacturing and Copy Exactly! methodology. This will enable companies like MiaSolé to scale to high volume manufacturing cheaper, faster, and better," commented Brian Krzanich, Senior Vice President and General Manager of Intel's Manufacturing and Supply Chain.

Manufacturing is central to MiaSolé's business; the company has increased its annualised production capacity to over 50 Megawatts (MW) in just over a year, and is on-track to triple capacity to over 150 MW by the end of 2011. However, the agreement with Intel, a world-leader in manufacturing with over 40 years of experience, will accelerate the production ramp with improved repeatability and consistency required for high-volume

manufacturing. This will further reduce the overall cost of solar energy and broaden its worldwide adoption.

"We are thrilled to learn from Intel's manufacturing expertise. The best technology manufacturer on the planet is now teaching us what it means to be world-class. This contribution will strengthen our goals to achieve manufacturing scale at our California factory this year," said Joseph Laia, CEO of MiaSolé.

First Solar certifies SolarMax inverters for use with its CdTe modules

The official approval covering all SolarMax inverters accelerates SDA inspection and ensures that the warranty will cover the system.

First Solar has officially certified that the SolarMax inverters made by Sputnik Engineering are compatible with the CdTe modules of its FS 2 and FS 3 series.

While crystalline modules can normally be combined with all inverters, this is not necessarily applicable to thin-film modules -- particularly when you combine these with transformerless inverters.

First Solar subjects all PV systems used in combination with its modules to its specifically developed system design and application (SDA) process. Along with the location, the company also checks the installation plan, the proper design, and the operating conditions.

Within this process, the interaction between modules and electrical components such as inverters plays an important role. The results of this quality control are high system efficiencies and economically working, well-designed solar systems, say the companies.

Inverters from Sputnik have been installed successfully with First Solar modules for years. The official approval comprising all SolarMax inverter types now accelerates the SDA inspection and ensures that the warranty will cover the system.

Sputnik Engineering AG manufactures grid-connected solar inverters. Under the name SolarMax the company develops, produces and sells inverters for every facility – from photovoltaic systems on single-family homes whose kilowatt output is modest, to the solar power plants whose output is measured in megawatts.

Apollo Solar unlocks the mystery of CdTe and files US patent

The firm believes its new invention may lead to a significant improvement in energy conversion efficiency and reduction of production cost of CdTe thin film solar panels.

Apollo Solar Energy, a provider of ultra- high purity metals and commercial-purity metals and manufacturer of CIGS and CdTe solar compounds, has announced that Ken Chin, director of the Apollo-NJIT Solar Energy Research Centre, has filed a US patent application entitled "CdTe Solar Panel Processing Technology based on Cd Vacancy Theory" (application number 61/357,058).

"Despite its commercial success, CdTe photovoltaic is still often called a 'mystery'. While many critical processing steps in current CdTe solar panel manufacturing were developed empirically through the years, their mechanisms remain controversial and not well-known. Our new invention, however, is based on fundamental understanding of the CdTe solar cell's materials, structure, and device physics," Jingong Pan, CEO of Apollo, stated.

"We believe that our new invention may lead to a significant improvement in energy conversion efficiency and reduction of production cost of CdTe thin film panels. As a result, we believe that our invention may significantly promote the development of the CdTe thin film PV industry, and increase market share for our products worldwide."

Isofoton to exhibit at International Energy and Environment Trade Fair

The firm will showcase its III-V CPV solar modules aswell as the Nessuno, a solar boat powered by

photovoltaic cells.

One of Spain's leading companies in III-V CPV solar photovoltaic energy, Isofoton, will unveil its new products, which are adapted to the demand of solar PV energy solutions, at the GENERA trade fair.

The exhibition will be held at IFEMA Madrid from the 11th to the 13th of May, which is a considered by many to be the reference event for solar energy and environment in Spain.

The firm will present its new ISF panel line composed by 3 modules. These modules can be customised according to the installation architecture and the desired aesthetics. The product range is distributed in 3kW kits and includes the ISF-245 and ISF-250 modules, formed by 60 cells, and the ISF-215 module of 54 cells. This product range ensures optimum energy output due to its micro-textured glass composition.

Along with the ISF modules, Isofoton will also be presenting its ISOTRACKER product line. ISOTRACKER products provide integral solutions with dual or single-axis trackers depending on the project requirements. The main advantage of the dual-axis ISOTRACKER products are their high energy output, which can reach up to an additional 42% in comparison to static installations (depending on environmental conditions and the solar resources).

Isofoton's most innovative launch will be the ISOTRACKER HCPV which combines the new high concentration GEN2 modules and trackers developed by INDRA. This product range uses Isofoton's cutting edge high concentration technology which enables it to obtain higher energy output in high irradiation locations. This topic will be discussed on Thursday 12th at 11:30 during the conference entitled "High Concentration Photovoltaic Systems".

Isofoton will also display *Nessuno* at GENERA2011, a solar boat powered by photovoltaic cells. The boat will be located at the Isofoton stand number 10D14, in pavilion 10.

SDG&E to use Soitec III-V modules to generate up to 30 MW solar power

The additional order, along with another secured last year, will increase the total amount of solar power generated in San Diego County by about 60%.

San Diego Gas & Electric (SDG&E) and subsidiaries of Soitec Solar Development, have signed three contracts with a combined capacity of 30 MW of solar energy.

The electricity will be generated at three III-V multi-junction solar cell solar power plant sites in San Diego County that will use Soitec' Concentrix technology. The concentrator photovoltaic (CPV) modules will be manufactured in a new Soitec factory to be built in the San Diego area.

"Including these three new contracts, SDG&E has signed nine renewable contracts over the past year for more than 1,100 MW of green energy, with nearly 520 MW from solar power, including a contract for up to 150 megawatts that also uses Concentrix™ technology," said James P. Avery, SDG&E's senior vice president of power supply. "Combined with another local solar contract we signed last year, these latest solar projects will increase the total amount of solar power generated in San Diego County by about 60 percent."

These three projects will produce enough renewable solar energy to serve more than 11,200 households a year and further contribute to SDG&E reaching its RPS goals. The projects will deploy ground-mounted dual-axis tracking CPV solar power system, which uses lenses to concentrate sunlight onto very small, extremely efficient solar cells which convert the light into electrical energy.

"We are extremely pleased to deploy our Concentrix technology for these three solar power plants in San Diego County," said André-Jacques Auberton-Hervé, chief executive officer and chairman of the board of Soitec.

"Our CPV systems are perfectly suited for projects close to well-populated areas as the high system efficiency of CPV minimizes the amount of land

needed for a given amount of electricity production. As a CPV leader, we are committed to the U.S. market and look forward to increasing our presence in the San Diego community with all of our San Diego operations."

Soitec will implement capacity investments and pursue options for related financing to construct its San Diego area factory. At full capacity, Soitec's San Diego area operations will generate up to 450 direct jobs and more than 1,000 indirect jobs. The factory location is anticipated to be announced this summer, with completion expected within 18 months of construction start. Soitec's delivery of the CPV systems for these three new solar energy facilities in San Diego County will begin in 2013 and finish in 2014.

The three power purchase contracts require approval from the California Public Utilities Commission.

Interservice Uzunovi to install 1 MW Solyndra CIGS plant in Bulgaria

The installation consists of approximately 6,000 Solyndra solar panels, which will produce over 30,000 MWh of electricity.

Solyndra, a manufacturer of cylindrical photovoltaic (PV) systems for large commercial rooftops, and Interservice Uzunovi solar division, have signed an engineering, procurement and construction (EPC) agreement.

Interservice Uzunovi will install a 1 MWp Solyndra installation on the rooftops of Biomet Co., a leading Bulgarian logistics company in Sevlievo, Bulgaria. The project highlights the continued adoption of Solyndra's rooftop solar PV systems in Bulgaria and in South Eastern Europe.

The installation consists of approximately 6,000 Solyndra solar panels, which will produce over 30,000 MWh of electricity. This will reduce CO2 emissions by more than 140,000 tons over the next 25 years - the equivalent of powering 500 households according to the EPA carbon calculator. The installation is planned to be connected to the grid by mid 2011.

"Solyndra's proven and bankable technology allowed us to complete the planning process in a very short time," said Ralitza Uzunova, General Manager of Interservice Uzunovi. "We were looking for a solution that was designed to partner with the roof, and Solyndra's performance on flat rooftops combined with the lightweight, non-penetrating design proved to be the ideal choice."

"We are pleased to have been selected for this important showcase project in Bulgaria," said Clemens Jargon, President of Solyndra International AG. "This logistics company rooftop is a perfect application for our product and demonstrates Biomet's commitment to the environment as well as the strong government support for distributed power in the region."

Hyundai-Avancis breaks ground for new CIGS solar plant

The US $200 million joint venture will start with the construction of a 100 MW CIGS solar module plant which should be completed in January 2012 and begin production in the second half of the same year.

Hyundai-Avancis, a joint venture of Hyundai Heavy Industries and Saint-Gobain, held a ground-breaking ceremony for Korea's largest CIGS thin film solar module plant.

The ceremony, held in Ochang Foreign Investment Zone, Chungcheongbuk-do, was attended by Pierre-André de Chalendar, chairman and CEO of the Compagnie de Saint-Gobain, Min Keh-sik, chairman of Hyundai Heavy, and 250 government officials and business people.

Saint-Gobain, a leader in the habitat and construction markets, and Hyundai Heavy, a leading green energy provider, each invested KRW 110 billion won for Hyundai-Avancis, bringing the total investment for the joint venture to KRW 220 billion (US $200 million). Hyundai-Avancis plans to complete the high-efficiency PV module plant by January 2012 and start production from the second

half of the same year.

Starting with the construction of the first 100 MW CIGS solar module plant, using the technology of Avancis, a fully owned subsidiary of Saint-Gobain, Hyundai-Avancis may expand the annual production capacity to 400 MW by 2015 after considering market conditions.

Hyundai Heavy, Korea's biggest solar cell manufacturer with a 600 MW solar cell and solar module factory at Eumseong, Chungcheongbuk-do, says it is the only Korean company with a complete solar power production chain. The new solar plant will also make Hyundai Heavy a manufacturer of a full range of solar power products such as polysilicon, ingot/wafer, solar cells, solar modules, and solar power systems. The Company aims to be a Global Top 5 CIGS solar module manufacturer by 2015.

With over 190,000 employees in 64 countries, Saint-Gobain designs, manufactures, and distributes building materials, providing innovative solutions to meet growing demand in emerging and mature countries, for energy efficiency and environmental protection. In addition to its first 20 MW facility in Torgau (Germany), the Group is currently building a second Avancis plant on the same site, with a future annual output of 100 MW, to begin operations at the end of 2011.

Birds Eye View of Hyundai Avancis CIGS Solar Module Plant

CIGS & CdTe manufacturers targeted by H.C. Starck

The sputtering target firm will exhibit its custom rotary and planar sputter targets from molybdenum and nickel based-alloys along with its other core competency materials tantalum, niobium and tungsten.

With increasing global interest in safe and sustainable energy sources, a bright future is shaping-up for U.S. based thin film PV production.

With these developments, a local presence coupled with global reach is critical to efficiently and effectively meet the rapidly increasing demand for sputtering targets. With over 30 locations worldwide including the U.S., Asia, and Europe, H.C. Starck offers local support to customers.

By responding to the demand to lower the cost-per-watt, H.C. Starck's Fabricated Products Group developed sputtering targets with superior sputtering performance for thin film PV (TFPV) energy applications. Thin film materials labs, equipped with sputtering tools and supporting equipment for testing film characteristics, together with in-house prototyping and modelling achieve this performance.

Marketing to CIGS, CdTe thin films and amorphous silicon solar module manufacturers, the firm manufactures custom rotary and planar sputter targets from molybdenum and nickel based-alloys along with its other core competency materials: tantalum, niobium and tungsten. The most demanding requirements of target users in the areas of LCD display, large area coating and solar cell applications are accomplished through extrusion technology.

H.C. Starck produces molybdenum rotary targets with inside diameters of 125 mm (monolithic) and 135 mm (bonded) applications in molybdenum up through the current largest rotary target requirement. Tantalum, niobium, nickel-vanadium and other materials are produced in planar or rotary form. H.C. Starck's extruded rotary targets are fully dense with extremely low oxygen levels.

VC funding for solar technology rockets to $658 million

Mercom Capital have said that venture capitalist funding in solar technology for Q1 was off to a strong start coming in at $658 million, with $196 million coming from deals in CIGS technology.

Mercom Capital Group, a global clean energy communications and consulting firm, has released funding and merger and acquisition (M&A) activity in the solar sector for the first quarter of 2011.

Venture capital (VC) funding in the solar sector came in at $658M in 25 deals, compared to $238M in the previous quarter. The trend was similar with M&A activity amounting to $1.4B in 18 transactions for Q1, compared to $266M in Q4 2010.

“Looking at the first quarter funding activities, it is clear that VC investor’s appetite for solar has not gone away. In fact, this was the best VC funding quarter since Q2 of 2010 and the second best quarter since Q4 of 2008,” commented Raj Prabhu, Managing Partner at Mercom Capital Group.

The top five funding deals were $201M raised by BrightSource Energy, a concentrated solar power (CSP) company. MiaSole, a CIGS thin-film panel maker raised $106M; Alta Devices, a GaAs thin-film developer raised $72M; Solopower, a CIGS flexible thin-film maker, raised $51.6M; and Kiran Energy, a project developer raised $30M.

Thin film companies attracted the most funding with $283M raised in seven deals. CIGS was the most popular technology within thin films accounting for $196M in four deals. CSP companies raised $212M in three deals, followed by $84M raised by solar downstream companies in six deals.

Top VC investors included Crosslink, Vantage Point, Convexa, Hudson Clean Energy and Kleiner Perkins.

In continuing with last year’s trend, VC arms of companies remained active in the sector, including Alstom, BP, GE, Chevron, Dow Chemical, Intel and Hanwha. California State Teachers’ Retirement System (CalSTRS), a pension fund, also invested.

Of the $9.8B announced in debt and other funding, Jinko Solar received $7.6B in credit from Bank of China.

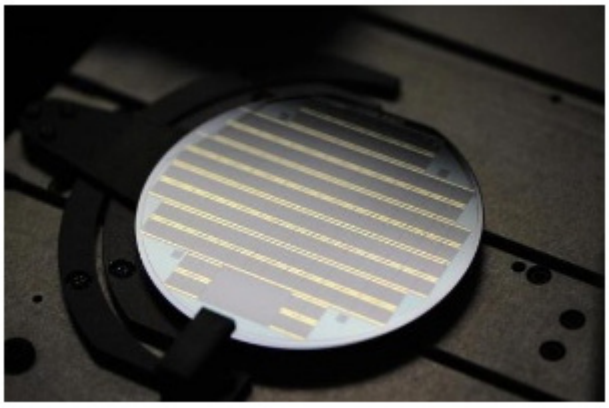
Solar Junction III-V solar cell breaks world record

With 43.5% efficiency, the CPV multi-junction production cell is a key driver for global CPV growth, says the CEO of Solar Junction.

Solar Junction, a developer of high efficiency multi-junction III-V cells for the concentrated photovoltaic (CPV) market, says it has set a world-record for 43.5 % efficiency on a commercial-ready production cell.

This achievement was, in part, supported under the U.S. Department of Energy (DOE) PV Incubator Program, managed through DOE’s National Renewable Energy Laboratory (NREL).

The cell’s efficiency was confirmed by NREL’s Measurement and Characterisation Laboratory. Solar Junctions says the 5.5 mm x 5.5 mm production cell tops the current record by 1.2 % and is significantly higher than the average efficiency gain achieved by previous record holders. The Solar Junction cell measured a peak efficiency of 43.5 %, at greater than 400 suns and still maintained an efficiency of 43 % out to 1,000 suns.



Wafer of Solar Junction CPV cells (Photo: Business Wire)

Solar Junction’s cells incorporate the company’s proprietary adjustable spectrum lattice-matched, A-SLAM technology, which enables the company

to more optimally partition the solar spectrum for maximum efficiency and greater reliability. Increases in CPV cell efficiencies are a key driver for improving CPV economics, with each cell efficiency gain leveraged and multiplied in value by the components that account for the remaining 80 % of total system costs.

“In the time I’ve been on Solar Junction’s board, the company has hit all of its aggressive efficiency milestones on target,” said Forest Baskett, General Partner at New Enterprise Associates. “That ability to deliver and execute sets it apart from the pack and positions it for swift market gains.”

Over the past four years, world record CPV cell efficiencies have averaged improvements of 0.4 % annually. By contrast, over the past nine months Solar Junction has been on a steep efficiency trajectory with its 5.5 mm x 5.5 mm commercial-ready production cell. This 43.5 % achievement comes just two months after Solar Junction reported achieving an NREL verified 41.4 % efficiency, also achieved as part of the Company’s PV Incubator subcontract.

“There’s no question that we’ve been on a nine-month tear,” said Jim Weldon, CEO of Solar Junction. “We’ve delivered on milestone after milestone and attribute this to our superior performing technology platform, driven by our dedicated, hard-charging technical team, supported by our integrated in-house manufacturing line that has enabled, and will continue to enable, multiple iterations of product improvement on an accelerated timeline. With A-SLAM™, we have a highly extensible technology that is actually delivering a clear and continued path to higher efficiencies in both the short and long term. That bodes well for CPV.”

In February, Solar Junction made the short list of finalists selected for post-selection due diligence within the DOE Loan Guarantee Program (LGP). The Company plans to scale in-house manufacturing to 250 MW capacity and ship commercial cells within the year.

First Solar introduces CdTe Modules for 10-30 kW power

The firm says this expansion gives its customers additional flexibility to serve smaller and medium-sized commercial and industrial rooftops.

First Solar has announced the availability of its industry-leading, CdTe thin-film photovoltaic (PV) modules for use in 10-30 kilowatt (kW) PV systems, effective immediately.

Since its market debut in 2002, First Solar and its business partners have focused on commercial PV systems larger than 30 kW (DC). With the introduction of the latest, high-efficiency, First Solar Series 3 modules, as well as increasing demand for commercial systems below 30kW, First Solar is responding to customer demand by serving this growing market segment.

“Commercial rooftops in the 10-30kW range represent a multi-gigawatt market globally,” said TK Kallenbach, President of First Solar’s Components Business Group. “This expansion gives our customers additional flexibility to serve smaller and medium-sized commercial and industrial rooftops. It is a natural extension of our thin film module capability and allows our customers to continue to learn and apply innovative technology and installation techniques to a growing market.”

“We believe that the combination of economic and environmental attributes of First Solar modules will prove just as attractive to customers of 10-30kW PV systems as they have to customers of bigger systems,” added Stephan Hansen, managing director of First Solar GmbH, the company’s European sales and marketing organization. “This offering is open both to existing First Solar customers and to new customers.”

More than 3 GW of First Solar modules are already installed world-wide, providing clean, affordable solar electricity to a broad variety of businesses, organisations, and individuals while displacing more than 1.5 million metric tons of CO2 emissions a year. About one-third are installed in commercial rooftop systems. Typical 10-30kW PV systems installed consist of 125-375 First Solar PV modules, require 90-270 square metres of roof space and displace 4-12 metric tons CO2 per year.

Solar systems using First Solar PV modules typically have high annual energy yields under real-world conditions, producing more energy than competing systems with the same power rating. First Solar modules also offer superior environmental benefits, including an industry-leading carbon footprint and a prefunded module collection and recycling program that enables the recycling of all First Solar modules at no additional cost.

Bruce Sohn to quit First Solar

The CdTe solar panel manufacturer has said that Sohn will not be replaced, and his direct reports will continue in their current responsibilities with new reporting lines.

First Solar has announced that Bruce Sohn, President of Operations, will be leaving the company effective April 30, 2011.

Sohn will not be replaced, and his direct reports will continue in their current responsibilities with new reporting lines. Among those leaders, Tymen DeJong, Senior Vice President of Operations, Doug Duval, Vice President of Supply Chain, Heinrich Eichermueller, Senior Vice President of Plant Replication, and Jim Lamon, Senior Vice President of Engineering, Procurement and Construction (EPC), will report to Rob Gillette, CEO of First Solar.

“Bruce has been an important part of First Solar’s history and growth, and his dedication to our vision has been unwavering. His leadership in establishing and building our manufacturing capabilities on a global scale has been a key driver of our success,” said Gillette. “Bruce and I have taken stock of his considerable achievements and we have agreed this is a natural time for him to pursue new opportunities outside the company. We wish him all the best in his future endeavours.”

“I am proud of what we have accomplished at First Solar so far and remain confident in the company’s future,” said Sohn. “Not only have we achieved our cost and manufacturing milestones, but we also have positioned a new generation of leaders to take First Solar into the next phase of growth.”

Sohn has been an integral part of First Solar’s early history, working as an engineering, operations and managerial consultant and serving on First Solar’s Board of Directors from 2003 to 2009. He joined the executive team in 2007 as President, and since then has been responsible for technology, operations and supply chain for module production, as well as for the EPC and Operations and Maintenance groups.

Tymen DeJong joined First Solar in 2010 as Vice President of Manufacturing from Numonyx Corporation, where he worked since 2008, most recently as a Vice President of Assembly/Test Manufacturing. Before that he worked for 25 years at Intel in Fab and Assembly/Test Manufacturing. Doug Duval joined First Solar as Vice President of Global Supply Chain Management in 2008 from Spansion where he was Vice President, Global Supply Chain Management. He previously worked in procurement at Advanced Micro Devices and Westinghouse Electric Corporation. Heinrich Eichermueller has been with First Solar’s manufacturing team since 2006 and has run the Plant Replication team for the past year.

Before that he held roles as Vice President of operations for NanoNexus, FlexICs and Siemens Solar Industries. Jim Lamon joined First Solar’s EPC group in 2008. He has more than 25 years of experience in engineering and construction management, including leadership positions at Shaw Power, Aker Kvaerner Power, Clark Construction and the U.S. Army Corps of Engineers.

MAG to provide XsunX customers with technical support

MAG will provide turn-key back-end process and 24/7 Global Service and Parts support for XsunX’s CIGSolar products globally.

XsunX, a developer of hybrid, thin-film photovoltaic (TFPV) solar cell technologies and manufacturing processes, has entered into an agreement with MAG Industrial Automation Systems.

MAG will provide XsunX customers with turn-key

back-end process and 24/7 Global Service and Parts support for its CIGSolar cell manufacturing lines.

XsunX and MAG have also agreed to work on specific requirements for the "back end" process equipment for the XsunX customers who are requesting to have a complete turnkey solar module assembly line. The XsunX CIGSolar system is designed to deliver what is commonly called the "front-end" process where the solar cells are made.

MAG will now work with XsunX to provide a module assembly line (or "back end" process equipment) that is capable of assembling the cells into modules for a complete turn-key factory to produce CIGSolar modules.

Joseph Grimes, XsunX's President and COO noted, "As a technology development company, we need to stay focused on our core competency, that of empowering our customers with breakthrough technology that incorporates the best systems and designs to address product market needs, rapid time to market to stay ahead of the competition, and pricing to make solar affordable for our partners and their clients. This teaming with MAG supports that goal and helps to provide our target customer group with confidence that their systems are backed by a proven installation and support infrastructure."

U.S. DOE funds Veeco assisted CIGS solar project with $57 million

The CNSE project is part of the SunShot Initiative which aims to reduce the total costs of photovoltaic solar energy systems by about 75 % by the end of the decade.

Last week, the U.S. Department of Energy (DOE) announced a $57 million award to The College of Nanoscale Science and Engineering (CNSE) at the State University of New York at Albany as part of its SunShot Advanced PV Manufacturing Partnerships Program.

Veeco Instruments, a provider of equipment for the solar industry is a key partner for CNSE on this project as part of the U.S. Photovoltaic Consortium.

The DOE's SunShot Initiative aims to reduce the total costs of photovoltaic solar energy systems by about 75 % so that CIGS solar is cost competitive with other forms of energy by the end of the decade. Achieving this goal - equivalent to approximately $1 per watt or roughly 6 cents per kilowatt-hour for utility systems - would allow solar energy systems to be broadly deployed across the country.

John Peeler, Veeco's Chief Executive Officer commented, "We are excited to be a key partner for the CNSE project. Driven by the world-class innovation at CNSE, the PVMI CIGS consortium will provide a full-scale CIGS center enabling the whole PV supply chain to work together to deploy new technologies, and enable the transition to commercial production.

Bringing together end-users, module manufacturers, suppliers, and technologists is the most efficient way to rapidly advance technology. This centre has all the elements to speed the progress of CIGS commercialisation.

Peeler added, "In addition to acknowledging the Department of Energy for this funding and their support of CIGS technology advancement, Veeco would like to take this opportunity to thank our Congressman, Steve Israel, who has been instrumental in helping get the PVMI project off the ground."

Representative Steve Israel (D-NY) commented, "Investments in our growing clean technology industry are critical to both our economic recovery and our national security. Veeco is a leader at finding innovative ways to produce solar technology in New York and across the country. This latest Department of Energy funding and support of the CNSE PVMI project will bolster our efforts to compete globally as a clean energy leader."

David Bruns, Senior Vice President, Veeco Solar, added, "CNSE and SEMATECH have a proven model demonstrated in the semiconductor industry. By leveraging this model, we are confident the same success can be achieved in solar. The DOE's commitment to CIGS and Veeco has been strong and we are appreciative of their continued support."

Veeco received a $4.8M DOE R&D grant earlier this year to help speed its development of CIGS

equipment technology. Veeco Solar currently has a small-scale pilot production line for CIGS development located in the Greater Albany region.

CNSE Senior Vice President and Chief Executive Officer Alain E. Kaloyeros said, "On behalf of the UAlbany NanoCollege, we applaud the leadership and support of New York's federal delegation, led by Senior Senator Chuck Schumer along with Congressmen Paul Tonko, Chris Gibson and Steve Israel, in helping to secure this investment by the DOE. Building on investments made by New York State and coupled with the pioneering model established by CNSE, this will infuse critical capital to position New York and the U.S. as world leaders in 21st century photovoltaic technologies. We look forward to working with Veeco as a key partner in our new PV Manufacturing Centre."

GE breaks barriers with 13% efficient CdTe solar cell

The firm has also acquired PrimeStar Solar, and has unveiled plans to build a US manufacturing solar panel plant that will be larger than any existing solar panel factory in the country today.

GE has announced that a full-size CdTe thin film solar panel developed by the company has been independently certified as the most efficient ever publicly reported milestone for the technology.

GE intends to manufacture the record-setting solar panels at a new U.S. factory that will be larger than any existing solar panel factory in the country today. When complete, the factory will highlight an expected $600 million plus investment made by GE in solar technology and commercialisation and will be complemented by the recently announced acquisition of power conversion company Converteam.

In addition, GE has completed the acquisition of PrimeStar Solar, a thin film solar technology company in which GE has held a majority equity stake since 2008. Photovoltaic solar is the next step in growing GE's renewable energy portfolio and is part of the company's ecomagination commitment to drive clean energy technology through innovation and R&D investment.

"Over the last decade, through technology investment, GE has become one of the world's major wind turbine manufacturers, and our investment in high-tech solar products will help us continue to grow our position in the renewable energy industry," said Victor Abate, vice president of GE's renewable energy business. "We are addressing the biggest barrier for the mainstream adoption of solar technology—cost—and the NREL certification proves that we are on track to deliver the most affordable solutions for our customers."

Global demand for photovoltaics is expected to grow by 75 GW over the next five years, with utility-scale solar power plants making up a significant part of that growth. With the technology and manufacturing investments recently announced, GE is well positioned to capitalise on this trend.

The record-setting panel was produced on the PrimeStar 30 MW manufacturing line in Arvada, Colorado. It was measured by the National Renewable Energy Lab (NREL) at a 12.8 % aperture area efficiency. This panel surpasses all previously published records for CdTe thin film, which is the most affordable solar technology in the industry.

Continually increasing solar panel efficiency is a key component of GE's goal to offer advanced solar products while reducing the total cost of electricity for utilities and consumers. In fact, a 1 percent increase in efficiency is equal to an approximate 10 % decrease in system cost.

"Milestones like these are pivotal as the United States looks to drive widespread adoption of solar technologies," said Ryne Raffaelle, director of the National Centre for Photovoltaics at NREL. "It's great to see technology that started at NREL ready to move into the market." NREL transitioned the technology to PrimeStar through a cooperative research and development agreement signed in 2007.

GE plans to build an advanced technology thin film solar panel factory in the United States that, at capacity, will produce enough panels per year to power 80,000 homes annually. The 400 MW facility will be larger than any U.S. solar panel manufacturing plant in operation today and will employ 400 people. Multiple locations are being considered for the new facility, with the final location

to be announced shortly.

Abate said, "Our plan to open a U.S. solar manufacturing facility further demonstrates our confidence in this technology and is just the first phase in a global, multi-gigawatt roadmap. We're not only excited by the efficiency milestone, but also by the speed at which our team was able to achieve it and the innovation runway for future improvements in this technology."

GE also announced more than 100 MW of new commercial agreements for its CdTe solar thin film products, including panels, inverters and total solar power plants. GE's largest solar agreement to date is with NextEra Energy for 60 MW of thin film solar panels. Once deployed, the panels will help grow NextEra's solar power portfolio, solidifying the company's position as the largest generator of solar energy in the country today. NextEra also currently produces 4.5 GW of renewable energy with GE's wind turbines.

Jim Robo, NextEra chief operating officer, said, "As the largest generator of renewable energy in the United States, NextEra believes that the North American solar industry presents a compelling opportunity for growth over the next several years. GE's advanced solar technology is a natural choice for us as we look to continue to build our portfolio of wind turbines and solar panels to meet our customers' demands for more affordable, cleaner energy."

GE also has signed a 20 MW solar agreement with Invenergy for the supply of thin film solar panels and GE Brilliance inverters. Invenergy, a Chicago-based clean energy generation company, will install the solar products at a project site in Illinois. Invenergy recently executed a power purchase agreement for the project, which upon completion will be one of the largest solar installations in the state.

"Invenergy is the nation's largest independent wind power generation company, and we're delighted to work with GE on this solar project as we expand our clean energy portfolio," said Michael Polsky, Invenergy's president and chief executive officer. "We look forward to utilizing GE's advanced solar module technologies."

In addition to thin film solar panels, GE offers power electronics and pre-designed utility scale solar power plants for use in multi-MW applications. The recently proposed $3.2 billion acquisition of Converteam will add the company's energy conversion technologies to GE's solar offerings, further broadening GE's portfolio.

Power electronics are critical to bringing renewable sources such as wind and solar into the mainstream, delivering economies of scale and providing stable connection to the grid. By adding Converteam technology, GE is well positioned to bring a broad range of integrated generators, converters and inverters to the wind turbine and solar plant sectors.

Nanosolar raises the bar with printed CIGS efficiency of 13.9%

NREL and ISE have independently certified the new panel and cell efficiencies. In addition, Munich Re is providing warranty insurance and Nansolar is now a member of the European panel recycling organisation PV Cycle.

Thin film solar innovation leader Nanosolar, has announced what it says is new efficiency benchmarks of 11.6 % for the Nanosolar Utility Panel and 13.9 % for its printed CIGS solar cells.

The cells were measured by the Fraunhofer Institute for Solar Energy (ISE) and the National Renewable Energy Laboratory (NREL). The company also announced an agreement for panel warranty insurance with Munich Re, and membership in European panel recycling organisation PV Cycle.

"Our mission is to produce the most cost efficient solar power possible," said Geoff Tate, CEO of Nanosolar. "We are doing this through our printed CIGS technology, innovative panel design and sound manufacturing decisions that lower panel costs in tandem with balance of system costs."

Nanosolar prints its proprietary CIGS and nanoparticle inks directly onto low-cost aluminum foil, both faster and more cost-effectively than with traditional high-vacuum manufacturing equipment. Both NREL and ISE recently measured these solar

cells at slightly below 14 % efficiency.

Leveraging the latest in robotic manufacturing practices, Nanosolar assembles these electrically-matched, all-back-contact thin film solar cells into uniform, high quality solar panels using its efficient and cost-effective metal wrap through process at assembly factories that can be located at the point of panel demand.

Nanosolar will reach an annual manufacturing capacity of 115 megawatts by Autumn 2011. Nanosolar is currently shipping 10 % efficient, 200W panels in volume with plans to reach 11 % and 12 % efficiencies in volume within the next 12 months.

Unique design choices enable the Nanosolar Utility Panel to significantly reduce mounting hardware costs, wiring cable volume, and required installation labour in multi-megawatt installations.

The Nanosolar Utility Panel has two pieces of durable, tempered glass versus one tempered glass sheet for most thin film panels, uses two edge connectors as opposed to a standard junction box, and produces more power and operates at a far lower voltage than standard thin film panels.

In addition, Nnosolar claims it is the first solar panel to be certified by TUV to operate at up to 1500 system volts. These unique system design features allow for balance of systems cost savings of up to 30 percent over competing thin film solar panels in utility-scale power plants.

Nanosolar recently signed a panel warranty insurance policy with Munich Re in preparation for future multi-megawatt installations and panel bankability. The panel warranty insurance policy covers Nanosolar's 2011 factory production and serves as a backstop to Nanosolar's 25-year limited performance panel warranty.

"Through our extensive due diligence process, we were impressed with the quality and controls in the Nanosolar manufacturing process," said Christian Scharrer, Head of Green Tech Solutions, Special Enterprise Risks at Munich Re. "We are confident in standing behind the Nanosolar Utility Panel as a credible and bankable technology for low cost utility-scale solar installations."

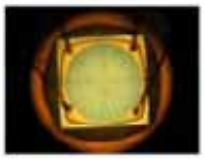
As part of its commitment to an effective waste management and recycling policy for the company and its partners, Nanosolar has joined PV Cycle, the leading European organization committed to responsibly recycle solar panels. The Nanosolar Utility Panel has one of the industry's lowest carbon dioxide and toxic emissions lifecycle footprints, and its energy payback time is less than eight months.

"Together, these announcements establish the Nanosolar Utility Panel as a leading choice in thin film, utility-scale solar," continued Tate. "We will soon announce strategic supply agreements with a number of solar power plant developers and installers that will leverage Nanosolar's ability to drive down the cost of solar power."

Isofoton locks in exceptional results in the first quarter of 2011

The III-V CPV Systems provider also aims to double total 2010 sales in 2011.

Isofoton has made major strides forward, bringing in invoicing of over €32 million in the first quarter of 2011. This exceptional performance is 74% above turnover for the same period of 2010.



The company expects to shore up results even further in the second quarter of the year, after rolling out a new manufacturing line that will double the production capacity. Isofoton also aims to double total 2010 sales in 2011. The company expects to see a recovery in the German, Italian and US markets this quarter, along with other markets.

Isofoton's new sales policy, which calls for expansion in new markets, is serving to both further diversify the customer portfolio and ensure stable sales. As part of the policy, the company is opening and strengthening its commercial offices in Germany, Italy, France, the US, South Korea, China and the Middle East.

The strong performance and the substantial improvement in the contribution margin have also been underpinned by the ongoing cost cutbacks implemented by the new management team, coupled with enhanced production efficiency (less wastage) and improved unit power.

The Isofoton brand, a global provider of CPVsolar energy using GaAs based cells, is backed by over 30 years' experience and its excellent product quality. The company ensures this leadership position through ongoing investment in R&D.

Isofoton aims to increase its production capacity fivefold in the coming three years. This, Isofoton says, will make it one of the most competitive companies in the global photovoltaic energy sector.

NREL and partners to compare efficiency of III-V solar cells

The three manufacturers whose cells will be compared are Spectrolab of the United States, Sharp of Japan, and Azur Space of Germany. The CPV cell efficiencies will be tested in sites in Colorado, USA and Yokohama, Japan.

The U.S. Department of Energy's National Renewable Energy Laboratory (NREL) is partnering with major international industrial technology and solar research organisations to test how solar cells from three manufacturers perform in two geographic locations with different lighting conditions.

A primary goal of the study is to assess how panels from three different manufacturers – from the United States, Japan and Germany – perform under different average lighting conditions characteristic of the study's test sites in Aurora, Colorado, and Okayama, Japan.

Concentrator photovoltaic (CPV) solar systems – which use lenses to multiply the sun's intensity, reduce the area of the solar cells needed to convert sunlight to electricity and improve the efficiency of conventional photovoltaics – have been installed at sites in Aurora and Okayama, in part, to measure how well the same cells perform in the high-altitude sunshine of Colorado in comparison with those in cloudier, lower-altitude Japan.

NREL teamed with Japan's National Institute of Advanced Industrial Science and Technology (AIST) to install 25 kilowatts of CPV systems at the Solar Technology Acceleration Centre (SolarTAC) in Aurora, Colorado.

SolarTAC provides a venue for researching, demonstrating, testing, and validating a broad range of solar technologies at the early commercial or near-commercial stage of development.

Photovoltaic systems made by Daido Steel, a Japanese manufacturer, are installed at both sites and are designed to compare solar cells made by Spectrolab of the United States, Sharp of Japan, and Azur Space of Germany.

Daido's CPV design uses a dome-shaped Fresnel lens and concentrator multi-junction III-V solar cells with efficiencies approaching 40 %, meaning that 40 % of the energy in the sunlight that hits the solar cells is converted into usable electricity. This results in module efficiencies of about 30 %. By contrast, most of the PV panels on rooftops today have an efficiency rating of 20 % or less. The output of the CPV systems will be compared with conventional silicon PV modules.

The study will also test high efficiency, advanced versions of the InGaP/GaAs solar cells originally invented and developed at NREL, which are now widely used for space exploration applications, such as the Mars rovers. The high efficiencies of these cells, coupled with system designs that greatly reduce the area that needs to be covered by solar cells, have attracted growing interest in recent years. In the modules being tested, solar cells cover 1 one-thousandth of the space covered by similar conventional solar modules.

The project is primarily funded by AIST as a part of the "R&D on Innovative Solar Cells" project, which in turn is funded by Japan's New Energy and Industrial Technology Development Organisation (NEDO)

Ascent Solar to target new emerging markets

The CIGS solar module manufacturer is resizing to align with its new growth plan with a new CEO in place to implement it.

Ascent Solar Technologies has announced a change in strategy that will focus the company's lightweight, flexible thin-film CIGS solar module technology on applications for emerging and specialty markets.

In the past, Ascent has dedicated many of its resources to establishing a position in the building applied and building integrated photovoltaic markets (BAPV/BIPV). The new market focus provides a clear path for the future and leverages the company's unique strengths. The change in strategy will mean a change in leadership and sizing the company to a new cost structure.

Producing solar modules that are exceptionally lightweight and flexible gives Ascent the ability to meet specialty needs for markets like the military and defence; custom near-space applications; off-grid charging solutions in developing countries; power for portable electronics; and custom and standard products for rooftop integration on buses, trucks and trains. Ascent believes that it can sell its products in these markets at more attractive margins than currently possible for ground mount applications or BIPV and BAPV markets.

"We want to assure shareholders, customers and partners that Ascent's various BIPV/BAPV products are still important to our long-term growth and success. Consequently, we will continue selective business development, testing and certification for those products. A number of economic considerations, including the serious reduction of government subsidies in major markets in Europe, indicate that these markets will be under some near term pressure," said company Chairman, Amit Kumar.

"Therefore, in the near term, we will focus our manufacturing and sales activities on emerging, high-value, specialty market applications. Although our cash position is strong, we are taking steps to reduce staffing and operating costs that will minimize the company's current cash burn rate and help to ensure our continued leadership in flexible thin-film solar technologies," he concluded.

With the change in strategy, CEO Farhad Moghadam is stepping down to pursue other interests and opportunities, including spending time with his family who lives in California. Ron Eller, an Ascent board member for the past two years, has been appointed the company's new President and CEO. Eller is a seasoned technology executive and management consultant with more than 25 years experience, including, most recently, running various divisions in the enterprise businesses of Hewlett Packard and Compaq Computer Corporation.

"Our innovative technology has unique sustainable advantages in a number of emerging specialty markets," stated Ron Eller. "I am pleased to lead the team that will shape and drive adoption of applications that can make a valuable contribution in these markets."

Emcore acquires assets of solar firm Soliant Energy

The assets of the triple-junction solar cell provider Soliant Energy acquired include equipment, inventory, software, licenses, intellectual property, and tooling for the rooftop solar energy product line.

Emcore Corporation, a provider of compound semiconductor-based components has acquired certain assets of Soliant Energy of Monrovia, California.

Soliant Energy was a leading developer of triple junction concentrated photovoltaic (CPV) systems grown on a germanium substrate for commercial rooftop applications.

Soliant's rooftop CPV system combined best-of-breed module design with patent-pending "TipTilt Tracking" that offers a high energy density, light-weight, low-profile, and low-cost solution.

The Soliant assets acquired by Emcore include the equipment, inventory, software, licenses, intellectual property, and tooling for the rooftop solar energy product line. The acquisition was completed as part of an Assignment for the Benefit of Creditors

process. Emcore did not assume any liabilities of Soliant.

Emcore plans to integrate the former Soliant research and development and pilot production line into its existing facilities located in Alhambra, California. The commercial manufacturing operation is expected to transfer to Emcore's low-cost manufacturing joint venture, Suncore, based in Huainan, China. Key members of the former Soliant team will join Emcore to facilitate the integration, product development, and business development and customer support.

"We are very pleased to add the Soliant solution to Emcore's terrestrial CPV product portfolio. The addition of Soliant's rooftop CPV product line gives Emcore immediate access to the reportedly multi-billion dollar rooftop PV market, and expands the reach of Emcore's existing ground mount systems," commented Hong Hou, Chief Executive Officer of Emcore.

"We are very impressed with the capability of the Soliant team. With the establishment of our CPV design and customer service centre in Southern California, we will be able to develop business opportunities and serve our customer base in the most active region for solar installations," he concluded.

Rick Russell, former VP of Engineering & Operations for Soliant and new VP of Engineering for Emcore Rooftop CPV Systems, added, "We are very excited to join the Emcore team. This integration allows us to leverage Emcore's highly-efficient solar cell supply and its low-cost manufacturing infrastructure. Soliant enjoyed a very successful working relationship with Emcore through the development of our system. We are confident this combined team will allow us to accelerate delivery of the most cost-effective and highest reliable rooftop system to market."

Abound Solar to enter Indian PV market

The CdTe solar panel manufacturer has signed a sales agreement with Solarsis. The first project will involve a 1 MW ground-mount array in the state of Andhra Pradesh.

Abound Solar, a manufacturer of CdTe thin-film photovoltaic solar modules, has signed a long-term sales agreement with Solarsis.

The companies will work together to provide solutions based on Abound's next-generation thin-film modules serving project developers in the Indian market. Solarsis will also establish a test facility with the purpose of optimizing balance of system (BoS) designs around Abound Solar's modules that will lower total system costs for customers.

The first project under this agreement will be a 1 megawatt ground-mount array in Ananthapur, in the state of Andhra Pradesh, India.

Abound Solar, based in Colorado, USA, recently closed on a $400 million loan guarantee from the U.S. Department of Energy (DOE) to fund the expansion of the company's manufacturing capacity and help cater to the demand for its products in emerging markets such as India.

Solarsis is a leading solar system integrator in India and has over 150 years of combined experience in the industry. Headquartered in Hyderabad, India, Solarsis designs, installs and project manages photovoltaic solar solutions. It uses a five-step integration process that includes comprehensive financing with debt and equity support.

"Abound Solar's thin-film modules are ideally suited for environmental conditions found across India: high temperatures and diffuse light conditions," said Venkat Rajaraman, CEO of Solarsis. "The combination of thin-film technology and high performance in a low-cost module and our experience in integrating BoS components allows us to deliver strong financial returns to our customers."

"We are extremely excited to work with Solarsis, as one of our preferred system integration partners," says Julian Hawkins, Senior Vice President of Sales & Marketing for Abound Solar. "The company's position as a leader player in the Indian solar market represents a great opportunity for Abound Solar as we work to develop our presence in the quickly growing market."

Spire to provide 20MW solar PV module line to Brazil

The company will provide its CdTe modules to Brazil, which is rapidly expanding its investments in green energy.

Spire Corporation, a global solar company providing capital equipment and turn-key manufacturing lines to produce photovoltaic (PV) modules, is providing a 20 megawatt (MW) solar PV module line to Tecnometal Equipamentos of San Paulo, Brazil.

"We worked Mr. Bruno Topel, a solar pioneer of Heliodynamica in San Paulo, many years ago and now we are pleased to be working with him again at Tecnometal," said Roger G. Little, Chairman and CEO of Spire Corporation. "Brazil is quickly expanding its investments in green energy. We are pleased to provide this state-of-the-art production line to Tecnometal to allow them to capture an early market position in solar energy."

Sunload Mobile signs distribution agreement with Ascent Solar

The firm will distribute Ascent Solar CIGS EIPV modules in Europe.

Sunload Mobile Solutions will act as an authorised distributor of Ascent Solar's lightweight, flexible, high-power thin-film CIGS modules for Electronic Integrated (EIPV) applications in Europe.

This agreement with Sunload will give Ascent Solar access to multiple opportunities within Europe's rapidly expanding off-grid battery charging and portable power markets.

Ascent Solar President and CEO Farhad Moghadam stated, "We are pleased to announce our agreement with Sunload Mobile Solutions. This relationship establishes a partnership through which we expect to market our lineup of flexible, lightweight CIGS modules for off-grid portable power. The innovative European market represents a significant opportunity for Ascent's portfolio of products. We welcome Sunload Mobile Solutions to our network of distributors."

First Solar breaks ground on Vietnam factory

The new CdTe solar module manufacturing facility about 25 kilometres north of Ho Chi Minh City, will add more than 250MW in PV manufacturing capacity.

First Solar has officially broken ground on its four-line CdTe photovoltaic module manufacturing plant in the Dong Nam Industrial Park near Ho Chi Minh City.

Vietnamese Deputy Minister of Industry and Trade Tran Tuan Anh attended a ceremony at the site to mark the occasion.

The $300 million manufacturing plant is scheduled to begin commercial production in the second half of 2012 and will employ around 600 associates. Up to 2,000 people will be involved in the construction.

The plant will produce more than 250MW of First Solar's advanced, thin-film solar modules per year on four manufacturing lines, with the flexibility for future expansion. First Solar plans to install some 3MW of its modules on the factory roof.

"Our Dong Nam factory will play a key role in our plan to nearly double First Solar's capacity by 2012 and further reduce the cost of solar electricity," said Bruce Sohn, President of First Solar. "We look forward to working closely with the Vietnamese authorities in the months and years to come."

The factory will utilise First Solar's continuous manufacturing process, which transforms a sheet of glass into a complete solar module in less than 2.5 hours. The factory is designed to maximise energy efficiency, which will contribute to the industry-leading energy payback time and low carbon footprint of First Solar's thin-film modules.

The factory will also include a recycling plant, a key feature of First Solar's commitment to cradle-to-cradle life cycle management and extended producer responsibility. The process currently recovers up to 90% of a module's semiconductor materials and glass, by weight, for use in new solar

modules and glass products.

The Dong Nam Industrial Park is a 342 hectare business development zone around 25 kilometres north of Ho Chi Minh City.

Ascent Solar signs distributor agreement with Sunload Mobile

Sunload Mobile Solutions will distribute Ascent Solar's CIGS Solar Modules in Europe.

Ascent Solar Technologies has announced that Sunload Mobile Solutions will act as an Authorised Distributor of its lightweight, flexible, high-power thin-film CIGS modules for Electronic Integrated (EIPV) applications in Europe.

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First Solar expands with CdTe solar factory in Arizona

The new factory will create 600 jobs and create an annual production of more than 250MW.

First Solar is building a new U.S. manufacturing centre in Mesa, Arizona.

The firm will invest about $300 million in the factory, which will create approximately 600 jobs and will include four manufacturing lines with a capacity to produce more than 250 megawatts (MW) of advanced thin-film photovoltaic (PV) modules per year. The new factory, in combination with First Solar's recently expanded facility in Perrysburg, Ohio, will increase First Solar's U.S. production capacity to more than 500MW per year.

Construction will begin in the second quarter of 2011 and is expected to last a year, creating an average of 400-500 construction jobs. Module shipments are scheduled to begin in the third quarter of 2012.

The facility is located on a 135-acre site that was previously home to a General Motors vehicle testing facility and is designed to accommodate future expansion. The facility will include a 3MW rooftop solar installation as well as an extensive ground-mounted PV testing facility.

The factory will utilise First Solar's continuous manufacturing process which transforms a sheet of glass into a complete solar module in less than 2.5 hours, which contributes to the industry-leading energy payback time and low carbon footprint of systems utilising First Solar's thin-film modules.

"Supportive state and federal policies have provided the visibility needed for the U.S. to become our fastest-growing market, and the Mesa factory will enable us to meet that growing demand," said Bruce Sohn, President of First Solar.

"Programs such as Department of Energy loan guarantees and the solar investment tax credit are crucial to helping the renewable energy industry quickly reach the scale needed to compete with fossil fuels. Over the long-term, programs like these facilitate the market growth and investment that will support the future expansion of this factory."

"First Solar's presence in Arizona has been a great engine in driving our renewable energy sector forward," said Arizona Governor Jan Brewer. "And now its plans for a 135-acre technology campus – with 600 quality jobs and the potential for hundreds more – will propel Arizona into its second century, while promoting the Arizona Commerce Authority's plan for business attraction, retention and expansion. We are grateful that First Solar's leadership has confidence in my Cornerstones of Reform – including the Arizona Competitiveness Package. "

"The U.S. has always led the world in innovation and Arizona is proud to be on the leading edge of the energy evolution," said Arizona Senator John McCain. "First Solar's announcement to build a new factory in Mesa and deploy their domestically manufactured modules in solar projects like Agua Caliente in Yuma County will not only create job opportunities for Arizonans but also represents another important step toward greater energy security."

"First Solar's investment is significant for both Mesa and our region," said Mesa Mayor Scott Smith. "The location also confirms the Gateway area's potential to become a major centre of economic growth, innovation and high-wage jobs."

The new Mesa facility is approximately 30 minutes from First Solar's corporate headquarters in Tempe, Arizona, where it employs about 200 associates. First Solar also is currently building two utility-scale PV projects in Arizona, the 290MW Agua Caliente project in Yuma County for NRG Energy and the 17MW Paloma Solar Plant in Gila Bend for APS, which are expected to create more than 500 construction jobs.

First Solar's North American project pipeline includes more than 2.4 gigawatts of projects expected to create approximately 2,000 construction jobs and drive $6 billion of infrastructure investment over three years.

Like all of its PV modules, the entire production output of the Mesa factory will be part of First Solar's comprehensive, prefunded CdTe solar module collection and recycling program, the first of its kind in the industry. Anyone wishing to dispose of First Solar modules can request collection at any time, at no additional cost, and First Solar will pick up the modules and recycle up to 90% (by mass) of the material for use in new products, including new solar modules and new glass products.

Luxembourg's low cost solar cells hold new European record

By combining copper, zinc, tin, and sulphur or selenium, all abundant and low cost elements, the University of Luxembourg has produced a solar cell with 6.1 % efficiency.
The Laboratory for Photovoltaics of the University of Luxembourg has developed an improved preparation process for kesterite solar cells, which resulted in a new European record efficiency of 6.1 percent.

The efficiency has been certified by the Fraunhofer Institute for Solar Energy Systems, one of eight labs in the world that is authorised to certify solar cell efficiencies.

Kesterites combine the low cost of thin film solar cell technologies with extremely low raw material cost. Their main component consists of copper, zinc, tin, and sulphur or selenium, all abundant and low cost elements.

Several labs have reported that the loss of tin during preparation limits the ability to control deposition processes. The Laboratory for Photovoltaics has therefore developed a preparation process that allows controlling the tin loss and has in the first attempt led to the record efficiency. Details of the preparation process have been published in the *Journal of the American Chemical Society*.

"With this first success we are now able to understand the further limitations of these solar cells. This will help us to improve the efficiency further" says Susanne Siebentritt, head of the Laboratory for Photovoltaics. This laboratory was founded in Luxembourg in April 2007 within the framework of the TDK Europe professorship, a public-private partnership funded by TDK Corporation and the University of Luxembourg.

Thin film solar cells are currently significantly increasing their market share, because of their low production cost. These are mostly based on considerably lower material and energy consumption compared to conventional wafer technologies.

The Laboratory for Photovoltaics of the University of Luxembourg is a group of researchers developing new materials and processes for solar cells. The laboratory also focuses on furthering the physical understanding of the materials and interfaces involved in these solar cells.

Mark Widmar to join First Solar as Chief Financial Officer

The CdTe solar cell manufacturer has appointed Widmar to take over from James Zhu, who has been interim CFO since January 2011.

First Solar has announced that Mark Widmar will join as Chief Financial Officer (CFO), responsible for the company's global financial operations.

Widmar will succeed James Zhu, who has been interim CFO since Jan. 1, 2011. Zhu will retain his role as First Solar's Chief Accounting Officer.

Widmar joins First Solar effective April 4, 2011, from Graftech International, a global manufacturer of advanced carbon and graphite materials, where he was CFO and President of the Engineered Solutions segment.

Prior to joining Graftech in 2006, Widmar worked at NCR Corporation from 2003 as corporate controller and a business unit CFO. Before that he was a division controller for Dell and a business unit CFO for Lucent Technologies.

"Mark brings nearly 25 years of experience in finance, accounting and controlling to First Solar," said Rob Gillette, CEO of First Solar. "We are confident that Mark's expertise and his track record of delivering results make him the right leader for our finance organisation."

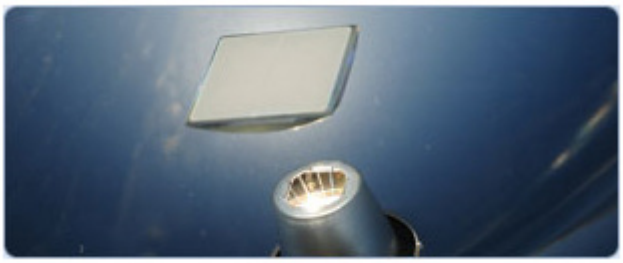
Widmar earned a B.S. in business accounting and an M.B.A. in finance from Indiana University and is a Certified Public Accountant.

SolFocus promotes Bob Legendre to president

With the new appointment, the manufacturer of III-V based solar cells intends to drive cost out of the product and improve product quality.

SolFocus has promoted Chief Operating Officer Bob Legendre to the position of President, reporting to CEO Mark Crowley. He will also stay on in his role as COO.

In his new, expanded position, Legendre will oversee a broad range of activities including manufacturing, supply chain, engineering, deployment, field support, and product quality.



SolFocus systems use a reflective design which includes a primary mirror to capture sunlight, along with a secondary mirror and non-imaging optical system to concentrate sunlight 650 times onto high-efficiency III-V solar cells.

"Bob has done an excellent job of building a supply chain and manufacturing capability that puts SolFocus in a leadership position in the CPV marketplace," said Mark Crowley, CEO of SolFocus. "As our business has matured, the benefits of consolidating all product-related activities under Bob's leadership will result in seamless customer service and the highest quality of operations."

As the COO, Legendre led SolFocus' engineering organisation to drive cost out of the product and improve product quality. Legendre also finalised SolFocus product sand product certification for deployment in EMEA, Australia and North America.

Legendre has 25 years of global experience in all aspects of operations management including supply chain, operations, captive and contracted offshore manufacturing, NPI operations, research, and engineering development.

Prior to SolFocus, Legendre was Executive Vice President of PowerWave. He also held senior positions with InFocus and Western Digital where he managed operations in South East Asia. Legendre has a bachelor's degree in business from LaSalle University.

XsunX and Globe Future sign CIGSolar purchase agreement

XsunX will initially provide Globe Future with baseline production system, and an additional 30 MW CIGSolar production system to produce CIGSolar cells.

XsunX, a developer of hybrid, thin-film photovoltaic (TFPV)CIGS solar cell technologies and manufacturing processes, has entered into an agreement with Globe Future Technology Development Company.

Globe Future will purchase of manufacturing systems and an operating license for XsunX's CIGSolar technology. Under the agreement, XsunX will provide Globe Future with an initial baseline production system, and an additional 30 MW CIGSolar production system to produce CIGSolar cells.

Joseph Grimes, XsunX's President and COO, commented, "We are very fortunate to solidify this agreement with Globe Future. This agreement further supports our business model and technology plan to introduce to the global market solar technologies that are truly unique and competitive with silicon cell technology."

Grimes added, "XsunX continues to target the silicon module manufacturing industry as a major customer segment and we are positioning XsunX customers for success as they compete in the $18 billion silicon solar cell industry."

Under the agreement, and as a condition to the commitment, the parties will now work to complete a joint specification to ensure that CIGSolar system configuration meets the optimal compatibility and integration for Globe Future's specific needs. Once the parties have finalised specifications for the deliverables, Globe Future will post a letter-of-credit for the payment of the systems.

Grimes further noted, "We are completing our designs and are preparing to build our first baseline production system for use as our primary marketing tool. We can now update these designs to meet Globe Future's specific product needs and re-capitalise our investment rapidly while still meeting our marketing and technology roadmap. There's a lot of work ahead but we are very excited about the opportunity to execute on our agreement with Globe Future and hope to secure additional commitments from other pending customers as we move forward."

PV Book-to-Bill analysis forsees record revenues in 2011

Strong equipment backlog reflects optimism of tier 1 PV producers and a new cycle of investment in emerging thin-film technologies such as CIGS.

In the fourth quarter of 2010 (ending December 31, 2010), the PV Book-to-Bill posted a three-month average of 1.10, according to its analysis featured in the "Solarbuzz PV Equipment Quarterly Report".

The Book-to-Bill ratio compares the total amount of orders received to the total amount of product shipped and billed within a given period. It is the ratio of demand to supply in the equipment supply chain. A PV Book-to-Bill ratio of 1.10 for Q4 2010 means that US$110 of orders was received by PV equipment suppliers for every US$100 of product shipped.

Across the entire year, the 12-month average in 2010 reached 1.27 compared to 0.97 for 2009.

According to Finlay Colville, Senior Analyst at Solarbuzz, "The latest PV Book-to-Bill figures reflect the ongoing investments across both monocrystalline silicon (c-Si) and thin-film segments, which are driving strong capacity expansions planned for 2011. Tier 1 c-Si manufacturers are expanding to reach vertically-integrated GW+ status on the back of still strong order books. Conversely, investments into a-Si (amorphous silicon)/mc-Si (microcrystalline silicon) and CIGS thin-film technologies represent the continued push by new entrants to find low-cost alternatives to First Solar's exclusive challenge to c-Si dominance in the market today."

Working closely with the PV equipment supply-chain, the Solarbuzz PV Book-to-Bill analysis

maps out quarterly spending profiles by all PV manufacturers with the relevant bookings and revenues assigned to the appropriate process tool manufacturers.

The consolidated PV Book-to-Bill analysis yields an averaged figure based on industry-wide equipment investments across established and emerging technologies. However, tier 1 cell manufacturer trends can be a more appropriate leading indicator to assess the impact of production equipment used to meet end-market PV demand.

Colville added, "Tier 1 designated c-Si cell and thin-film panel producers satisfied 75% of PV demand during 2010. Equipment supply to this crucial midstream solar cell manufacturing segment highlights the portion of overall PV capacity expansion that is most likely to drive the level and timing of any panel oversupply during 2H'11."

For the tier 1 segment, the PV Book-to-Bill ratio was higher at 1.39 during Q4'10, with a 12-month average of 1.26. Early indications are that this segment's Book-to-Bill ratio will dip below parity during Q2 2011. This would represent the first sign of capacity expansion slowdown by leading PV producers and the beginning of a downturn in revenues on offer to leading PV equipment suppliers through 2H 2011 and 1H 2012.

Figure 1: Consolidated PV Book-to-Bill at the End of Q4'10

Soitec announces major U.S. CPV solar power project

The firm will build a new 200MW CPV manufacturing facility which uses its III-V multijunction solar cell technology, in the San Diego region.

Soitec, a supplier of Concentrix concentrated photovoltaic (CPV) technology has been selected by Tenaska Solar Ventures to produce 150 megawatts (MW) of clean energy for San Diego Gas & Electric.

The new CPV solar power plant, named Imperial Solar Energy Centre (ISEC) West, will be constructed on a 1057-acre site in Southern California's western Imperial County, and is expected to be completed in 2015.

To support the project, Soitec will build a new factory in the San Diego region to manufacture its proprietary CPV modules. With an annual production capacity of 200 MW, the new CPV manufacturing facility will supply CPV modules not only to ISEC West, but to other utility-scale solar power projects throughout the desert southwest of the U.S.

San Diego Gas & Electric (SDG&E) signed a 25-year power-purchase agreement with a subsidiary of CSOLAR Development, LLC, a renewable energy company managed by Tenaska Solar Ventures that will develop and operate the ISEC West solar power plant. The ground-mounted concentrated photovoltaic power plant will have a capacity of 150 MW of solar generated electricity.

The ISEC West project will produce enough electricity to meet the annual electricity needs of approximately 55,000 California homes. Concentrated photovoltaic technology converts sunlight directly into "clean" electricity via concentrator optics and high efficiency solar cells that neither produce noise nor emit greenhouse gases. Additionally, CPV technology requires no water for ongoing operations, a crucial consideration for the water-constrained Imperial Valley. Finally, the ISEC West project represents a significant economic investment in Imperial County, one that will create hundreds of jobs in the area.

"The start of construction of the Sunrise Powerlink has triggered a wave of proposed new utility-scale solar and wind projects in the Imperial Valley region," said James Avery, SDG&E's senior VP of power supply. "What is unique about this contract is that not only will the Imperial Valley benefit from the jobs created to construct the solar plant, San Diego will benefit from the approximately 450 new jobs that will be created at the new manufacturing facility

that will be located here in the region. SDG&E's voluntary commitment to obtain 33 percent of its power from renewable sources by 2020 is creating new jobs in both the Imperial Valley and here in San Diego, and we are proud of this accomplishment."

Concentrix CPV solar power systems are more efficient and perform better than conventional solar systems, particularly at locations with extremely hot ambient temperatures and dry weather conditions.

Because of the very low temperature coefficient of its multijunction solar cells, a CPV system's performance is much less affected by temperature than any other photovoltaic technology. Additionally, a CPV system's 2-axis tracker produces a high and constant power production output throughout daylight hours.

According to Dave Fiorelli, President of Tenaska's Development Group, "The ISEC West solar power plant will demonstrate Concentrix CPV scalability, and commercial viability of this innovative technology for utility scale deployment. We are excited to work with Soitec and SDG&E to bring clean energy to the homes and businesses of Southern California."

"Soitec is extremely pleased that Tenaska Solar Ventures chose our Concentrix CPV technology for the ISEC West solar power plant," adds André-Jacques Auberton-Hervé, CEO and Chairman of the Board of Soitec. "Our CPV systems are perfectly suited for the very high solar irradiance prevalent in the Imperial Valley. As a CPV leader, we are very committed to the U.S. market and look forward to increasing our presence in the San Diego community by contributing to the emerging renewable energy ecosystem in the region."

The ISEC West project has applied for a U.S. Department of Energy loan guarantee. Upon receipt of the guarantee and closing of its agreement with Tenaska, Soitec will implement capacity investments to construct its San Diego area factory and pursue options for related financing. The factory location is anticipated to be announced this summer, with completion expected within 18 months of construction start. Soitec's delivery of the CPV systems to the ISEC West solar power plant will begin in early 2013 and finish in 2015. At full capacity, Soitec's San Diego operations will generate up to 450 jobs in the local area.

CPV installations to grow at CAGR of 174% through 2015

Although crystalline silicon solar cells continue to be the primary technology, it is followed by strong momentum of cadmium telluride (CdTe) and copper indium gallium selenide (CIGS) technologies.

Concentrated photovoltaic (CPV) technology, used for the production of solar energy, faces a number of challenges, not least because of potential limitations in deployable locations.

Most effective in areas with direct sunlight, Strategy Analytics believes that CPV technology has the potential for strong growth. The Strategy Analytics GaAs and Compound Semiconductor Technologies (GaAs) service report, "CPV Technology Market Status Update and Future Prospects," predicts CPV installed capacity will grow at a compound annual growth rate (CAGR) of 174% through 2015.

Solar energy installations have continued to grow strongly, with Strategy Analytics estimating that new global installations reached 16.3 GW in 2010.

Approaches utilising crystalline silicon continue to be the primary technology, followed by strong momentum behind a host of thin film technologies including CdTe and CIGS. Concentrated PV (CPV) technology remains behind these other technologies.

"While potentially offering 100% improvement in efficiencies compared to other solar technologies, CPV is only really effective where there is high direct normal solar irradiation," noted Asif Anwar at Strategy Analytics. "While this has limited early deployment, the benefits of CPV will translate into rapid growth in these locations."

"In 2010, some significant projects came into play in the southwestern United States, the Middle-East, Africa and Australia," noted Eric Higham Director, GaAs service. "CPV installations will grow at a CAGR of 174% to account for just over 4% of global solar installations in 2015."

Alta raises funding to improve efficiency of III-V based solar cells

One of the technologies Alta is developing is 'epitaxial lift off 'which will enable efficient use of very thin layers of gallium arsenide for solar PV applications.

Alta Devices has raised funding to focus on improving the production economics of high efficiency solar PV (photovoltaic) applications.

In addition to breakthroughs in advanced technology, the company is focused on manufacturing and form factor breakthroughs.

"There are a number of advanced materials that could demonstrate higher solar conversion efficiency than silicon," said Christopher Norris, Alta's CEO. "To date, the challenge of these materials is that they have been expensive to produce and difficult to implement. Therefore, they are not currently an economic solution for addressing the world's energy needs. We are working to solve this problem by leveraging new approaches in several disciplines."

Norris explained that the company has been making good progress in the lab. "We have a team of technologists working on issues ranging from efficient use of raw materials, better manufacturing processes, and new ways to optimize the conversion efficiency of these materials for energy applications."

For example, "One of the technologies on which Alta is seeing good results is a process called 'epitaxial lift off'," according to Kleiner Perkins Caufield and Byers partner and Alta board member Bill Joy. "This is a technique that will enable efficient use of very thin layers of gallium arsenide for solar PV applications. Based on our review of the state-of-the-art, Alta has the world's leading experts in this area."

Total investment in this round to date is $72 million. The new funds are being used to continue moving toward commercialisation.

Among the investors are returning firms August Capital, Kleiner Perkins Caufield and Byers, Crosslink Capital, DAG Ventures, New Enterprise Associates (NEA), Presidio Ventures (a Sumitomo Corporation company), Technology Partners, and Dow Chemical. New investors are Alberta Investment Management Corporation (AIMCo) on behalf of certain of its clients, Good Energies, Energy Technology Ventures (a joint venture involving GE, ConocoPhilips and NRG Energy), and Constellation Energy.

Jagdeep Singh Bachher of AIMCo has joined the Alta board; continuing board members include Joy, Norris, Andy Rappaport of August Capital, Alain Harrus of Crosslink Capital and company founders Harry Atwater, Professor of Applied Physics and Materials Science at Caltech, and Eli Yablonovitch, Professor of Electrical Engineering and Computer Sciences, University of California, Berkeley and Lawrence Berkeley National Laboratory.

XsunX and Telecomps enter into CIGS technology agreement

The Taiwanese firm is the first commercial customer to use XsunX's breakthrough CIGSolar technology.

XsunX, a developer of hybrid, thin-film photovoltaic (TFPV) solar cell technologies and manufacturing processes, has entered into an agreement with Telecomps Technology (Telecomps) for the use of its CIGSolar technology.

Under the agreement, Telecomps and XsunX will work together to complete back-end CIGSolar solar module assembly capabilities to produce solar modules using XsunX CIGSolar cells.

Joseph Grimes, XsunX's President and COO, commented, "This is a great opportunity for both companies. Telecomps' growing capabilities in the module assembly business will provide us a head start and will help accelerate the adoption of our CIGSolar technology in the rapidly growing Chinese market."

Grimes continued, "We have targeted the silicon module manufacturing industry as a major customer segment and, with the assistance of Telecomps

providing competitive OEM module assembly, we are positioning XsunX customers for success as they compete in the $18 billion silicon solar cell industry. In addition to Telecomps a number of other manufacturers are now seriously exploring the use of our CIGSolar technology as a robust and less expensive alternative to silicon."

Founded in 1991, Telecomps has expanded its expertise in the electronics component industry building a network of capabilities in the fast growing turnkey OEM solar module assembly sector. Well respected within their industry, Telecomps' growing capabilities specialise in both silicon and thin-film solar module assembly.

XsunX is developing and has begun to market a new manufacturing process to produce low cost, high efficiency thin-film Copper Indium Gallium (di) Selenide (CIGS) thin film solar cells. The patent pending system and processing technology, which XsunX calls CIGSolar, focuses on the mass production of individual thin-film CIGS solar cells that match silicon solar cell dimensions and can be offered as a non-toxic, high-efficiency and lowest-cost alternative to the use of silicon solar cells.

The company is offering licenses for the use of the CIGSolar process technology and plans to generate revenue through licensing fees and manufacturing royalties for the use of the CIGSolar technology.

GT Solar Settles IPO Securities Litigation for $10.5 Million

Of this amount, GT Solar will contribute $1 million and the company's liability insurers will contribute the remaining $9.5 million.

GT Solar International, a global provider of sapphire and silicon crystalline growth systems and materials for the solar, LED and other specialty markets, has reached an agreement in principle to settle two putative securities class-action lawsuits related to the company's initial public offering on July 24, 2008.

The terms of the proposed settlement, which includes no admission of liability or wrongdoing by the company or by any other defendant, provide for a full and complete release of all claims that were or could have been brought against all defendants in both the federal and state securities actions.

The firm will pay $10.5 million into a settlement fund. Of this amount, GT Solar will contribute $1 million and the company's liability insurers will contribute the remaining $9.5 million. The company's contribution represents its contractual indemnification obligation to its underwriters. Both the terms of the proposed settlement and the plan of distribution for the settlement fund are subject to further documentation and Court approval.

"This settlement, once approved by the federal and state courts, will resolve these matters in a way that is in the best interests of GT Solar's shareholders," said Tom Gutierrez, GT Solar's president and CEO. "We believe that this settlement will provide GT Solar with certainty on the federal and state securities lawsuits, will eliminate the uncertainties and further expense associated with those litigations, and will eliminate an unnecessary drain on management time."

The actions to be resolved by this settlement include a consolidated federal securities case pending in the United States District Court for the District of New Hampshire, and a state securities case pending in the Superior Court of Hillsborough County, New Hampshire.

In addition to GT Solar, both the federal and the state securities lawsuits also name as defendants certain of the Company's current and former directors and officers, together with the underwriters of the IPO and certain private equity funds that had invested in the Company prior to the IPO.

A shareholder derivative action pending in New Hampshire state court is not part of the proposed settlement of the securities cases. The derivative action is premised on the same purported misconduct alleged in the federal and state securities cases. The Company and other defendants intend to continue to defend that action vigorously.

Power Electronics

Cissoid showcases THEMIS-ATLAS SiC power driver evaluation kit

The high temperature power driver chipset for SiC switches has also been selected by the FUPET consortium in Japan.

Belgian based firm Cissoid, a provider of high-temperature semiconductor products, has released an Evaluation Kit for THEMIS and ATLAS, a power transistor driver chipset.

This chipset is specifically designed for motor drives and power converters for applications such as aerospace, renewable energies and electric & hybrid vehicles. The Japanese R&D consortium for Future Power Electronics Technology (FUPET) that includes 22 leading companies (Nissan Motor, Fuji Electric, Sanken Electric and others) and 3 academic sectors in these areas has selected THEMIS-ATLAS for its leading-edge developments around SiC and power conversion.

CHT-THEMIS and CHT-ATLAS integrated circuits are specifically designed to drive seamlessly Silicon SiC MOSFETs, JFETs but also silicon IGBTs and MOSFETs and GaN power switches. The new Cissoid chipset can be used either in applications operating in a hot environment, or in systems that will see an increase of the junction temperature due to the power density in the power stage. THEMIS and ATLAS can also be used in lower temperature applications in order to achieve a dramatic increase of the lifetime, with more than an order of magnitude gain compared to traditional solutions. With this new chipset from Cissoid, aeronautic applications such as EMA and EHA-type actuators for X-by-wire, as well as solar inverters, can now reach more than 25 years of lifetime expectancy at 125°C.

CHT-THEMIS and CHT-ATLAS are available in ceramic package forms, guaranteed for operation from -55°C up to +225°C. The Evaluation Board implements one CHT-THEMIS and one CHT-ATLAS integrated circuits, respectively the controller and the push-pull driver stages of the power transistors. The current output is controllable through 2 distinct channels capable of sourcing/sinking up to 4A total to the gate of the power transistor.

Depending on the type of power transistor the user implements, this typically translates into a total current capability of up to 150A in the power stage. A complete set of built-in protection features, such as under-voltage lockout, de-saturation detection, soft-shutdown and active Miller clamping are included.

The Evaluation Board is built from a 200°C polyimide PCB, and it is populated with CHT-THEMIS and CHT-ATLAS integrated circuits in ceramic packages guaranteed for -55°C up to +225C. As a result, the board supports short excursions to +200°C~225°C for testing. The Evaluation Kit includes the Evaluation Board, the complete electrical schematic, the Gerber files, the bill of materials and an Application Note.

The Evaluation Kit THEMIS-ATLAS, referenced EVK-TIT9036 is available now, priced at 2,850€. The integrated circuits CHT-THEMIS and CHT-ATLAS are available now for sampling and evaluation. Pricing starts at 532.53€/chipset up to 200 units in CSOIC ceramic package, The chipset is also available in plastic SOIC package, for maximum temperature of 175°C, under the references CMT-THEMIS and CMT-ATLAS.

G-Way unveils GaN high power broadband amplifier

Typical applications for the 0.5 to 2.5 GHz amplifier include communication systems and broadband jamming.

G-Way Microwave is marketing its MP1500/2G/48MK-CP-A module which operates in a frequency range from 0.5 to 2.5 GHz. The High Power Amplifier (HPA) employs advance GaN power devices that provide an output power of 60 Watts through-out the full frequency band.

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Model MP1500/2G/48MK-CP-A

The package size is (8" x 5.6" x 1.1"), with a nominal operating DC current at 28V of 6 Amps. This HPA offers a typical gain flatness of ± 2.5 dB with a typical gain of 50 dB. The HPA integrates a Bi-directional power coupler for forward and reflection power monitoring. Additional standard features include current & temperature monitoring, enable/disable function, over temperature shutdown with auto recovery. Standby current is a maximum of 0.2 amps under disable status. All DC, monitoring functions, and muting are accessible via a 9 pin D-sub connector. Typical applications include communication systems and broadband jamming.

Cree signs global SiC materials agreement with Nippon Steel

As part of the license agreement, Cree will receive certain financial considerations from Nippon Steel and has also been granted rights to Nippon Steel's relevant SiC-related patents.

Cree has entered into a SiC materials license agreement with Nippon Steel Corporation.

Under the terms of the agreement, Nippon Steel Corporation, and affiliates including Nippon Steel Materials Co., Ltd., have been given the right to manufacture and sell SiC materials for electronic device applications. Over the lifetime of the agreement, Cree will receive certain financial considerations from Nippon Steel. As part of this agreement, Cree was also granted rights to Nippon Steel's relevant SiC-related patents. Other terms of the agreement were not disclosed. No technology transfer between the parties was included.

SiC is a high-performance semiconductor material used in the production of a broad range of lighting, power and communication components, including LEDs, power switching devices and RF power transistors for wireless communications.

SiC devices are used today for solar inverters, high-voltage power supplies and power conditioning in many industrial power applications.

"Cree is a pioneer in SiC materials technologies, resulting in energy-efficient power switching devices and high brightness LEDs," said Steve Kelley, Cree chief operating officer. "We are pleased that Nippon Steel joins us in supporting the electronics device industry with licensed SiC materials."

"Nippon Steel has been conducting intensive R&D on SiC materials over twenty years," said Misao Hashimoto, Nippon Steel, fellow and director of the Advanced Technology Research Laboratory. "The good working relationship between Cree and Nippon Steel enabled us to achieve our commitment for growing the global SiC market."

Fairchild acquires TranSiC

With this acquisition, Fairchild is branching out into SiC power device technology.

Answering the need for increasing efficiencies and higher performance for semiconductor applications, Fairchild Semiconductor is extending its technology capabilities with the acquisition of TranSiC, a SiC

power transistor company.

The acquisition provides Fairchild with bipolar SiC transistor technology with demonstrated industry leading efficiencies and excellent performance over wide temperature ranges, and superior performance over MOSFET and JFET technology approaches. Fairchild also acquired a team of highly experienced SiC engineers and scientists and multiple patents in SiC technology.

"The combination of silicon carbide technology with Fairchild's existing capabilities in MOSFETs, IGBTs and multi-chip modules, along with our global access to customers, positions us to continue to be a leader in innovative, high performance power transistor technology," said Mark Thompson, Fairchild's Chairman, CEO and president.

"The performance levels achieved with SiC technology allow for much higher efficiency in power conversion. It also offers a higher switching speed, a feature that enables smaller end system form factors. Silicon Carbide technology is established in the market with a strong lead over alternatives in the wide bandgap area for applications that require voltages greater than 600V and demonstrates superior ruggedness and reliability," added Dan Kinzer, Fairchild's Chief Technology Officer.

Benefits over alternative technologies include lower on-state voltage drop for a given chip size and higher current density. SiC devices also operate at higher temperatures and have extremely low thermal resistance. With ultrafast switching and only majority carrier conduction, SiC devices offer easy drive solutions due to normally off operation with current gain in the range of 100. Furthermore, they offer easy paralleling due to the positive temperature coefficient of resistance.

Additionally, the device resistance is very near the theoretical limit for SiC. Turn-on and turn-off times in the 25ns range switching 50A from 800V have been demonstrated. Parametric stability has been demonstrated under long term full rated bias and current stress conditions.

These high gain SiC bipolar devices are ideal for high-power conversion applications in down-hole drilling, solar inverters, wind-powered inverters, electric and hybrid electric vehicles, industrial drives, UPS and light rail traction applications. These markets are projected by Yole Development to approach $1 billion by 2020.

This device is capable of industry leading efficiency, cutting losses relative to established silicon approaches by up to half, or allowing an increase of frequency by up to 4 times with similar losses. Overall system cost and value can benefit from much smaller, lighter passive components. For systems that require the best efficiency and power density, there is no equal.

Fairchild is sampling initial 1200V products up to 50A ratings in targeted applications. Future offerings are in development to expand the voltage and current range, and to continue to drive improved energy saving.

Alan Seabaugh wins 2011 Quantum Devices award

The award recognises his "Seminal contributions and leadership in semiconductor devices and circuits based on quantum mechanical tunnelling such as tunnel-FETs and resonant tunnelling transistors "

Alan Seabaugh from the University of Notre Dame was recently named the recipient of the 2011 Quantum Devices Award by the Award Committee of the 38th International Symposium on Compound Semiconductors.

The Quantum Devices Award was established in 2000 by Fujitsu Quantum Devices, and it is awarded for "pioneering contributions to the field of compound semiconductor devices and quantum nanostructure devices."

The citation for Seabaugh's award recognises

his “Seminal contributions and leadership in semiconductor devices and circuits based on quantum mechanical tunnelling such as tunnel-FETs (TFETs) and resonant tunnelling transistors (RTTs)”.

The award will be made at the 2011 ICSC to be held in May 2011 in Berlin, Germany.

Northrop GaN-based modules smash records for sustaining high power

The tests prove that the next generation of active electronically scanned arrays is capable of reliable operation while producing much greater radar sensitivity, at a higher efficiency and lower cost.

Northrop Grumman Corporation has set a new standard for its GaN-based high power transmit/receive (T/R) modules by reliably operating them for more than 180 days during continuous high-power testing.

In a rigorous evaluation conducted by the company’s Advanced Concepts and Technology Division, the T/R modules were tested by using high-stressing operational long-pulse waveforms, which operated on the modules nonstop for more than six months. These waveforms were designed to simulate the electronic activities of actual radar functions, in a relevant environment allowing Northrop Grumman engineers to understand how well they would perform in tactical operation.

The successful tests prove that the next generation of active electronically scanned arrays (AESA) is capable of reliable operation while producing much greater radar sensitivity, at higher efficiency and lower cost. With this new threshold established, the T/R modules can serve as critical technology elements for a wide range of future applications.

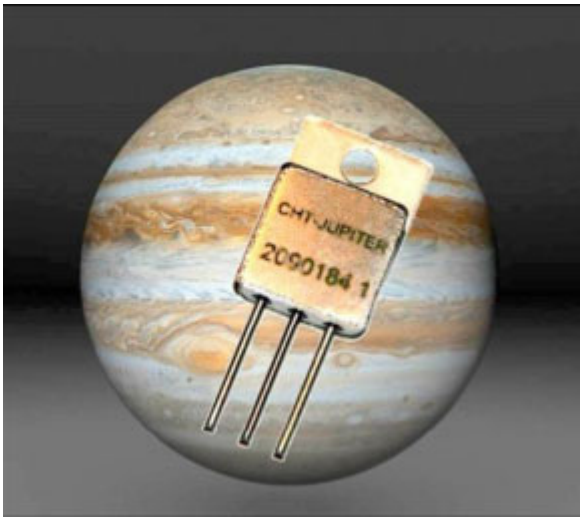
“By successfully employing the latest advances in high power semiconductor technology in a functioning T/R module, we have demonstrated the great performance and reliability of our design approach,” said Steve McCoy, vice president of the Advanced Concepts business unit within the company’s Electronic Systems sector. “This new level of maturity also supports technology readiness for the next generation of Northrop Grumman’s high performance, low cost AESA radars, and opportunities for cost reduction and performance upgrades to our current AESA product line.”

Cissoid reveals high voltage 225°C SiC power switch

With operation guaranteed between -55°C and +225°C, the CHT-JUPITER greatly simplifies the design of high-voltage converters that have to operate in extreme environments.

Belgian based firm Cissoid, a provider of high-temperature semiconductor products, has unveiled JUPITER. The firm claims this is the first high-temperature SiC high-voltage switch with seamless gate control through a simple logic-level 0/5V.

CHT-JUPITER is a 600V normally-off switch rated for 1A drain current at 225°C. The device is packaged in a hermetically sealed TO-254 metal package and guaranteed for operation from -55°C up to +225°C.



CHT-JUPITER’s on-resistance ranges from 0.7 Ohms at 25°C to 1.25 Ohms at 225°C. Its input capacitance is typically 430pF. The gate leakage and drain off currents are respectively 160nA and 250µA at 225°C.

A key feature of this new device is its ability to be driven by a 0/5V logic-level signal, which dramatically reduces the complexity of the

driver stage. In particular, CHT-JUPITER greatly simplifies the design of medium-power, high-voltage converters such as Switched Mode Power Supplies and Motor Drives that have to operate in extreme environments.

With CHT-JUPITER, electronic engineers can decrease the complexity of their electrical schematics, shorten their bill-of-material, and improve the reliability, weight and size of their systems whilst reducing the need for cooling in their applications.

CHT-JUPITER' data-sheet is available now from Cissoid web site. CHT-JUPITER can be ordered now for sampling and evaluation. Pricing starts at 481€/unit for up to 200 units.

Rohm SiC Schottky Diodes push the performance envelope

The firm says its new SiC diodes provide industry-leading performance combining lower forward voltage and faster recovery time than in silicon based devices.

Rohm Semiconductor has unveiled its SCS1xxAGC series of high-performance SiC Schottky barrier diodes (SBD).

Rohm says its new class of SiC diodes offer industry-leading low forward voltage and fast recovery time, leading to improved power conversion efficiency in applications such as PFC/power supplies, solar panel inverters, uninterruptible power supplies, air conditioners and others.

The SCS1xxAGC series maintains low forward voltage over a wide operating temperature range which results in lower power dissipation under actual operating conditions. For example, the 10 A rated part has a VF of 1.5 V at 250C and 1.6 V at 1500C. Low VF reduces conduction loss while the ultra-short reverse recovery time (15 ns, typical) enables high-speed switching and minimizes switching loss.

With the acquisition of SiCrystal AG, Rohm possesses manufacturing capability for SiC semiconductors from ingot formation to power device fabrication. This allows the rapid development of advanced products and complete control of raw materials for industry leading reliability and quality.

According to David Doan, Senior Technical Product Marketing Manager for Rohm Semiconductor, "SiC is the ideal material for power electronics with its high breakdown voltage, low power loss, high operating temperature and superior thermal conductivity. Rohm is not the first vendor to offer SiC SBDs, but we're introducing devices with some differentiating features such as low VF and the highest current rating at 600 V (a true 600 V/20 A SBD, not dual 2x10 A). These diodes are but the first in Rohm's SiC product lineup. We also have 1200 V SBDs and MOSFETs, currently in sampling at strategic partners, to address higher power applications such as UPS and to enable all-SiC power devices."

Pricing is as follows:

US$ 6.38 SCS106AGC (If= 6 A)

(Small OEM quantity) US$7.70 SCS108AGC (If= 8 A)

US$9.70 SCS110AGC (If= 10 A)

US$13.48 SCS112AGC (If= 12 A

US$24.60 SCS120AGC (If= 20 A)

Samples are currently in stock and delivery is 16 weeks ARO.

Powdec GaN transistor breaks barriers

Dramatically reducing power losses, the device increases break-down voltage and eliminates current collapse.

Powdec and researchers from Sheffield University have succeeded in developing breakthrough high voltage GaN power transistors.

This was realised by creating semiconductor hetero-junction structures based on novel principles, which solve the problems of conventional transistors and dramatically improve the transistor performance. In these transistors, current collapse is almost completely eliminated, power losses are reduced and high break-down voltages of more than 1,100 V are realised.

These new GaN transistors are suited to be used in a broad range of equipment from inverters in consumer appliances to server power supplies, electric vehicles and industrial motors to lower power use.

GaN is a next generation semiconductor that enables power devices to have lower power losses and higher energy efficiency compared to present silicon devices. Together with Powdec's GaN diodes, these GaN transistors will be core devices enabling an energy efficient, green future.

Up until now GaN HFETs with high-voltage, high energy efficiency have been developed, however they suffer from a major problem of current collapse where current decreases and on-resistance increases during operation. To suppress this phenomenon, various techniques have been developed including metal field plates attached to the gate electrode to decrease the electric field and surface passivation to suppress gate leakage. However, improvement in device performance is still not sufficient.

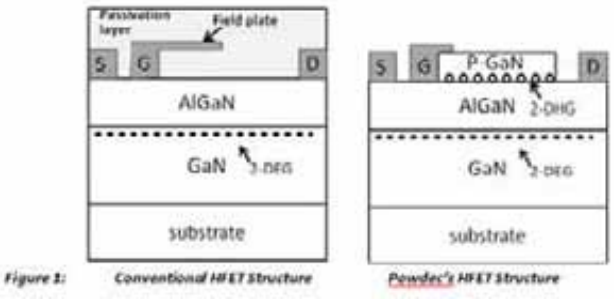


Figure 1: Conventional HFET Structure Powdec's HFET Structure

In Powdec's design, instead of a conventional metal field plate, which has hit its limits, a thin film of p-type GaN (p-GaN) is used (Figure 1).

Powdec succeeded in realising a polarisation effect in the top and bottom interfaces of the AlGaN layer where equal negative and positive charge is generated, creating a 2 dimensional hole gas (2DHG) and 2 dimensional electron gas (2DEG) at the interfaces (Figure 1). This polarisation effect almost completely suppresses both the current collapse and current leakage at the gate of the HFET.

This is a similar effect seen in silicon super junction devices where the entire length of the gate-drain channel is depleted (high resistance), and the electric field is distributed uniformly along the channel, enabling these GaN transistors to sustain high breakdown voltages.

This accomplishment will be presented at the 23rd International Symposium on Power Semiconductor Devices and ICs (ISPSD) in May, 2011 at San Diego, USA.

Powdec solved the difficult issue of realising a high hole density in collaboration with the University of Sheffield. This allowed a 2DHG of a high hole density of 1.3 x 10^{13}/cm^2 to be achieved which Powdec says, for the first time in the world.

These transistors with a gate-drain distance of 22mm, in the off-state, sustainable voltages of over 1,100 V are achieved, even without surface passivation. At 1,100 V, drain and gate leakage current is an extremely low 0.3mA/mm and on-resistance is at a "world leading" level of 6 mW/cm^2. In a dramatic comparison to conventional HFETs, there is no current collapse at a stress voltage of 350 V (Figure 2).

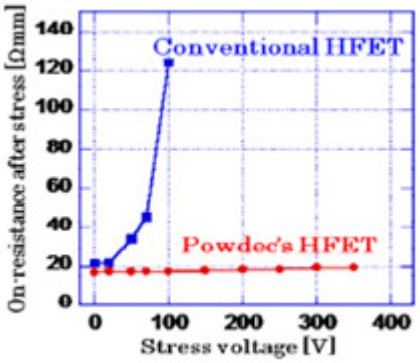


Figure 2. Comparison of current collapse showing virtually zero current collapse for Powdec's new HFET

Going forward, Powdec's says its breakthrough HFET technology can be easily combined with 'normally-off' structures.

Powdec now plans to shift growth of the devices to large diameter silicon wafers, with aims to have these energy efficient, high voltage products shipping in volume in 2 to 3 years. To accelerate the market adoption of these innovative, low-power GaN devices, Powdec is actively expanding its partnerships worldwide.

EPC Introduces two industry-leading eGaN FETs

Both GaN on silicon devices have many times superior switching performance compared to similar state-of-the-art silicon-based power MOSFETs. Both devices also have low on resistance and are smaller than silicon devices with similar resistance.

Efficient Power Conversion Corporation is introducing the EPC2001 and EPC2015, two lead-free, RoHS-compliant enhancement-mode GaN on silicon (eGaN) FETs.

The EPC2001 FET is a 100 VDS device with a maximum RDS(ON) of 7 milliohms with 5 V applied to the gate, and the EPC2015 is a 40 VDS with a maximum RDS(ON) of 4 milliohms.

Both eGaN FETs provide significant performance advantages over similar state-of-the-art silicon-based power MOSFETs. Both devices have low on resistance, are smaller than silicon devices with similar resistance and have many times superior switching performance.

Figure : Magnified die photo of EPC2015 or EPC2001 indicating the solder bar that is connected to the silicon substrate and the decreased solder bar width.

Applications that benefit from eGaN FET performance increases include DC-DC power supplies, point-of-load converters, class D audio amplifiers, notebook and netbook computers, LED drive circuits and telecom base stations.

"Protection of the environment is a high priority for EPC and a driving force for offering lead-free, RoHS-compliant eGaN FETs. The EPC2001 and EPC2015 are the first lead-free and RoHS-compliant eGaN FETs to be introduced and it is our plan to have all eGaN FETs available lead-free and RoHS-compliant within the next 4 months," said Alex Lidow, co-founder and CEO.

In 1k piece quantities, the EPC2001 is priced at $2.80 and the EPC2015 is priced at $2.48.

Transphorm unveils 99% efficient GaN Diode

The 600 volt diodes using its patented EZ-GaNTM technology are ultra-efficient, compact and easy-to-embed, and cut energy lost by 20 percent.

At the Applied Power Electronics Conference (APEC), Transphorm revealed how it would solve the large and growing problem of electrical energy waste in power conversion.

The company announced the availability of its first product: power diodes based on its patented, high-performance EZ GaNTM (Gallium Nitride) technology. Transphorm's efficient, compact, and easy-to-embed solutions cut energy waste by 20 percent and simplify the design and manufacturing

of a wide variety of electrical systems and devices, including motor drives, power supplies and inverters for solar panels and electric vehicles.

To demonstrate the performance advantage of its patented GaN based technology, Transphorm will showcase at the APEC exhibition a Total GaNTM based, dc-to-dc Boost Converter running at more than 99 percent efficiency.

"On the heels of our February 23 launch, we are pleased to announce the availability of samples of our first product at APEC and showcase our technology to customers, partners and other stakeholders," said Umesh Mishra, CEO of Transphorm. "For customers looking for a low-risk roadmap to the next generation of power conversion technology, Transphorm provides a cost-effective, customizable and easy-to-use solution ready for commercial scale."

Energy loss that occurs during power conversion is equivalent to the daily output of 318 coal plants, and costs the U.S. economy $40 billion per year. Transphorm is the first company to provide a viable solution to inefficient power conversion, by commercializing a high-voltage normally off GaN solution.

The company's GaN-based power converters are designed with 600 Volt transistors and low loss power diodes, making them the industry's fastest and most efficient conversion technology. They come in industry-standard packages and are designed for optimum high-frequency switching, lowest loss and highest efficiency.

"It is critical to realise high performance under high voltage switching operation that is required in real applications. Transphorm's Total GaNTM based Boost Converter operating at over 99% efficiency at 400 Volts demonstrates this for the first time," said Primit Parikh, President of Transphorm. "From material technology and device processing to circuit design and module assembly, Transphorm designs its power conversion solutions to meet the needs of our customers, helping them scale quickly and save money."

By using a proprietary EZ-GaNTM platform, Transphorm can reduce power system size, increase energy density while reducing overall system cost. This design uses fewer components, minimizes snubbers and filters, simplifies module packaging, and enables high-frequency design by reducing transients.

Transphorm designs and supplies application-specific modules for a variety of customers. A vertically integrated company, Transphorm offers a high performance product at competitive cost and rapid time to market.

The firm's ultra-efficient and cost-competitive power modules enable significant energy savings across the grid, from HVACs to hybrids, and from servers to solar panels. Transphorm is showcasing its products at booth # 346 at APEC.

Equipment and Materials

Explosion injures 3 at Agilent facility in Santa Rosa

The incident occurred when an employee was cleaning an MBE machine and there was a chemical flash.

An explosion at the Agilent Technologies facility in Santa Rosa on Tuesday morning left three people injured and prompted about 100 employees to evacuate the building, according to the media outlet to MercuryNews.com.

The explosion happened at about 10:30 a.m. in Building One at the facility, located at 1400 Fountaingrove Parkway. It occurred in a ground-floor laboratory, in an area where integrated circuits are made using MBE, said Jeff Weber, spokesman for Santa Clara-based Agilent.

The explosion injured two employees, a man who was taken to Santa Rosa Memorial Hospital with critical injuries and a woman with minor injuries who was later taken by private car to Kaiser Hospital.

The man was cleaning a machine when there was

a chemical flash, Weber said. He said cleaning the machine generally involves wearing a protective body suit, but he did not know whether the man was wearing one on Tuesday morning.

According to Weber, the woman, a contract employee from Volt, was injured when something fell and hit her on the head outside the laboratory.

A Santa Rosa firefighter who was one of the first to respond to the incident also was injured and was taken to Santa Rosa Memorial Hospital, Fire Inspector Marita Petersen said. She did not know his condition.

About six engines from the Santa Rosa Fire Department were dispatched to the scene. Rincon Valley Fire Department offered mutual aid, with four fire engines, one truck and two chief officers.

Agilent's own chemical emergency response team also responded. No flames were found, but there was some damage to the laboratory, Weber said.

The explosion's cause is under investigation. There were about eight chemicals involved, Petersen said. She did not know what those chemicals were.

However, speculation from other media sources indicates that phosphorus was the major culprit.

It is not clear whether staff will be returning to work today. People working in the company's other three buildings at the facility were unaffected.

Veeco revenues strong at $254 M thanks to LED & Solar markets

The firm sees strength continuing in China as it builds its LED infrastructure for solid state lighting. Quoting activity in Korea and Taiwan is also picking up with improved utilisation rates being reported by key customers.

Veeco Instruments has announced its financial results for the first quarter ended March 31, 2011.

John R. Peeler, Veeco's Chief Executive Officer, commented, "Veeco reported a strong first quarter, with revenues of $255 million, gross margin of 51% and non-GAAP net income of $57 million, all in line with our guidance. As expected, revenues were down 15% sequentially, but increased 89% from the prior year first quarter. LED & Solar revenues were $215 million and Data Storage revenues were $40 million. Veeco's first quarter bookings totalled $231 million," continued Peeler, "with another solid quarter in LED & Solar of $198 million and Data Storage orders were $33 million."

"We continued to experience strong demand for MOCVD systems and, while China remained the majority of our bookings, we also received orders from key customers in Taiwan, Korea and the U.S." The Company's Q1 2011 book-to-bill ratio was .91 to 1, and quarter-end backlog was $530 million. Veeco's operating cash flow during Q1 was extremely strong at $75 million, resulting in cash and short term investments at the end of the quarter of $779 million."

In February, Veeco announced its newest generation MOCVD system, the TurboDisc MaxBright Multi-Reactor ("cluster") MOCVD System. Peeler commented, "Our customers are excited about MaxBright, as evidenced by the strong quoting and purchase order activity underway with key LED customers in all regions. During the first quarter, we shipped three MaxBright 4-chamber systems. Orders have been received from three of the top tier Taiwanese LED makers, as well as from key customers in Korea and China. Customers are clearly recognizing that we are helping to enable the industry's transition to LED lighting with a unique value position and the most

productive MOCVD systems on the market."

Veeco also announced that it is calling for redemption all of its outstanding 4.125% Convertible Subordinated Notes due 2012. Approximately $91.6 million aggregate principal amount of the Notes were outstanding as of April 20, 2011. Please visit www.veeco.com on our Investor Relations site to read today's 8K filing for further detail on this action.

Veeco's second quarter 2011 revenue is currently forecasted to be between $255 and $285 million. Earnings per share are currently forecasted to be between $1.08 to $1.32 on a GAAP basis.

"We currently forecast Q2 2011 orders at 25% or more above the Q1 level, and we have visibility for continued order strength through Q3," added Peeler. "We are experiencing extremely strong levels of quoting activity, very positive customer reaction to MaxBright, and a large number of multi-system deals currently on the table. We expect MOCVD order patterns to remain lumpy from quarter to quarter depending upon the timing of customer deposits. We see order strength continuing in China as it builds its LED infrastructure for solid state lighting, and quoting activity in Korea and Taiwan is also picking up with improved utilisation rates being reported at key customers. Orders for our Data Storage products should also improve sequentially as customer quoting activity for technology and capacity buys are improving to support anticipated hard drive unit growth in the second half of 2011."

Full Year 2011 Guidance

"Veeco's $530 million in backlog, combined with our forecasted Q2 revenue increase and very positive order outlook give us even greater confidence in our full year 2011 guidance of over $1 billion in revenues and non-GAAP earnings per share of greater than $5.00," continued Mr. Peeler. "We are optimistic about the future and confident that we are well positioned from a technology, product, and operational standpoint to grow our LED & Solar and Data Storage businesses in 2011 and beyond."

A conference call reviewing these results was held yesterday.

A replay of the call is available upto midnight on May 9, 2011 by dialling 888-203-1112 begin or 719-457-0820 using passcode 1854737, or on the Veeco website. There is also a slide presentation posted on the website.

MEI flying high with large order from major CS manufacturer

The multiple order for wet bench equipment from the new plant in Texas confirms the compound semiconductor company and MEI are experiencing rapid growth.

MEI produced and delivered a record order for seventeen semiconductor wet processing systems for a major compound semiconductor manufacturer, completing delivery this month.

Primary applications for the wet bench process systems are compound semiconductor etch, wafer cleaning, stripping and plating processes.

MEI was selected as the semiconductor equipment vendor of choice for duplicating the semiconductor manufacturer's processes of record into a new fabrication facility in Texas.

The order for custom semiconductor wet benches is remarkable, both in its size and speed. The leading compound semiconductor manufacturer requested the custom, semi-automated and manual wafer processing tools in September 2010 and needed rapid delivery.

MEI was able to meet both the production specifications and rapid delivery schedule to meet their growing business needs, and had a strong history of quality and support. Both the compound semiconductor company and MEI are experiencing rapid growth, and the production of these systems creates a significant win for the operations of both companies.

"We're very pleased to be able to fill this large order," said Dan Cappello, CEO of MEI. "The contract is especially challenging and rewarding because of the strict performance requirements that the vendor had, combined with the rapid production schedule. With our Revolution rotary wet bench and Achiever wet processing platforms, we were able to meet their throughput and quality needs with custom wet benches. With our new production facility, we were able to ramp up and meet their schedule without difficulty."

Oxford honoured with "Queen's Award for Enterprise: International Trade"

The 12th Queens award won by the company recognises its aggregate exports of £139 million in six years and the creation of 29 more full time permanent UK jobs.

Oxford Instruments Plasma Technology has been awarded The Queen's Award for Enterprise: International Trade for more than doubling its overseas earnings over six years of sustained growth, and exporting over 90% of its production.

Oxford Instruments Plasma Technology (OIPT), part of the Oxford Instruments Group, designs and manufactures high performance capital equipment for the semiconductor industry. The company started trading in 1981 and is one of the world's largest supplier of thin film plasma etch and deposition equipment to the R&D market, and is also very successful in several key production applications.

The Company's outstanding performance was based on a comprehensive product range addressing a wide spread of markets combined with an aggressive strategy of developing new markets, primarily in Asia. This resulted in aggregate exports of £139 million in six years and the creation of 29 more full time permanent UK jobs, during the period applicable to the Award selection criteria.

This growth has continued as demand for equipment has increased, and the Company has recently undergone an expansion and refurbishment programme, investing over £2.5 million ($4.0 million) in its factory near Bristol, UK. This has expanded production capacity by over 50%, and allowed OIPT to keep up with the significant growth in business witnessed in the last 12 months.

The Company has also substantially enlarged its Applications Laboratory by extending the research and development area, and installing an additional Class 1000 clean room area where another 6 tools for process development and running customer samples will be installed. This increase in facility size has resulted in more staff, with over 330 people now working in the company worldwide, with many new additions in the front line including process expertise, service and support.

Andy Matthews, Managing Director of OIPT says "Our Company's continued growth and success is attributable to our strong workforce, continuous research and development, and our belief in listening to our customers and developing the tools and systems that they want. We're delighted with the Award as it recognises the skill, commitment and dedication of everyone at Oxford Instruments Plasma Technology over a sustained period, and we intend continuing to build on this success."

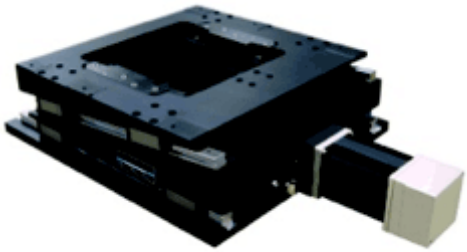
"Oxford Instruments aims to meet our customers' needs through advanced technology and service, using innovation to turn smart science into world class products," comments Jonathan Flint, Chief Executive. "This is the 12th Queen's Award that the Oxford Instruments Group has won, and is a reflection of our commitment to delivering the tools that are needed to shape the future."

Aerotech high load lift stage offers precise elevation

With a large aperture, and coping with loads of up to 135 kg, the AVS100 is suited for use in manufacturing and inspection, automated tool alignment and other systems used in the compound semiconductor industry.

Aerotech's AVS1000 series stages offer a solution for applications that require positioning of large or heavy loads over very small incremental movements in elevation above a horizontal plane.

The low profile and precise motion capability make these stages ideal for use in semiconductor manufacturing and inspection, automated tool alignment, machine vision inspection systems, laser machining applications, and more. The series also offers optional cleanroom and ESD protection.



The AVS1000 series provides precise elevation of a load in a vertical plane using a moving-wedge design. The precision machined wedge block converts horizontal movement from a precision-ground ball screw into vertical elevation of the AVS1000 series tabletop. Excellent pitch and yaw characteristics over the length of travel minimise the impact of angular errors. AVS1000 performance includes exceptional resolution (5 nm) and accuracy (±1 µm), with the ability to apply this performance to large loads up to 135 kg. With a standard 5 mm travel, custom designs are also available.

Sealed linear motion guide bearings with integral wipers are incorporated to provide excellent payload capability, long life, and smooth, precision motion. Stable and parallel vertical motion with no rocking or horizontal deviation of the platform is assured. Careful design of the wedge angle and bearing system allows the AVS1000 series to achieve submicron resolution and still maintain a compact profile.

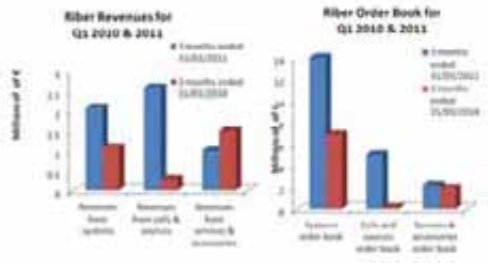
The vertical lift approach offers an alternative to traditional Z-plane oriented stages. Not only do the AVS1000 series stages offer a lower profile, but the load can also be conveniently accessed from any side due to the large aperture. And by centring the payload over the bearings, there are no cantilevering effects.

The AVS1000 series includes Aerotech's high performance NEMA 34 frame-size BMS series brushless, slotless servomotor. The slotless motor has zero cogging and therefore is optimized for applications requiring very smooth motion.

Riber order book storming with 134% increase

Strong quarterly results showed that much of the gains were due to the French company's diversification into the strongly growing CIGS technology market.

Riber, a manufacturer of MBE equipment, recorded €5.7 million in revenues for the first quarter of 2011, up 98% in relation to the first quarter of 2010, with its order book climbing 134% compared with last year to €21.3 million.



Growth in business is being driven by the development of systems sales, with two machines delivered during the first quarter. This is combined with the increase in sales of evaporation sources and cells, multiplied by nine compared with the same period in 2010. This change reflects ongoing move to diversify Riber's activities on the strongly growing OLED (Organic LED) and thin-layer solar panel (CIGS technology) markets.

Sales of services and accessories are down temporarily compared with the high level seen in

the first quarter of 2010. The positive evolution of revenues also results from Riber's policy aiming to evenly spread production throughout the year.

The order book at the end of March 2011 came to €21.3 million, 134% higher than the same period in 2010. It consists of six research systems and four production systems, with the company receiving an order for a new production machine in March. Out of these 10 machines in the order book, only one system is not scheduled to be delivered during the year. In addition, the book includes major effusion cell orders in the OLED sector.

Riber will be releasing its revenue forecasts at the end of the first half of 2011.

The next General Meeting will be held on Thursday May 26th, 2011.

5N Plus completes acquisition of MCP

The firm has acquired Belgium based firm MCP which produces gallium, indium, selenium and tellurium, and made a public offering of $125 million worth of shares.

5N Plus has completed its previously-announced acquisition of MCP Group SA and "bought deal" public offering of 13,590,000 common shares at a price of $9.20 per share, for total proceeds to 5N Plus of $125 million.

"We are delighted to have completed the acquisition of MCP", said Jacques L'Écuyer, President and Chief Executive Officer of 5N Plus. "We look forward to working with MCP in order to expand 5N Plus' product offering and establish a worldwide manufacturing and distribution platform."

MCP, headquartered in Tilly, Belgium, is the world's leading producer and distributor of bismuth and bismuth chemicals, with a market share that MCP estimates to be more than 50%, and an important player in other specialty metals, including gallium, indium, selenium and tellurium. MCP's products are used in a variety of products, mainly related to industrial and electronic applications.

MCP employs approximately 400 people in its nine production sites and 15 commercial offices across Europe, Asia and the United States. In connection with the acquisition, Frank Fache, co-Chief Executive Officer of MCP, will be appointed to the Board of Directors of 5N Plus, which will be comprised of six directors. Laurent Raskin, also co-Chief Executive Officer of MCP, is expected to join 5N Plus' Board of Directors at the next annual meeting of shareholders.

Fache and Raskin will be appointed Executive Vice-Presidents of 5N Plus, and will report directly to Jacques L'Écuyer, President and Chief Executive Officer of 5N Plus.

At the closing of the acquisition, 5N Plus acquired all of the issued and outstanding shares of MCP for:

(i) a cash consideration of €105,793,548 (equal to approximately CDN$142.8 million as of February 25, 2011, the last business day before the date of the Acquisition Agreement among 5N Plus and MCP and its shareholders);

(ii) promissory notes to the selling shareholders of MCP in an aggregate amount of €46,908,459 (equal to approximately CDN$63.3 million as of February 25, 2011); and (iii) 11,377,797 common shares of 5N Plus issued to the selling shareholders. The purchase price also includes a cash "holdback" in an amount of €14,970,785 (equal to approximately CDN$20.2 million as of February 25, 2011).

Using the closing price of 5N Plus' shares on the Toronto Stock Exchange on Friday, February 25, 2011 ($8.00) and the Euro to Canadian noon dollar exchange rate of 1.3494 on that date, the total consideration for the acquisition of MCP is approximately €235.2 million or CDN$317.3 million. In addition, 5N Plus assumed the net debt of MCP, which represented €65.6 million as at December 31, 2010, most of which is comprised of short term debt used to fund MCP's working capital requirements.

The promissory notes in the amount of €46.9 million issued by 5N Plus to the selling shareholders are payable over a three year period after closing of the acquisition and the cash "holdback" of €14.9 million is payable by 5N Plus three years after closing of the acquisition. The 11,377,797 shares issued by 5N Plus to the selling shareholders are subject to lock□up provisions lasting up to 18 months.

In light of today's closing of the acquisition of MCP, investors in the "bought deal" public offering received common shares in lieu of subscription receipts. The 13,590,000 common shares issued by 5N Plus were sold to a syndicate of underwriters led by National Bank Financial Inc. and including GMP Securities L.P., CIBC World Markets Inc., TD Securities Inc., Versant Partners Inc., Cormark Securities Inc., HSBC Securities (Canada) Inc., M Partners Inc. and Stonecap Securities Inc.

The public offering was made by way of short form prospectus filed with the securities commissions of each of the provinces of Canada, as well as in the United States under applicable registration statement exemptions. The shares will start trade on the Toronto Stock Exchange.

The net proceeds from the "bought - deal" public offering were used by 5N Plus to fund part of the cash portion of the MCP purchase price. 5N Plus paid the balance of the cash portion of the purchase price from its cash on hand.

Following the closing of the acquisition of MCP and the "bought-deal" public offering, there are 70,864,207 common shares of 5N Plus issued and outstanding.

Nothing wrong with EVG's innovation for NIL technology

Frost & Sullivan have awarded EVG with its "2010 Technology Innovation Award " for the firm's nanoimprint lithography (NIL) tools.

EV Group, a supplier of wafer bonding and lithography equipment for the MEMS, nanotechnology and semiconductor markets, has received the 2010 European Nanoimprint Technology Product Innovation Award from independent market research firm, Frost & Sullivan.

The prestigious award recognises EVG's accomplishments in addressing industrial needs with nanoimprinting solutions.

Frost & Sullivan implemented a comprehensive research study that ranked multiple nanoimprint lithography (NIL) providers across several categories including advancement of technology, industrial implementation, solution portfolio, fulfilling future market needs, and impact on end user. EVG received among the highest marks in every category and ranked significantly higher than the nearest competitor overall.

"With market leadership in wafer bonding, 3D interconnect and MEMS manufacturing tools, EV Group has vast expertise in different areas that synergize with its nanoimprinting solutions," said Frost & Sullivan research analyst, Kenneth Chua. "The company is known to provide proven solutions fulfilling the needs of the semiconductor industry. Its NIL equipment continues this legacy and brings about low-cost, high-throughput and reliable solutions to its end-users."

According to Frost & Sullivan, much of the competition in NIL has been focused on making NIL viable for either mainstream semiconductor fabrication or patterning for future data storage media (bit patterned media in hard disk drives). In contrast, EVG has leveraged its expertise and experience to focus on key high-growth markets, including optics and microfluidics, where manufacturers are successfully benefiting from EVG's NIL technology today.

Moreover, as EVG continues to enhance the capabilities and performance of its NIL technology, it periodically evaluates its potential for other markets, and is prepared to realign its development strategies in the event that NIL becomes better suited to the needs of data storage and mainstream semiconductor manufacturers. This is evident in EVG's latest development, which is the ability to pattern features as small as 12.5 nm in diameter using ultraviolet-assisted nanoimprinting, compatible with its EVG620, EVG6200 and EVG770 NIL systems.

Commenting on the award, Thomas Glinsner, EV Group's head of product management said, "With a decade of experience in nanoimprint lithography, this award is testament to the quality and EVG's outstanding achievements in NIL technology innovation, as well as to the company's overall success in aligning its development efforts with market demand."

Nanoimprinting is used to produce patterns on a

substrate by mechanical means. EVG's ultra-violet assisted NIL (UV-NIL) as well as hot embossing processes leverages the company's proprietary soft stamp technology, whereby a master imprinting stamp is used to generate soft stamps. This method increases the lifetime of the master stamp due to reduced mechanical contact and enables its customers to benefit from an overall reduction in cost of ownership.

Japanese Quake not expected to affect GaAs Industry

Strategy Analytics says there is no danger of immediate disruption to the supply of gallium and arsenide raw materials.

Strategy Analytics says that Japan is a leading player in the GaAs RF/microelectronics industry, accounting for 50 % of bulk substrate supply, 18-20 % of global SI GaAs epitaxial substrate production and up to one-fifth of the global GaAs device market.

The impact of the March 11 earthquake and ensuing tsunami, as well as the on-going issues with the nuclear reactors at Fukushima, are affecting the equipment and materials suppliers, consumer electronics companies, automotive, test and measurement companies in Japan.

Strategy Analytics believes the primary factors that will impact GaAs device supply out of Japan relate to more generic issues which have an impact on the whole electronics industry. These include disruption to utilities, logistics and concerns around the availability of materials used in chip packaging and assembly.

The firm's assessment of the situation indicates that there is no danger of immediate disruption to the supply of gallium and arsenide raw materials. The supply of SI (semi-insulating) bulk substrates will be sustained and GaAs device manufacturing facilities were also largely unaffected.

There is the possibility, however, that any significant ramp in demand for GaAs epitaxial substrates over the next three to six weeks may lead to end-users being placed on allocation.

Strategy Analytics analysis shows that the Japanese epitaxial substrate suppliers were running at full production rates with little to no excess inventory in the supply chain.

LDK Solar branches out further into silane gas business

The firm expects to begin construction of a new plant to produce the gas in Q3 2011 and commercial production is planned to commence in Q2 2012

LDK Solar, a manufacturer of multicrystalline solar wafers and PV products, has invested $35 million to establish a new manufacturing line to produce silane gas in its Mahong Plant in Xinyu City, Jiangxi Province in China.

The firm will supply up to 2,000 MT of silane gas to meet the growing demand from the semiconductor, solar and flat panel display industries.

LDK Solar expects to begin construction of this new plant in the third quarter of 2011 and to achieve mechanical completion in the first quarter of 2012. Commercial production is being planned to commence in the second quarter of 2012.

"We are very pleased to expand our business to capture the growing demand for silane from the semiconductor, flat panel display and solar industries in Asia," stated Xiaofeng Peng, Chairman and CEO of LDK Solar.

"We believe this new investment in manufacturing silane gas has a great synergy with LDK Solar's polysilicon manufacturing expertise and will enhance LDK Solar's product offerings in the long term. There is growing demand for silane in China, but there is not a domestic supplier."

"We will be able to leverage our existing technologies and Trichlorosilane (TCS) production assets to lower the capital expenditure as well as to achieve very attractive manufacturing costs. We believe that LDK Solar will have a competitive

advantage as the first mover supplying domestic silane gas needs," added Goran Bye, President and CEO of LDK Silicon and Chemical Business Unit.

Keithley introduces System SourceMeter with "widest current range"

This wide range is critical for a variety of R&D, reliability, and production test applications, such as testing HBLEDs and power semiconductors.

Keithley Instruments has revealed the Model 2651A High Power System SourceMeter instrument, the latest addition to the company's Series 2600A System SourceMeter family.

Specifically designed for characterising high power electronics, Keithley says the model 2651A provides the widest current range available in the industry. This range is critical for a variety of R&D, reliability, and production test applications, such as testing high brightness LEDs (HBLEDs), power semiconductors, DC-DC converters, batteries, and other high power materials, components, modules, and subassemblies.

Like each member of the Series 2600A family, the Model 2651A offers a highly flexible, four-quadrant voltage and current source/load coupled with precision voltage and current meters. It combines the functionality of multiple instruments in a single full-rack enclosure: semiconductor characterisation instrument, precision power supply, true current source, DMM, arbitrary waveform generator, V or I pulse generator, electronic load, and trigger controller, and is fully expandable into a multi-channel, tightly synchronized system via Keithley's TSP-Link technology.

Unlike competitive solutions, which typically have limited power, measurement speed, and/or resolution, the Model 2651A can source or sink up to 2,000W of pulsed power (±40V, ±50A) or 200W of DC power (±10V@±20A, ±20V@±10A, ±40V@±5A). It can also make precise measurements of signals as low as 1pA and 100 microvolts at speeds up to one microsecond per reading.

The Model 2651A provides a choice of digitizing or integrating measurement modes for precise characterisation of both transient and steady-state behaviour. Two independent analogue-to-digital (A/D) converters define each mode—one for current and the other for voltage—which run simultaneously for accurate source readback without sacrificing test throughput.

The digitizing measurement mode's 18-bit A/D converters allow capturing up to one million readings per second for continuous one-microsecond-per-point sampling, making this mode an appropriate choice for waveform capture and measuring transient characteristics with high precision. Competing solutions must average multiple readings to produce a measurement result and often don't allow the measurement of transient behaviour.

The integrating measurement mode, based on 22-bit A/D converters, optimizes the instrument's operation for applications that demand the highest possible measurement accuracy and resolution. This ensures precise measurements of the very low currents and voltages common in next-generation devices. All Series 2600A instruments provide integrating measurement mode operation.

Connecting two Model 2651A units in parallel via TSP-Link expands the system's current range from 50A to 100A. This is two-and-one-half to five times greater than the nearest competing solution. The voltage range can be expanded from 40V to 80V when two units are connected in series.

The embedded Test Script Processor (TSP) included in all Series 2600A instruments simplifies testing by allowing users to address multiple units as a single instrument so that they act in concert. The built-in trigger controller in the Model 2651A can synchronize the operation of all linked channels to within 500 nanoseconds. These capabilities of the Model 2651A provide the broadest dynamic range available in the industry, making the unit suitable for a broad variety of high current, high

power test applications, including:

• Power semiconductor, HBLED, and optical device characterisation and testing
• Characterisation of GaN, SiC, and other compound materials and devices
• Semiconductor junction temperature characterisation
• Reliability testing

To minimise device self-heating during tests, a common problem with high power semiconductors and materials, the Model 2651A offers high speed pulsing capabilities that allow users to source and measure pulses with high accuracy. Pulse widths from 100 microseconds to DC and duty cycles from 1 percent to 100 percent are programmable. Competing solutions are typically hampered by limited flexibility for programming the instrumentation's duty cycle.

TSP Express, Keithley's LXI-based I-V test software utility, is embedded in the instrument, so there's no need for software installation or programming. From basic to advanced tests, TSP Express delivers device data in three easy steps: connect, configure, and collect. It also simplifies connecting instruments to allow higher pulsing levels.

Results can be viewed in either graphical or tabular format and then exported to a .csv file for use with spreadsheet applications. Two other powerful software tools for creating test sequences are also provided. The Test Script Builder application supports creating, modifying, debugging, running, and managing TSP scripts. An IVI-based LabVIEW driver simplifies integrating the Model 2651A into LabVIEW test sequences.

Availability

Effective April 2011, delivery is eight weeks after receipt of order.

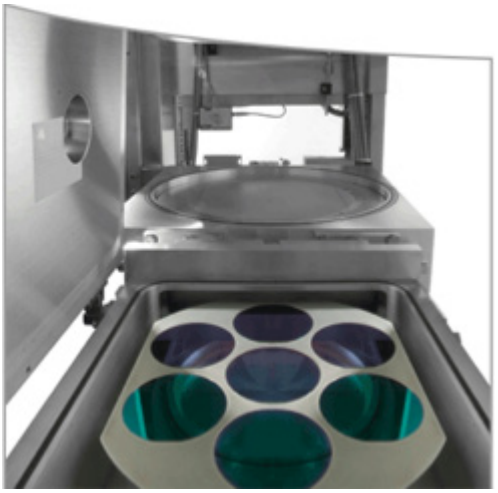
Soraa selects several Plasma-Therm systems for fab

The three systems will be used for etch and deposition steps which are vital to the firm's technology development and the expansion of their LED and laser fabrication capacity.

Soraa, an LED and laser technology company has recently purchased three Plasma-Therm systems to provide plasma deposition and etch steps in it wafer fabrication process.

Founded by pioneering nitride researchers from the University of California at Santa Barbara professors Shuji Nakamura, Steve DenBaars, and Jim Speck, Soraa is developing a new class of LEDs and lasers for application in general lighting and projection display markets.

Led by their CEO, Eric Kim, the company is rapidly expanding its U.S. based manufacturing capacity in preparation for volume production.



VERSALINE PECVD system for R & D and production

The three systems purchased include a 790+ RIE, VERSALINE PECVD and VERSALINE ICP. By providing dielectric deposition and metal, dielectric, and active material patterning, they collectively deliver key front-end processing technologies, steps that are critical to the development and production of state-of-the-art photonic devices. Demand for LEDs and lasers continues to increase as they enter mainstream applications that include consumer lighting, displays, biotechnology, defence and industrial among others.

"As engineers apply their skills and knowledge to different semiconductor applications, they often keep the knowledge and experience they have from working with different equipment

sets. Positive experiences with Plasma-Therm processing systems have repeatedly led to new orders and continued relationships," stated Ed Ostan, Executive Vice President of Sales and Marketing. "The value previously experienced with Plasma-Therm equipment was instrumental in this manufacturer's decision to purchase Plasma-Therm equipment. Our emphasis on building strong business relationships as well as the proven reliability and support of our systems is a key factor in repeat orders."

Hiden unveils TMS System for fast event gas analysis

The Hiden Spaci-MS system can be used in MOCVD growth.

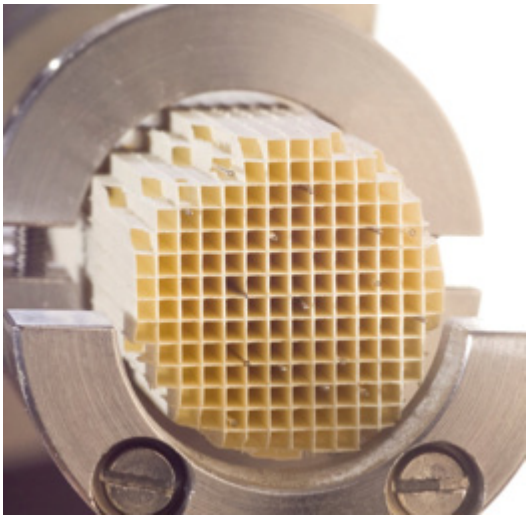
Hiden Analytical is introducing its Transient Mass Spectrometer System specifically designed for the analysis of fast transient gas events at process pressures near atmosphere.

Typical applications include respiratory analysis, process control, pulsed gas experiments for surface reaction/reduction studies in catalyst characterisation and, with high-speed rotating multiport valve, spacial gas distribution measurement as demonstrated in the award-winning Hiden Spaci-MS system.

It can also be used in MOCVD growth.

The benchtop system features a fast response purpose designed capillary inlet together with pulse ion counting mass detection enabling response times of less the 150milliseconds and measurement speeds of up to 500 data points per second over an entire 7 decade dynamic range.

The system monitors species with molecular weights to 300 amu, with higher mass ranges available for specialist applications. The Hiden MASsoft control and data acquisition program provides ease of operation with integral calibration routines together with user-programmable template files for automatic operation of routine analyses. Multiple I/O's permit integration of external parameters such as temperature or flow rates, and control of external equipment with species specific pressure level sensors.



Oxford Instruments & Southampton University to present at workshop

The two organisations will present results of their collaboration at the Mountbatten Building, University of Southampton on 30 June 2011.

The first part of the seminar shares experiences in successful collaborations between industry and the scientific research community. In the afternoon, the speakers present latest results of the collaborations and how partners can truly benefit from this.

Oxford Instruments will also describe its processing and servicing of equipment and how it provides support to users.

Agenda

Initiating and funding successful partnerships
UK Academic/Industrial partnerships - a model for success
Understanding public funding sources
First results of a successful partnership: Materials

and etchers for nanowire biosensors
Oxford Instruments/Southampton University collaboration success

Results of successful partnerships

Plasma source & Ion Beam technologies
Developing plasma etch processes
How to get the most from your tool (CS)
ALD and technical achievements/working in a successful partnership
Cleanroom tour & Networking Tea

The specialist speakers from the University of Southampton include

Don Spalinger, Director, Corporate Relationships
Myrddin Jones, Lead Technologist; Electronics, Photonics & Electrical Systems, Technology Strategy Board
Peter Ashburn, ECS

The specialist speakers from Oxford Instruments Plasma Technology include

Frazer Anderson, Business Development Director
Mike Cooke, CTO
Bob Gunn, Applications team leader
Nick Curtis, Training Officer
Chris Hodson, ALD Product Manager

Places are limited, so Oxford advises to book as soon as possible. There is no charge for this event however booking is essential.

The conference will also include a tour of the Mountbatten Building's state-of-the-art clean room and fabrication capability which will enable researchers in the ECS and ORC groups to make leading-edge contributions to new research areas in nanotechnology, bio-nanotechnology and photonics.

Mountbatten Building's state-of-the-art clean room

Further information on the event can be obtained by emailing plasma@oxinst.com

MV Products unveils vacuum traps for MOCVD reactors

The traps will be ideally suited to manufacturing solar cells and HB-LEDs which generate high volumes of particulates.

MV Products is introducing a line of vacuum foreline traps for manufacturing processes that create large volumes of solid byproducts such as those used for producing solar cells and HB-LEDs.

MV Vacuum Inlet Traps are ideally suited for MOCVD, HVPE, PECVD, or LPCVD processes used in manufacturing solar cells and HB-LEDs which generate high volumes of particulates. Offered in several models to accommodate different manufacturing process applications and volume requirements, they can incorporate a wide range of filters for trapping solids, organic solvents, and other contaminants and protecting vacuum pump systems from oil back streaming.

MV Multi-Trap *Posi-Trap*

Featuring user-selectable filter elements, MV Vacuum Inlet Traps include the MV Multi-Trap which has a knock-down stage plus two stages of filter elements and is capable of up to 2,500 cu. in. of solids accumulation, and the Posi-Trap for applications up to 50 CFM. Both are offered in several sizes with stainless steel, copper gauze, molecular sieve, activated charcoal, pleated polypropylene (2-, 5- and 20 µm pore sizes), and Sodasorb filters.

MV Vacuum Inlet Traps are priced according to model and filter element selection.

SPTS promotes Kevin Crofton to Chief Operating Officer

The semiconductor industry veteran has been promoted to lead company operations into its next phase of growth.

SPP Process Technology Systems (SPTS), a manufacturer of plasma etch and deposition, and thermal processing equipment for the semiconductor industry has promoted Kevin Crofton to Chief Operating Officer (COO).

Crofton was serving as the company's executive vice president in charge of global customer operations and as managing director of SPTS' Single Wafer Division before his promotion to this newly created role. He will continue to report to William Johnson, President and CEO, and will provide operational direction to facilitate the company's continued expansion.

"Kevin has been instrumental in the formation and subsequent rapid growth of SPTS, especially in the expansion of our global sales and service network," said William Johnson, president and CEO of SPTS. "In the past 16 months, he has steered our global field operations to much success, both in gaining new customers and increasing the number of technology applications. In his new role, Kevin will continue to lead our field operations and the U.K. Single Wafer Division to further growth, while in addition, providing operational direction to the Thermal Products Division in San Jose, California."

Crofton has a bachelor's degree in aerospace engineering from Virginia Tech, and a master's degree in international business from American University, and is an 18 year veteran of the semiconductor equipment industry. Currently he resides in Newport, Wales UK, is a keen runner and enjoys participating in marathons in the U.K. and his native U.S.

Anne Roby named president of Praxair Asia

The provider of gases used in III-V compound semiconductor growth aims to expand its presence in Asia.

Anne Roby, currently president of Praxair Electronics, has been named president of Praxair Asia. She will be responsible for the growth and profitability of Praxair's industrial gases business in China, India, South Korea, and Thailand.

Praxair's products include gases which are instrumental to III-V epitaxial semiconductor growth.

She will retain responsibility for the global electronics business, which has operations in Asia, Europe and North America.

"Anne's extensive knowledge of Praxair's business and capabilities, along with her proven leadership abilities, puts her in a strong position to continue to deepen Praxair's presence in the important Asian economy," said Ricardo Malfitano, executive vice president.

Roby joined Praxair in 1991 as a development associate in the company's R&D organisation. She became global marketing manager for chemicals and refining in 1996 and moved to Houston in 1999 to become a pipeline sales and business manager in the North American Industrial Gases business unit.

She was named area director in 2004, responsible for commercial activities related to both pipeline and merchant atmospheric products. In 2006, she became vice president of the U.S. South Region, responsible for business in a seven-state area that includes many of Praxair's major chemicals and refining customers. She was appointed vice president, Global Sales, for Praxair in 2009, and

became president of Praxair Electronics in 2010.

Roby earned a bachelor's degree from Villanova University and a doctorate in chemical engineering from the University of Delaware. She holds four patents for industrial gas applications.

Plasma-Therm acquires majority share in Advanced Vacuum

The two companies, which supply etch and deposition systems, will extend their market reach in the areas of dedicated R&D systems, failure analysis and non-clustered platforms.

Plasma-Therm, a supplier of plasma etch and deposition equipment, has secured majority shareholder status of Advanced Vacuum, a vacuum and thin film equipment provider headquartered in Sweden.

Both operations have partnered to create a strategic alliance with complementary etch and deposition systems that support the needs of R&D through production environments.

This mutually beneficial partnership will strengthen their respective product offerings and expand an established sales and service network. With additional support and funding through Plasma-Therm, Advanced Vacuum will be able to dedicate additional resources to product development.

Thomas Engstedt, CEO of Advanced Vacuum, expressed that, "We are very pleased to establish this relationship with Plasma-Therm. Having a world class partner who can provide financial support, technology and a solid service infrastructure will allow us to increase our product portfolio and grow our market share."

"The two companies, each a leading supplier for etch and deposition systems, will extend their market reach in the areas of dedicated R&D systems, failure analysis and non-clustered platforms. Advanced Vacuum brings an outstanding reputation for providing high performance at low cost and will complement Plasma-Therm's value driven product portfolio of systems intended for production," said Abdul Lateef, CEO at Plasma-Therm.

"With this transaction we anticipate expansion into applications that will leverage Advanced Vacuum's capabilities for custom vacuum equipment design and fabrication. The large combined installed system base will benefit from their expertise in control system upgrades."

Engis to expand world headquarters by 54,000 square feet

The expanded centre will house five labs. One of these will be The Wafer Process Lab (WPL), which serves the advanced material and compound semiconductor markets.

Engis Corporation, a provider of superabrasive finishing solutions for lapping, honing, polishing and grinding, plans to nearly double the size of its world headquarters in Wheeling, ILL, a Chicago suburb.

The company will expand its state-of-the-art manufacturing and warehouse facilities and create space for the new Engis Technology Centre.

Engis announced plans for a 54, 000-sq.-ft. expansion, shown here in an architectural rendering, that demonstrates the company's commitment to superabrasives innovation, excellence in customer support and keeping jobs in the United States.

The 54,000-sq.-ft., multi-million-dollar expansion will bring total space to 121,500 sq. ft. and enable the company to consolidate all engineering, process

development labs, manufacturing, warehousing and administrative offices into a single facility.

In conjunction with this project, Engis will add new manufacturing, process development and testing and measurement equipment. Construction will start in April and be complete by autumn 2011.

"This expansion demonstrates our long-term commitment to customers as a leading-edge provider of superabrasive solutions," says Stephen Griffin, president of Engis Corporation.

"For example, new automated manufacturing equipment will enable us to increase our ability to support global markets, while the Engis Technology Centre will enhance our capability to develop turnkey manufacturing solutions. It also demonstrates our commitment to keep and generate future jobs in Wheeling and in the United States."

The cornerstone of the expansion project will be the new Engis Technology Centre, where the company works hand-in-hand with customers to finish components to nanometre tolerances and achieve mirror surfaces.

The Centre will house five labs. One of these will be The Wafer Process Lab (WPL), which serves the advanced material and compound semiconductor markets. The Process Development Lab (PDL), will provide assistance for general industrial lapping and polishing inquires. The Bore Finishing Lab (BFL), will work closely with customers on honing and bore finishing applications in the automotive, hydraulic, medical, aerospace and defence industries.

"Consolidating all the labs in one location will enable us to concentrate our engineering resources and enhance our customer service activities," says Griffin.

Engis currently leases space for some of its process labs and other activities at a nearby location. All of these operations will be incorporated into the new expansion.

Kyma and Sinmat to together advance crystal fabrication services

The companies hope to provide one-stop shopping and enhanced value to their customers, from boule-grinding, slicing, and orientation-fixing, through to mechanical polishing and CMP.

Kyma Technologies, a supplier of ultra-high purity crystalline GaN and AlN materials and related products and services, and Sinmat, have agreed to collaborate to advance crystal fabrication to better serve their customers.

Sinmat is a provider of innovative chemical mechanical planarization (CMP) technologies for wide band-gap materials. A primary goal of the agreement is to provide customers with a single entry point to access a variety of services which until now have been provided separately by Kyma and Sinmat.

Together, the companies hope to provide one-stop shopping and enhanced value to their customers, from boule-grinding, slicing, and orientation-fixing, through to mechanical polishing and CMP. These services are available for a wide variety of materials ranging from SiC, sapphire, GaN, AlN, and silicon to emerging new materials such as diamond.

"This partnership with Sinmat realises our final goal towards offering our customers a complete portfolio of crystal fabrication services," said Tamara Stephenson, Kyma's Technical Sales Engineer.

"Since we announced the opening of our custom crystal fabrication facility earlier this year, customer interest has been excellent, ranging from simple crystal slicing and shaping to more complex device-wafer backside processing. Our partnership with Sinmat will allow us to go all the way to making epi-ready crystalline substrates for a range of materials."

Kyma president and CEO Keith Evans added, "Sinmat's leading expertise and capabilities in advanced surface modification chemistry and engineering is a perfect complement to Kyma's leading expertise and capabilities in crystal fabrication processing. By working together our

customers can leverage the strengths of both companies together with the simplicity of a simple and organised customer-supplier interface."

Sinmat's Vice-President and CTO Rajiv Singh further elaborated "This agreement provides a unique opportunity for crystal growers to transform their boules into epi-ready wafers utilising state-of-the-art technologies from both companies."

Sinmat develops advanced planarisation-enabled technologies, manufacturing processes, engineered substrates, and semiconductor devices. Sinmat's technologies enable higher performance and lower cost manufacturing of semiconductor devices.

The company provides several unique Chemical Mechanical Planarization (CMP) manufacturing technologies needed for current and next-generation semiconductor, clean energy, and advanced material industries, such as LED, computer chip and memory devices.

Sinmat's CMP technologies are based on the company's unique expertise in creating engineered slurries, mixtures of nano-particles and chemicals that smooth out rough topographies and create defect-free surfaces in a rapid, reliable, and cost-effective manner.

Kyma says the market for nitride semiconductor devices is expected to surpass $30B over the next decade. The market for nitride based LEDs grew at almost a 100% year-over-year rate in 2010 to nearly $12B.

B&W Tek unveils improved portable spectrophotometer

The i-Spec is a portable spectrophotometer system equipped with silicon and InGaAs array detectors, allowing it to measure from as low as 350nm to as high as 2600nm.

B&W Tek, an advanced instrumentation company producing optical spectroscopy and laser systems hs revealed its updated i-Spec portable spectrophotometer.

The i-Spec is a portable spectrophotometer system equipped with silicon and InGaAs array detectors, allowing it to measure from as low as 350nm to as high as 2600nm. The i-Spec has optimised high throughput spectrographs, plug-and-play USB interface, broadband and high speed measurement systems, built-in high intensity light sources with forced air cooling, and SMA905 fibre-optic input/output connections.

B&W Tek is offering a variety of fibre sampling accessories for the i-Spec, making it ideal for broadband transmission, reflection, absorption, and emission measurement applications.

The newest i-Spec model, the BWS005A, features a new and improved extended InGaAs array detector with a built-in AutoZero function resulting in exceptionally low noise and high dynamic range. It is designed with four levels of gain, producing great results for most applications in low light level NIR detection. The i-Spec is ideal for agricultural, pharmaceutical, geological/gemological, and semiconductor applications.

Hiden Analytical unveils vacuum species analysers for MBE systems

The single stage mass filters can be used for many general applications, with the 3F-series triple-stage mass filter being used for the most demanding applications requiring maximum performance in terms of both mass resolution and abundance sensitivity.

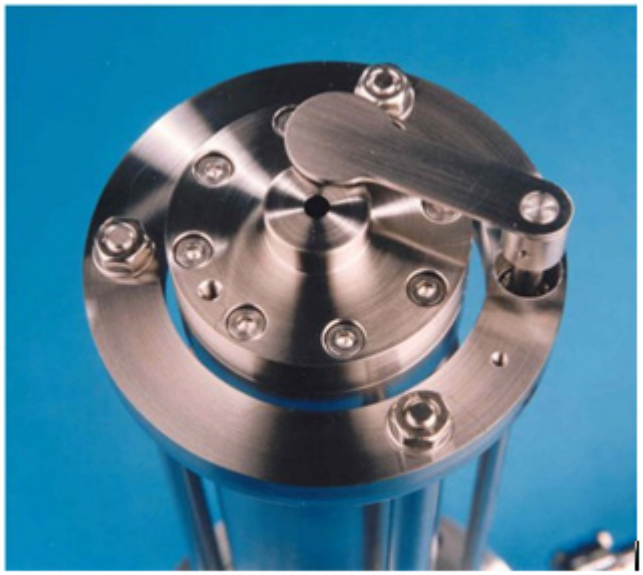
Hiden Analytical now offers an extended range of quadrupole residual gas analysers for diverse vacuum applications through the pressure range from millibar through to extreme high vacuum (XHV).

The firm's standard systems are supplemented by a custom-engineering design facility for experiment-specific requirements including in-vacuum cooling and heating, probe insertion distance and remote in-vacuum mounting.

Typical mass ranges of 1:50amu to 1:300amu accommodate most gaseous and vapour species, with alternative mass ranges to 1000amu offered for specialised applications. Analogue and pulse ion counting detectors are selectable to optimise performance for widest dynamic range of 10 decades, fastest measurement rate to 500 samples per second and highest sensitivity to 5x10E-16 millibar.

RGA Shutter

The single-stage mass filters are used for many general applications, with the 3F-series triple-stage mass filter being used for the most demanding applications requiring maximum performance in terms of both mass resolution and abundance sensitivity.



RGA Shutter closeup

All operating parameters are software integrated giving full control of mass resolution, ionisation current and ionisation energies, with the soft ionisation feature being used for simplification of complex molecular fragmentation spectra. Ion source options are configured for general analysis, for molecular beam applications or for minimal degas rates for UHV/XHV applications.

Indium headed for prices at over $1,000 per kilo

The report, "Chinese Indium Strategies: Threats and Opportunities for Displays, Photovoltaics and Electronics," indicates that high indium prices may force the conservative display industry to shift to ITO alternatives, especially those using nanomaterials.

Industry analyst firm NanoMarkets has just released a new report that examines the impact on the electronics and related materials industries of recent Chinese policies to restrict the export of indium.

This activity has recently been formalised in a new Chinese five-year plan, which is designed to stimulate domestic Chinese high-tech industries. NanoMarkets claims that this move by the Chinese government will have significant negative implications for several classes of electronics products but also serve as a catalyst for growth in

companies in the extraction and electronic materials industries.

The report, "Chinese Indium Strategies: Threats and Opportunities for Displays, Photovoltaics and Electronics," indicates that high indium prices may force the conservative display industry to shift to ITO alternatives, especially those using nanomaterials.

NanoMarkets also believes that indium is headed for prices at over $1,000 per kilo and higher prices have been suggested in the Chinese press; as much as $3,000 per kilo.

Japanese indium users, who currently use 70 % of China's indium production, may find themselves without sufficient indium within a year. As a result, NanoMarkets expects firms in countries that have not been large suppliers of indium to rush into the market. This includes firms in Australia, Canada, Laos and Peru, among others.

For the first time, there will be significant amounts indium extraction from sources other than zinc mines; sources such as tin and tungsten mining. Chinese indium policy seems certain to incentivize new sources outside of China to produce indium either through primary extraction methods or through recycling/reclamation.

A sharp rise in the indium price will harm the resurgent CIGS PV industry but in turn will open the door for CdTe and c-Si PV which will become for more price competitive. In addition, new classes of absorber materials (zinc or tin) might emerge that are CIGS-like but don't actually use indium.

China is the world's largest supplier of indium by far. As such its policies affect the markets for all indium related electronic materials. In this report, NanoMarkets discusses the impact and opportunities of these policy shifts in the areas of displays, lighting, photovoltaics and compound semiconductor chips.

The report examines in depth evolving Chinese indium policy both in economic and political terms and explains how it will create new opportunities for both the extraction industry and the advanced materials industry worldwide. In particular, it looks at the impact on markets for novel transparent conductors and compound semiconductors.

Novel Devices

Aixtron sells first 300mm graphene system to AIST

The system will be used for the development and application of nanocarbon materials, which is one of the three main research assignments of the Green Nanoelectronics Centre (GNC) established in April 2010.

Aixtron SE has a new order for the first automated 300mm Black Magic system for graphene deposition from the National Institute of Advanced Industrial Science and Technology (AIST) in Japan.

The unique properties of graphene make it an extremely promising channel material for next generation microelectronics and high frequency applications.

AIST placed the order in the first quarter of 2011 and the system will be delivered in the third quarter of 2011. The system will be installed in the AIST Super Clean Room at Tsukuba and commissioned by the local Aixtron support team.

The Aixtron automated Black Magic Graphene system met the very challenging requirements by the project group of Synthesis and Transfer Application of Graphene at the Collaborative Research Team Green Nanoelectronics Centre (GNC).

The system will be used for the development and application of nanocarbon materials, which is one of the three main research assignments of GNC established at AIST in April 2010.

Ken Teo, Director of Nanoinstruments at Aixtron, comments, "We are providing the most technologically advanced platform for graphene production available today and I believe it is the world's first 300mm size commercial system ever sold."

"The reactor has extraordinary temperature uniformity and a sophisticated gas delivery system which has been designed for precise precursor delivery. The system also includes our ARGUS in-

situ thermal mapping system. An automated handler and multi-wafer loadlock are integrated for high throughput."

Headquartered in Tsukuba and Tokyo, Japan, AIST is a public research institution funded mainly by the Japanese government. AIST has over 40 autonomous research units in various innovative research fields, and the units are located at nine research bases and several sites (smaller than research bases) of AIST all over Japan. AIST was ranked in the top 10 Japanese Research Institutions for All Fields 1998-2008 by Thomson Reuters.

GNC is supported by the "FIRST Program" which aims to encourage leading-edge research and development to strengthen Japan's international competitiveness and contribute to the society and people's welfare.

This program was approved by the Council for Science and Technology Policy, Cabinet Office, Government of Japan in 2009. GNC research and development activities are performed in collaboration with visiting researchers from industrial partner companies.

Doping InAs quantum dots opens up possibilities

"Nanocrystal doping" developed by Hebrew University researchers results in semiconductor nanocrystals with enhanced electrical function.

Researchers at the Hebrew University of Jerusalem have achieved a breakthrough in the field of nanoscience by successfully altering nanocrystal properties.

By doping free-standing InAs nanocrystals using a solution-phase synthesis, they say they have opened up the way for the manufacture of improved semiconductor nanocrystals.

Semiconductor nanocrystals consist of tens to thousands of atoms and are 10,000 times smaller than the width of a human hair. These tiny particles have uses in a host of fields, such as in LEDs, solar cells and bio-imaging.

However, these semiconductors are poor electrical conductors, and in order to improve electrical conductivity so they can be used in electronic circuits, their conductivity must be tuned by the addition of impurities (or doping).

Due to the importance of doping to the semiconductor industry, researchers worldwide have made continuing attempts at doping nanocrystals in order to achieve ever greater miniaturisation and to improve production methods for electronic devices.

Unfortunately, these tiny crystals are resistant to doping, as their small size causes the impurities to be expelled. An additional problem is the lack of analytical techniques available to study small amounts of dopants in nanocrystals. Due to this limitation, most of the research in this area has focused on introducing magnetic impurities, which can be analysed more easily. However, the magnetic impurities don't really improve the conductivity of the nanocrystal.

Uri Banin in his lab (Hebrew University photo)

Now, Uri Banin and his graduate student, David Mocatta, of the Hebrew University Centre for Nanoscience and Nanotechnology, have achieved a breakthrough in their development of a straightforward, room- temperature chemical reaction to introduce impurity atoms of metals into the semiconductor nanocrystals.

In their novel solution-phase synthesis of metallically doped, free-standing InAs nanocrystals, they claim to have seen new observations not previously reported. When the researchers tried to explain the results, however, they found that the physics of doped InAs nanocrystals was not very well understood.

Bit by bit, in collaboration with Oded Millo of the

Hebrew University and with Guy Cohen and Eran Rabani of Tel Aviv University, they built up a comprehensive picture of how the impurities affect the properties of nanocrystals. The initial difficulty in explaining this process proved to be a great opportunity, as they discovered that the impurity affects the nanocrystal in unexpected ways, resulting in new and intriguing physics.

"We had to use a combination of many techniques that when taken together make it obvious that we managed to dope the nanocrystals. It took five years but we got there in the end," said Mocatta.

This breakthrough sets the stage for the development of many potential applications with nanocrystals, ranging from electronics to optics, from sensing to alternative energy solutions. Doped nanocrystals can be used to make new types of nanolasers, solar cells, sensors and transistors, meeting the exacting demands of the semiconductor industry.

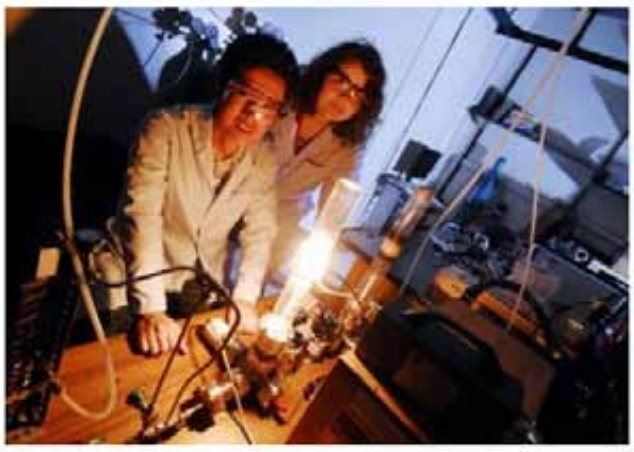
This work is further described in the paper "Heavily Doped Semiconductor Nanocrystal Quantum Dots", by Mocatta *et al,Science,* Vol. 332 no. 6025 pp. 77-81, published online 1 April 2011 ; DOI: 10.1126/science.119632.

Georgia Tech technique produces new generation graphene nanoribbons

Epitaxial graphene may be the basis for a new generation of high-performance devices that will take advantage of the material's unique properties in applications where higher costs can be justified.

A new "templated growth" technique for fabricating nanoribbons of epitaxial graphene has produced structures just 15 to 40 nanometres wide that conduct current with almost no resistance.

These structures could address the challenge of connecting graphene devices made with conventional architectures, and set the stage for a new generation of devices that take advantage of the quantum properties of electrons.



Georgia Tech graduate student Baiqian Zhang and undergraduate student Holly Tinkey observe a high-temperature furnace used to produce epitaxial graphene on a SiC wafer

"We can now make very narrow, conductive nanoribbons that have quantum ballistic properties," said Walt de Heer, a professor in the School of Physics at the Georgia Institute of Technology. "These narrow ribbons become almost like a perfect metal. Electrons can move through them without scattering, just like they do in carbon nanotubes."

Professor Walt de Heer and equipment used to characterise graphene properties

De Heer discussed recent results of this graphene growth process March 21st at the American Physical Society's March 2011 Meeting in Dallas. The research was sponsored by the National Science Foundation-supported Materials Research Science and Engineering Center (MRSEC).

First reported on October 3 2010 in the advance online edition of the journal *Nature Nanotechnology,* the new fabrication technique allows production of epitaxial graphene structures with smooth edges.

Earlier fabrication techniques that used electron beams to cut graphene sheets produced nanoribbon structures with rough edges that scattered electrons, causing interference. The resulting nanoribbons had properties more like insulators than conductors.

"In our templated growth approach, we have essentially eliminated the edges that take away from the desirable properties of graphene," de Heer explained. "The edges of the epitaxial graphene merge into the SiC, producing properties that are really quite interesting."

The templated growth technique begins with etching patterns into the SiC surfaces on which epitaxial graphene is grown. The patterns serve as templates directing the growth of graphene structures, allowing the formation of nanoribbons and other structures of specific widths and shapes without the use of cutting techniques that produce the rough edges.

Georgia Tech graduate students Yike Hu and John Hankinson observe a high-temperature furnace used to produce epitaxial graphene on a SiC wafer

In creating these graphene nanostructures, de Heer and his research team first use conventional microelectronics techniques to etch tiny "steps", or contours, into a SiC wafer whose surface has been made extremely flat. They then heat the contoured wafer to approximately 1,500 degrees Celsius, which initiates melting that polishes any rough edges left by the etching process.

Established techniques are then used for growing graphene from SiC by driving the silicon atoms from the surface. Instead of producing a consistent layer of graphene across the entire surface of the wafer, however, the researchers limit the heating time so that graphene grows only on portions of the contours.

The width of the resulting nanoribbons is proportional to the depth of the contours, providing a mechanism for precisely controlling the nanoribbon structures. To form complex structures, multiple etching steps can be carried out to create complex templates.

"This technique allows us to avoid the complicated e-beam lithography steps that people have been using to create structures in epitaxial graphene," de Heer noted. "We are seeing very good properties that show these structures can be used for real electronic applications."

Since publication of the *Nature Nanotechnology* paper, de Heer's team has been refining its technique. "We have taken this to an extreme, the cleanest and narrowest ribbons we can make," he said. "We expect to be able to do everything we need with the size ribbons that we are able to make right now, though we probably could reduce the width to 10 nanometres or less."

While the Georgia Tech team is continuing to develop high-frequency transistors, perhaps even at the terahertz range, its primary effort now focuses on developing quantum devices, de Heer said. Such devices were envisioned in the patents Georgia Tech holds on various epitaxial graphene processes.

"This means that the way we will be doing graphene electronics will be different," he explained. "We will not be following the model of using standard FETs, but will pursue devices that use ballistic conductors and quantum interference. We are headed straight

into using the electron wave effects in graphene."

Taking advantage of the wave properties will allow electrons to be manipulated with techniques similar to those used by optical engineers. For instance, switching may be carried out using interference effects, separating beams of electrons and then recombining them in opposite phases to extinguish the signals.

Quantum devices would be smaller than conventional transistors and operate at lower power. Because of its ability to transport electrons with virtually no resistance, epitaxial graphene may be the ideal material for such devices, de Heer said.

"Using the quantum properties of electrons rather than the standard charged-particle properties means opening up new ways of looking at electronics," he predicted. "This is probably the way that electronics will evolve, and it appears that graphene is the ideal material for making this transition."

De Heer's research team hopes to demonstrate a rudimentary switch operating on the quantum interference principle within a year.

Epitaxial graphene may be the basis for a new generation of high-performance devices that will take advantage of the material's unique properties in applications where higher costs can be justified. Silicon, today's electronic material of choice, will continue to be used in applications where high-performance is not required, de Heer said.

"This is an important step in the process," he added. "There are going to be a lot of surprises as we move into these quantum devices and find out how they work. We have good reason to believe that this can be the basis for a new generation of transistors based on quantum interference."

Microsemi unveils enhancement mode GaN FETs for radiation applications

The devices are expected to deliver excellent high temperature performance with junction temperatures approaching 300 °C.

Microsemi Corporation, a provider of semiconductor technology aimed at building a smart, secure, connected world, has announced the development of enhancement mode GaN FETs for satellites and other military power conversion, point-of-load, and high speed switching applications.

The FETs are built on a wide band gap material, which increases performance over current radiation-hardened silicon MOSFETs. The enhancement mode FETs have extremely low parasitic capacitance which reduces switching losses by at least 50 percent resulting in higher efficiency circuits.

They have lower on-resistance to minimise conduction losses resulting in circuit efficiency gains and exhibit excellent radiation performance.

Microsemi is working with Efficient Power Conversion (EPC) in the development of a complete line of high performance FETS for high reliability space and military applications.

The first new devices will be offered by Microsemi in voltages of 40V, 60V, 100V, 150V, and 200V and will have Drain-to-Source on-resistance values of 4 milli-ohms to 100 milli-ohms. Additionally, the devices are expected to deliver excellent high temperature performance with junction temperatures approaching 300 °C. A family of standard through-hole and surface-mount packages in addition to flip chip die will be available.

Preliminary radiation testing of the devices has shown high Single Event Effect (SEE) and Total Ionising Dose (TID) capability. This allows the devices to operate in high orbit and deep space missions without degradation to performance. Microsemi will work closely with the Defence Logistics Agency (DLA) to define the test specifications within standard military drawings (MIL-PRF-19500 slashsheets), assuring customers of the performance capabilities of these products.

Prototype customer samples are expected to be available by mid-2011 with production quantities by November 2011.

ITRI adopts Synopsys' TCAD Sentaurus to develop SiC technology

The advanced device simulation capabilities support development of novel SiC power devices.

Synopsys, a provider of software and IP for semiconductor design, verification and manufacturing, has announced that the Industrial Technology Research Institute of Taiwan (ITRI) has adopted Synopsys' TCAD Sentaurus simulation software to support its research and development of silicon carbide (SiC) semiconductor devices.

TCAD Sentaurus' accurate modelling enables ITRI to speed up the development of SiC power devices with detailed simulations of their electrical and thermal behaviour.

SiC is a wide bandgap semiconductor with superior electrical and thermal properties for power devices. Over the past decade, SiC Schottky barrier diodes have become commercially available, resulting in the development of a new generation of SiC devices targeting applications in hybrid and electric vehicles, smart grid and other innovative power systems. ITRI is researching a wide range of power devices to serve emerging market needs for electric vehicles and solar arrays.

"The market for SiC devices is growing rapidly because of the need for more energy-efficient power switches in major application segments like automotive and energy distribution," said Ming-Jer Kao, EOL deputy general director of ITRI. "The Synopsys TCAD Sentaurus software allows us to simulate the electrical and thermal performance of our devices in a very realistic way. This capability is essential for understanding the behaviour of our new devices and is used to optimise the device characteristics to meet market requirements."

The TCAD Sentaurus product family comprises 2D and 3D process and device simulation tools for exploring and optimising silicon and compound semiconductor technologies. The TCAD Sentaurus tools implement models specific to SiC simulation.

"Power devices are a fast-moving segment of the semiconductor market, with innovation through new device structures and materials addressing increasingly complex and challenging applications. TCAD simulation can help accelerate the commercial deployment of SiC by supporting the design and optimisation of new devices," said Howard Ko, senior vice president and general manager of the Silicon Engineering Group at Synopsys. "As a leader in semiconductor research and development, ITRI's adoption validates the value Synopsys TCAD simulation brings to SiC power device development."