

LED News

Uniroyal installing reactors for manufacturing HB-LEDs

UNIROYAL Technology Corp is installing three EMCORE TurboDisc reactors to manufacture high brightness blue and green LEDs, as part of a joint venture between the companies. The systems will be capable of producing 200 million high brightness LEDs per year at full capacity.

Uniroyal entered into an agreement with EMCORE last financial year to acquire technology for the manufacture of epitaxial wafers used in high brightness LEDs. The companies also entered into a joint venture, managed by Uniroyal, whereby the partners are near completion of a \$25 million state-of-the-art facility for the manufacture of high brightness LEDs in Tampa, FL, USA. The facility, upon completion, will

be one of the largest single-site LED manufacturers in North America.

The joint venture is focusing on blue and green high brightness LEDs, but will produce a full array of colours including high brightness red, orange and yellow.

Commercial production at the facility is expected to begin in the third quarter of 1999. The market for HB-LEDs is tipped to reach US\$1 billion by 2003 from an estimated \$386 million in 1998. Applications include automotive lighting, traffic signals and outdoor signs.

Uniroyal owns Convertible Preferred Stock of EMCORE that, upon conversion, represents 6.4% of the company. **Uniroyal Technology; tel: +1-941-361-2100; Fax: +1-941-361-2214.**

Laser News

Nichia releases samples of commercial blue laser

NICHIA Chemical Industries Ltd (Tokushima) has continued its leadership in the race to commercialize the blue laser with the release of trial samples of InGaN-based violet laser diodes.

The laser diodes have an output power of 5 mW, an emission wavelength of 400 nm, an operating current of 40 mA and operating voltage of 5 V. The lifetime of the devices is 10 000 hours at room temperature.

The diodes promise to win a number of major applications from higher capacity optical storage devices and higher-resolution laser printers, to more precise laser surgery.

Reflecting the importance of the devices, Nichia's chief researcher, Shuji Nakamura, is con-

tinuing to win a number of major awards for his blue laser developments. Among the latest major prizes conferred to him and his research group are a 1998 C&C Prize and a 1998 Rank Prize for Optoelectronics.

Both awards recognized Nakamura's efforts in pioneering efforts in the development of GaN-based lasers. Included in both awards was Dr Iamu Akasaki of Meijo University, while Professors Hiroshi Amano, also of Meijo University, and Jacques Pankove (University of Colorado) were included for their pioneering work on the Rank Prize citation.

Turn to pages 30-35 for more Nichia updates. **Nichia Chemical; tel: +81-884-222311; fax: +81-884-210148.**

LED News

EMCORE forms joint venture to produce white LEDs

EMCORE Corp (Somerset, NJ, USA) has formed a new joint venture with GE Lighting targeting white light LEDs - devices tipped to reach sales of US\$1 billion within the next decade.

The new company, GELcore LLC, will develop and market a range of both white and coloured LEDs for automotive, traffic, flat panel display and other speciality lighting applications. It expects to begin commercial production in the second

half of 1999 at the new facility in Tampa, FL, USA. This facility is a joint venture between EMCORE and Uniroyal (see above story).

GELcore will produce proprietary LEDs by converting GaN-based blue emitters to white light through the combination of phosphors and plastics. Under terms of the agreement, GE Lighting will hold a 51% interest in GELcore. It is also acquiring a capital position in EMCORE.

EMCORE is also enjoying success with its GaAs solar cell technology, having just entered into a four-year agreement with Space Systems/Loral (SS/L) to supply its satellite programme. The agreement, effective once EMCORE completes SS/L's space qualification and test procedures, includes an initial order with a value in excess of \$5 million.

Deliveries of the solar cells are expected to commence in the second quarter of 1999.

In other news, EMCORE has posted a net loss of \$6.1 million for the first quarter of fiscal 1999. Revenue for the quarter ended 31 December 1998 was \$10.1 million, down 18% on the same period a year ago. The recent spate of agreements with major partners is part of the strategy to return the company to profit, EMCORE says.

EMCORE Corp; tel: +1-732-271-9090; fax: +1-732-271-9686.

Epi News

Kopin to double device wafer manufacturing capacity

KOPIN Corp (Taunton, MA, USA) is to double its manufacturing capacity for its GaAs HBT device wafer products in response to growing demand from digital cellular phones, high speed SONET networks and other communication devices.

Kopin has ordered multiple device wafer production systems, as

well as additional wafer processing and characterization equipment, to expand its device wafer production capacity. Delivery and installation of the production systems will be in 1999 and 2000, with the equipment taking the company's capacity to more than 80 000 4" wafers per year. Dr John Fan, Kopin's presi-

dent and CEO, says the investment is due in part to an overall shift in the GaAs integrated circuit market to HBT based solutions from more traditional technologies.

"These high performance HBT circuits eliminate the need for many of the support circuits required by other technologies, thereby providing a

simpler, lower cost solution", he says. "We believe the addition of this new capacity, coupled with our materials technology, will enable us to continue to lead the rapidly growing market for GaAs HBT device wafers," he adds.

Kopin Corp; tel: +1-508-824-6696- fax: +1-508-824-6958.

MOCVD News

AIXTRON begins building 10 000 m² production plant

AIXTRON AG has completed the first phase of its capital expansion strategy, with the opening of a five-storey building at its headquarters in Aachen, Germany. The 2800 m² building will house the company's research and development activities, as well as the sales and the service departments.

AIXTRON has now moved onto the second phase of the programme, announced at the time of its initial public offering, which will see a 10 000 m² manufacturing plant built near its existing facilities in Aachen. The plant, which will bring a ten-fold increase on current production capacity when completed, will be built in three stages. The first stage is scheduled to open in the third quarter of 1999.

In its most recent financial results, the MOCVD equipment maker reported third quarter revenues of DM31 mil-

lion (US\$18.4 million) and pre-tax profits of DM7.8 million. In line with the strong performance in this quarter, AIXTRON has adjusted upwards its forecasts for full-year sales to DM106 million, which would represent an increase of 36% on the previous year.

AIXTRON has enjoyed particularly strong sales in Taiwan, where it has won more than 16 contractors in the past year, primarily for the delivery of large scale GaN and AlGaInP production systems for the manufacture of UHB-LEDs. New orders have come from United Epitaxy Corp (UEC), Epistar Corp, Visual Photonics Epitaxy (VPEC), Opto-Electronics & Systems Laboratories (OES), the National Central University (NCU), and other LED manufacturers.

AIXTRON AG; tel: +49-241-8909-0; fax: +49-241-8909-40.

Epi News

QED continues production expansion in 1999

AFTER increasing output by 40% in 1998, merchant epiwafer supplier Quantum Epitaxial Designs Inc (QED) is planning for a further 50% increase in 1999.

To support the expansion, QED (Bethlehem, PA, USA) will soon take delivery of VG Semicon's latest production system, the V150. QED expects the new system, which handles multiple 6" GaAs wafers, will arrive in April and be fully operational by mid-year.

The V150 will offer a significant expansion in QED's capabilities. QED currently operates four V100 systems and two single wafer reactors and is enjoying an increasing market share in the merchant epiwafer business. In addition to MESFET and HEMT material, QED is developing an impressive HBT and laser diode capability. "The V150 offers us a big step in capacity at a crucial point in QED's growth", com-

mented Tom Hierl, QED's founder and president. "It will help us fulfil our commitment to provide the highest quality epiwafer while enhancing the value of our product."

David Williams, managing director of VG Semicon says the V150 had reached the market at a time of growing demand. "Continuing expansion of wireless applications is widely forecast and VG Semicon is determined to maintain our position by providing superior, technically advanced products," he says.

In other news, QED has recently promoted Dr Keith Evans to vice president of operations responsible for directing the manufacturing and engineering departments. Prior to his new responsibilities, Evans was director of new technologies. **QED Inc; tel: +1-610-861-6930; fax: +1-610-861-5273.**

CdTe News

CdTe technology receives funding boost

ITN Energy Systems (ITN) has won a three year, US\$733 166 contract for the development and commercialization of CdTe thin film solar technology.

The company, based in Denver, CO, has received the award from the National Energy Research Laboratory (NREL) under its Thin Film Partnership programme.

ITN specializes in the manufacture of thin film using proprietary chemical vapour deposition technology developed by its founder Dr Mohan Misra.

ITN also holds a 50% interest in Global Solar Energy LLC, another to win a contract under the programme. It will receive \$1 698 232 over three years to develop large area, thin film copper indium gallium diselenide (CIGS) photovoltaics.

The grants are part of \$60 million NREL has awarded to US companies to speed the development of photovoltaic cells, which promise much lighter and more efficient solar cells that could be produced roll to roll like a newspaper.

ITN Energy Systems; tel: +1-303-298-8037.

Solar News

TRW opens space power production facility

TRW Inc (Redondo Beach, CA, USA) has opened a solar array production facility to meet the growing demand for its space systems and for those of other manufacturers of satellites and satellite constellations.

The 9300 m² TRW Space Power Production Facility (SPPF) at the company's Space Park campus contains custom-designed automated equipment for interconnecting, testing and inspecting solar cells, as well as assembling products. The facility uses software developed by TRW to control solar array manufacturing and

inspection equipment, and to operate a real-time inventory control and data collection management system. It is designed to accommodate both crystalline silicon and GaAs solar cells of any size, without changing equipment or tooling.

TRW says the new facility not only reduces labour costs and reduces solar cell attrition rates, but also increases its annual capacity by a factor of three which is equivalent to 25 typical geosynchronous satellites.

TRW Space & Electronics Group; tel: +1-310-812-4721.

LED News

Osram and Siemens form opto venture

SIEMENS's Semiconductor Group (HL) has formed a joint venture with Osram GmbH to produce optoelectronic devices.

Based in Regensburg, Germany, the joint venture began operation on 1 January 1999 under the name OSRAM Opto Semiconductors GmbH (OHG). Osram, also a Siemens' subsidiary, has a majority interest of 51% and will assume management of the new company. With a workforce of 2300, the joint venture plans to generate DM350 million in sales during its first, incomplete (nine months) fiscal year.

The optoelectronic activities exclusively pursued by Siemens Semiconductors to date will be assumed by the new joint venture. This step will enable HL, which will become an independent company in 2000, to focus on its core business, while continuing to enjoy the growing market success of its optoelectronics business. For Osram, one of the world's three largest lamp manufacturers, this move into the future-oriented field of LED technology has far-reaching strategic implications.

HL will contribute its current business in LEDs, infrared components, power lasers and displays. These activities also include marketing and development in Regensburg and Cupertino (CA, USA) as well as chip production in Regensburg and assembly in Malaysia. To ensure continuity in customer relations, the joint venture will continue to use sales channels employed by Siemens Semiconductors. Osram will give the joint venture greater access to the market for lighting applications.

The lamp manufacturer also has special expertise in electronic lighting systems as well as in materials such as glass and fluorescent substances, which are increasingly being used in LED production.

HL recently introduced a white LED in surface mount device (SMD) technology featuring luminescence intensities of 20 mcd. A second generation is expected in early 1999 providing intensities of 60-80 mcd.

Siemens AG; tel: +49-89-63628480; fax: +49-89-63628482.

Business Brief

Siemens AG has formed a new subsidiary, **Frictronics GmbH**, to supply SiC wafers. The company will help Siemens in its efforts to commercialize SiC devices for a range of high temperature and other electronic applications.

Research News

Lasing in powders offers LED challenge

SCIENTISTS at Northwestern University (Evanston, IL, USA) have demonstrated lasing in a simple powdered material, suggesting that semiconductor lasers may eventually be made cheaply enough to replace LEDs. The Northwestern team showed that powdery layers of ZnO and GaN can produce blue laser light when it is pumped with light from another laser. The observation was reported in the 21 December 1998 issue of *Applied Physics Letters*.

Unlike traditional solid state lasers the powdered zinc oxide layer has a highly disordered structure, which the re-

searchers were able to show enhanced the lasing effect. "We're exploiting what had been seen as a drawback," researcher Hui Cao said. "People have been trying to eliminate scattering, which you always think of as bad for a laser. But we went to the other extreme. In a totally disordered medium, scattering is very strong, and it actually helps lasing because it forms closed-loop paths for the light and creates feedback. It makes its own laser cavities."

When they pumped the zinc oxide layer with a conventional laser at low power, the team found that the material gave off light with a

broad band of wavelengths. But as the pump power was increased, the bands sharpened, and above a certain threshold, very sharp frequency bands appeared. The narrow frequency range of those bands and their strong polarization confirmed that the light was in fact a laser emission.

Cao said that the random orientation of the self-formed laser cavities in the film is also an advantage because it makes the laser output omnidirectional. "Traditional lasers are highly directional, while LEDs shine in all directions," she said. "But if a ZnO laser device ultimately works, it could replace LEDs in

luminescent display devices, because the light would go in all directions but with much greater efficiency. A laser at the same power consumption could be 1000 times brighter than an LED," she said.

In separate Northwestern news, the university has received final patent approval for the world's smallest laser, a microcavity semiconductor laser.

Northwestern's Transfer Technology Program has awarded Nanovation Technologies Inc (Miami, FL, USA) exclusive worldwide licensing rights to these devices and their underlying technologies.

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Business

TriQuint furthers alliance with Boeing for IC design services

TRIQUINT Semiconductor (Hillsboro, OR, USA) is combining its GaAs IC foundry services with the third-party IC design services of Boeing Co (Seattle, WA, USA).

Under the agreement, the two companies will work together to provide customers with turn-key GaAs ASIC services.

Customers, while contracting with TriQuint, will have access to, and be supported by, Boeing's IC design team. TriQuint will then move

the design into production providing manufacturing, packaging and testing services. While the TriQuint/Boeing relationship has existed for more than 10 years, this is the first time the combined services have been offered in the merchant market.

"The purpose of this agreement," says Bruce Fournier, vice president of TriQuint's Foundry Services Division, "is to open up new options for customers with GaAs re-

quirements, but without the design resources to bring their IC ideas to reality. There simply are not many options open to a customer wishing to bring moderate volume GaAs ICs to production," he says. "We are providing a path which protects a customer's intellectual property, while offering proven design and production manufacturing capabilities."

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+1-503-615-8900.

Research News

Bell labs advance quantum cascade laser

SCIENTISTS at Bell Labs (Murray Hill, NJ, USA), the R&D arm of Lucent Technologies, have demonstrated the first semiconductor laser that can simultaneously emit light at multiple widely separated wavelengths.

The experimental new light source does the work of three conventional semiconductor lasers, each with a hundred times less power. It emits light in the invisible region of the spectrum, where most gases and vapours leave telltale light-absorption fingerprints, and could find important applications in areas such as pollution and environmental monitoring, industrial process control, and medical diagnostics. It is not a communications laser.

Grown by MBE, the quantum cascade laser consists of alternating layers of AlInAs and GaInAs. Under operating conditions, a current injection causes electrons to cascade through 25 stages of the new material. This cascade scheme boosts the power of the laser to high levels, with a peak power of 100 mW emitted at wavelengths of 6.6 μm and 8.0 μm . A further increase of the current generates an additional laser wavelength at 7.3 μm . The three wavelengths can be further tuned by changing the temperature of the laser. Details of the work were published in the 26 November 1998 issue of *Nature*.

Meanwhile, Federico Capasso, head of Bell Lab's

Semiconductor Physics Research Department and a member of the team, has received a further honour for his work in developing the quantum cascade laser. Capasso, along with Jerome Faist, Rudolf F. Kazarinov, and Robert A. Suris, were awarded a 1998 Rank Prize for Optoelectronics for their work on the devices.

In quantum cascade lasers the wavelength is entirely determined by the thickness of the active layers rather than by the chemical composition of the material. In this way, a huge wavelength region can be covered using the same material, and a single laser can simultaneously emit multiple wavelengths.

Business

Commercial GaAs MOSFETs a step closer

BELL Labs researchers have moved closer to developing commercially viable GaAs MOSFETs, devices that promise cellular phones with longer battery lives and more powerful wireless base stations.

At the recent 'IEEE International Electron Devices Meeting (IEDM)', the researchers announced they had made further advances in perfecting the gate oxide material needed to produce MOSFETs. Building on earlier work, the Bell Labs team has improved the stability and electrical characteristics of the gate oxide, comprised of gallium oxide and gadolinium oxide.

As a result, the current decreases only 1.5% after 150 hours of operation under extreme conditions. The previously best research results reported a 22% drop over a three hour period.

"After we further improve the gate oxide material, GaAs MOSFET devices may be very attractive for various applications, such as cellular phones, wireless base stations and potentially microprocessors in computers," says Bell Labs researcher Ming-Hwei Hong.

Commercial GaAs MOSFETs would offer a strong challenge to their MESFET counterparts, due to their lower power consumption requirements.

Design News

Anadigics teams with HP EEsof to improve design tools

ANADIGICS (Warren, NJ, USA) has teamed with HP EEsof, to develop and enhance electronic design automation (EDA) tools to improve R&D efficiency. Working with HP Advanced Design System from HP EEsof, engineers at both companies are sharing information on product design

and software capabilities. The partnership's key areas of focus include improving package modelling (critical in RF designs), training and integration. Long term goals of collaboration include advancing the concept of virtual sampling, the ability to supply a software sample

that represents a hardware circuit, which is seen as an important in reducing time to market for new products.

In other recent developments, Anadigics plans to accelerate the qualification of its state-of-the-art 6" wafer fabrication facility and has

adopted a 'Share Purchase Rights Plan' (see "III-Vs confront the new millennium", pp. 18-20).

The company is also examining new technologies such as HBTs and SiGe.

Anadigics; tel: +1-908-668-5000; fax: +1-908-668-5068.

Research News

CdSe crystals hold promise as fluorescent probes

SOME of the more shadowy secrets of biology may soon be illuminated through the use of fluorescent probes based on compound semiconductors.

Scientists with the US Department of Energy's Lawrence Berkeley National Laboratory (LBNL) and the University of California at Berkeley have developed nanometre-sized crystals of semiconductors, including CdSe and CdS, that can be used as fluorescent probes for the study of biological materials. They offer a distinct advantage over conventional dye-molecules in that they emit multiple colours of light, which means they can be used to label and measure several biological markers simultaneously.

The unique optical properties of these nanocrystals also hint at the possibility of observing changes that take place in labelled biological systems, over a period of time.

In fluorescent labeling, markers, usually antibodies that attach themselves to specific proteins, are tagged with dye-molecules that fluoresce or emit a specific colour of light when stimulated by laser light, usually from a confocal microscope. "Sometimes, in order to fully characterize a sample, a population of cells, for example, you need to look at combinations of markers", says Professor Paul Alivisatos.

"Such measurements require multiple-colour light emissions which are difficult to obtain with conventional dye molecules. Ideal probes for multi-colour experiments should emit at spectrally resolvable energies, should have a narrow, symmetric emission spectrum, and the whole family should be excitable at a single wavelength", he says.

Prof. Alivisatos, LBNL; tel: +1-510-643-7371; fax: +1-510-642-6911.

Business Briefs

US device makers **Alpha Industries** (Woburn, MA) and **Anadigics** (Warren, NJ) have both joined the Bluetooth Special Interest Group, which now boasts >200 members. Bluetooth is a technical specification for short-range 2.4-GHz radio links between mobile personal computers (PCs) and other portable devices such as cellular phones, portable digital assistants (PDAs), and digital cameras.

Isonics Corp (San Jose, CA, USA) has entered into an agreement with **Voltaix Inc** (North Branch, NJ, USA) to offer enriched silicon-29 tetrafluoride for use in ion implantation of GaAs devices. Using enriched silicon-29, one of three stable isotopes of the element, can increase implantation productivity by as much as 500%.

The UK's **Defense Evaluation and Research Agency** (DERA) has purchased an Epi Centura® system to develop

silicon-germanium applications for its facility in Malvern.

The US **Office of Naval Research** (ONR) has just closed its call for submissions for a new programme on wide bandgap IMPATT diodes. The project seeks to exploit recent advances in these materials to develop high power, high efficiency IMPATT diode oscillators for operation at 35 GHz and above.

Uniphase Corp (San Jose, CA, USA) has acquired **Broadband Communications Products Inc** (BCP), a designer and manufacturer of fibre optic transmitters and receivers and test instrumentation.

BCP (Melbourne, FL, USA) will be operated as a business unit of Uniphase under the name of Uniphase Broadband Products.

Oxford Plasma Technology (Yatton, UK) has launched a new web site at www.oxfordplasma.com.

Business News

Power semiconductor market tipped to reach US\$2.8 billion by 2003

THE market for power semiconductors, ICs and modules is expected to grow at an annual average growth rate (AAGR) of 19%, reaching US\$2.8 billion by year-end 2003 according to a new study.

In its report, *Wireless Power Devices, Transistors, ICs, and Power Modules, Strategies, Technologies and Trends*, Allied Business Intelligence Inc (ABI) of Oyster Bay, NY, USA, says cellular/PCS will be a major driving factor in most markets. GaAs power amplifier ICs are expected to grow at an AAGR of 26% during the next five years, most of which will result from mobile voice communications platforms.

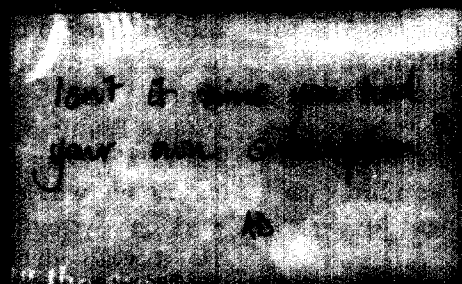
But cellular/PCS will not promote growth in all semiconductor markets equally. GaAs transistor manufacturers already have lost much of the cellular segment to LDMOS power transistors (for base stations)

and GaAs MMICs (for handsets). The minimal growth that is expected for GaAs transistor producers - CAAG of 5% over the next five years - will mainly come from high frequency applications, such as LMDS, broadband satellite projects, and point to point millimetre wave radio. But GaAs transistor suppliers are not the only ones who are experiencing diminishing share. "HBT processes account for close to 30% of the market for GaAs power amplifier ICs, and more gains are anticipated at the cost of MESFET processes. There will still be double digit growth for MESFET producers, but HBT is expected to account for a greater share of the market in the future", says Andy Fuertes, senior analyst with ABI.

Allied Business Intelligence; tel: +1-516-624-3113; fax: +1-516-624-3115.

Industry Brief

SDL Inc (San Jose, CA) has been awarded a three-year US\$1.275 million contract by the US Defense Advanced Research Projects Agency (DARPA) under the 'Optical Micro Networks Program' for the development of 2.5 Gbit transceivers for use in the harsh temperature environment of avionics platforms. These transceivers, unlike existing commercial counterparts, would have a small footprint, minimal mass and would be able to work 'uncooled' over the full military temperature range from -55 to 125°C and high humidity with very high reliability.



Company Results

Mixed fortunes for US device makers

US gallium arsenide device makers enjoyed mixed fortunes during the last quarter of the 1998 calendar year.

Recent quarterly results include:

- Alpha Industries (Woburn MA) posted net sales for its fiscal third quarter of US\$32.5 million, up 5.5% on a year earlier;
- Celeritek (Santa Clara, CA) saw revenues for its third quarter fall 31% to \$10.004 million;
- RF Micro Devices (Greensboro, NC) enjoyed a 212% revenue increase on its third quarter earnings to \$41.5 million;
- Vitesse Semiconductor (Camarillo, CA) registered first quarter rev-

enues of \$60.2 million, an increase of 11%;

• Anadigics Inc (Warren, NJ) witnessed a 19.3% decline in net sales for its fourth quarter to \$2.6 million.

Alpha's strong performance, which saw net income increase 51% to \$4.8 million for the period, was fuelled by shipments for new Motorola and Ericsson digital handsets. The company also received orders for two new product areas during the quarter, 3Com's Palm™ VII wireless PDA and an upcoming home wireless networking system. Alpha has recently declared a three-for-two stock split of its outstanding common stock shares.

Celeritek posted a net loss of \$1.594 million for the quarter, due mainly to a 55% decrease in commercial sector sales compared with a year earlier. Bookings of near-term shippable orders have increased its backlog to its highest levels in nearly a year, however, with the company confident this marks the beginning of a recovery among its markets and customers. The company has recently reduced its workforce by about 40 and plans to use subcontractors for low-end technical work.

RF Micro Devices, benefiting from increasing output from its new GaAs HBT fab, posted net income of \$5.6 million

for the quarter. The company says its recently expanded line of Si bipolar based products is also becoming a significant earner, while it also has high expectations for its expanded access to IBM's SiGe foundry services.

Vitesse enjoyed net income of \$10.4 million for the quarter, with its focus areas continuing to be in communications and test equipment.

Anadigics reported a net loss of \$138 000, although this included special charges of \$7.3 million primarily associated with its planned closing of its existing fab. Highlights for the quarter included a 48% increase in the sales of its broadband products.

Company News

American Xtal to open production facility in China

AMERICAN Xtal Technology (AXT) is to open a production facility in Beijing, China. It is expected to be operational during the second quarter of 1999.

The company has purchased a 2800 m² facility and obtained a business license in a major tax-free industrial park. The size of the facility may be increased to more than 5600 m².

Although the company's proprietary vertical gradient freeze (VGF) crystal growth operation will continue to be housed at its Fremont, CA, headquarters, all oth-

er manufacturing operations will take place at the Beijing facility. ISO 9002 certification is anticipated for late 1999.

AXT recently reported revenues for the fourth quarter of its 1998 fiscal year of US\$11.4 million, up 51% on a year earlier. Net income for the quarter was \$1.7 million, up 70% on the 1997 figure.

For the full year, the company posted net revenues of \$43.3 million, up 71% on the previous year. Net income for the 12 months was \$6.3 million, a 94% increase on a year earlier.

Market News

SiGe device market to reach US\$1.8 billion in 2005

THE worldwide market for silicon germanium (SiGe) wireless and digital semiconductor devices will reach US\$1.8 billion in 2005, a 100-fold increase over current levels. This is the forecast of a Strategies Unlimited (Mountain View, CA, USA) report.

SiGe ICs are forecast to capture nearly 10% of a \$19 billion market for high speed devices in 2005, in competition with silicon and GaAs chips. The report, *Silicon Germanium 1999*, projects demand for SiGe RF, microwave, and digital devices in ten market

sectors and 69 applications, through the year 2005. Led by the strong global demand for communications, SiGe IC demand is projected to grow from \$15 million in 1999 to \$450 million in 2002. Applications such as wireless and satellite-based voice and data services are expected to drive 79% of the demand in 2002. High-speed computer networking applications will make up another 16% of the market, while consumer, industrial and military uses will account for the remaining 5% percent of world demand in 2002.

Device News

ANADIGICS, Inc (Warren, NJ, USA) has introduced an integrated photodetector and transimpedance amplifier (TIA) for use in the front end of fibre-optic receivers. The AMT121302T46F integrates a PIN diode and a TIA in the same package, and features high sensitivity (typically -25 dBm) and overload performance, says the company. The device has been developed in response to the increasing number of 1300 nm fibre-optic installations in gigabit speed networks.

Also for the gigabit data communication and telecommunication switching market, **EMCORE Corp's** MicroOptical Device Division (MODE) (Albuquerque, NM, USA) has released a 850 nm VCSEL 1x12 array. MODE says the Gigarray™ enables parallel optical links operating with aggregate throughput ranges up to 15 Gbits s⁻¹.

Rhopoint Components Ltd (Hurst Green, UK) has introduced a range of thermo-variable chip at-

tenuators to correct temperature gain shift in GaAs amplifiers and similar temperature-dependent devices. The PBV attenuators utilize a thin-film thermistor element which, the company says, ensures excellent high-frequency characteristics and reproducibility. Two basic models are available - the 1206 sized PBV 1632S and 0805 sized PBV 1220S, rated at 100 and 63 mW respectively. Rhopoint says the components are suited for use in base stations and similar applications.

A high-efficiency, low-voltage GaAs power amplifier supplied by **Alpha Industries** (Woburn, MA, USA) is being used in **3Com's** Palm VII™ organizer, Alpha says that use of its GaAs amplifier in the wireless Internet device provides excellent efficiency at low voltage, giving weeks of performance on two AAA batteries.

In further wireless data communication news, **Motorola, Inc** (Fort Worth, TX, USA) has introduced a chipset and

software solution integrating wireless 'air mail' and telemetry technology for computers, consumer devices and industrial equipment. Motorola has collaborated with a number of companies including TriQuint Semiconductor Inc produce the system. **TriQuint's** role is to provide a 1 V GaAs RF down-converter mixer for use in the transceiver subsystem.

TriQuint Semiconductor (Hillsboro, OR, USA) has also introduced the TQ5121, 3 V, LNA/mixer receiver IC. The device configuration integrates a GaAs MESFET RF LNA, a buffered local oscillator input, a GaAs MESFET mixer, and an IF output amplifier in a single, small RFIC. TriQuint says the TQ5121's RF performance meets the requirements of both the digital TDMA IS-136 standard and analog cellular AMPS standard. It can also be used for receiving functions in products designed for the 900 MHz ISM band. The TQ5121 has typical conversion gain of 17.5 dB and a noise figure of 2.7 dB over operating conditions and frequency.

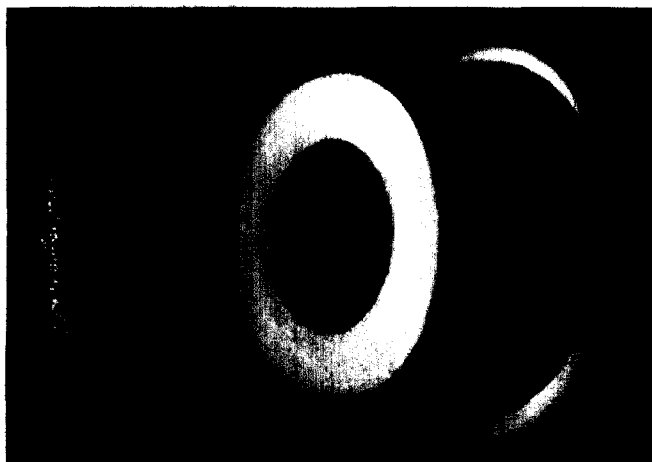
California Eastern Laboratories (CEL) of Santa Clara, CA, USA, has added four GaAs MESFETs to the range of NEC semiconductor products it offers in the USA. The NES1823P-100 is a 'twin transistor' device consisting of two pairs of GaAs MESFET chips. Designed for 2.1-2.2 GHz base stations it

can also be modified for use in 2.3-2.4 GHz wireless local loop and digital audio broadcast applications. The NEZ3436-30E NEC S-Band GaAs MESFET has been developed specifically for high power WLL transmitter applications, with performance guaranteed across the 3.4-3.6 GHz frequency band, says CEL. Designed for operation in the 4-18 GHz frequency range, the NE960R575 and NE960R272 are suited for amplifier and oscillator applications.

M/A-COM (Lowell, MA, USA) has unveiled a family of DC-2 GHz GaAs FET MMIC digital attenuators with integral silicon CMOS ASIC drivers. The multi-chip module (MCM) components are designed for a variety of receive and transmit channel opportunities in multi-channel, wireless infrastructure applications. The attenuators offer a choice in dynamic range from 15-50 dB.

Also new to MA/COM's MCM portfolio is a family of DC-3 GHz GaAs FET MMIC switches with integral ASIC drivers. The company says each integrated switch can replace several single function packages.

A miniature solid state relay with current-interrupt has been introduced by **Solid State Optronics, Inc** (SSO) (San Jose, CA, USA). The company says the M211 relay is the first to offer a current-interrupt function and long-term reliability and performance in a 4-pin SOP package.



The integrated PIN diode and transimpedance amplifier from ANADIGICS.