ElectroniCast Photonics

A Journal of the Fiber Optics Group **February 9, 2011**

Inside This Issue...

Market Trends: Planar Waveguide Circuit Modules…

A new market research report, by ElectroniCast Consultants provides a detailed market and technology analysis of planar waveguide circuit modules used in optical communication applications. Below, are three levels (or "food chain") pertaining to planar waveguide circuits. For the purposes of this ElectroniCast study, we quantify and provide a market forecast for "Level 3"

- Level 1 - The PWC chip
- Level 2 – PWC packaged chip with fiber attached (compact component)
- Level 3 – Module: typically 1 or more PWC chips and compact component(s) inside an module enclosure, with fiber(s) attached

PWC module average selling price (ASPs), which are quantified in this report by ElectroniCast, include attached optical fiber(s) (1-2 meters in length), along with splice sleeves, module enclosure and associated packaging components; however, connectors are not included. The prices are the estimated or forecasted average prices paid during the indicated calendar year.

The module prices are the manufacturer's ("factory") prices, invoiced to the first (original) customer, or transfer prices for internal (captive) production. They take into account the typical purchase quantities and related quantity discounts, as well as the variation in performance specifications between one user and another. The costs of supplier testing, qualification, documentation and other ancillary costs are included in the price calculation.

The average module footprint (enclosure dimension size) will trend to decrease in size; however, the number of channels and functions per module are trending to increase. All of this is made possible by technology allowing for more functional integration and/or capacity on a (single) PWC chip (in this study, we are quantifying the 2010-2015 timeframe).

Based on primary research (interviews and evaluations) with engineers and product planners from both the supplier-side and the user (customer-base), ElectroniCast can see ideas and then (eventually) concepts about 3-7 (or more) years before innovation solutions (products) are announced in the public domain. Once we feel confident that these ideas and concepts will become innovative solutions (new products), we set anticipated usage (consumption) into the market forecast.

It is also important to note that we, in effect, forecast signal transmission demand growth, which will drive demand for increased capability/capacity components. In addition to serving as an improved solution for advanced applications, this solution often also is a better/more economical solution for earlier (existing) applications.

So, yes the forecast can change over the forecast period (2010-2015), as "sure-bet" products "flop" and innovation solutions enter the arena. ElectroniCast analysts have extensive experience at searching for and finding-out about these ideas-concepts-innovations and evaluating them with an excellent success factor rate.

Networks combine voice, audio, data at various speeds for video, television, including interactive 3-dimensional high definition television (3D/HDTV), wireless/mobile, Internet and other specialized transmission into a single integrated infrastructure. Included within the infrastructure is business Enterprise resource planning (ERP) software, unified messaging, Internet-based social networking, web-assisted call centers, and a variety of communication infrastructures.

Residential use includes video on demand, e-commerce, small office/home office telecommuting, advertising, medical monitoring, elder care monitoring, childcare monitoring, home and office security. Communication networks are utilizing built an Internet backbone, rooted in demand. The customers are demanding greater speed, more functionality and reliability, and naturally, they expect "perfect" quality of service.

A planar lightwave circuit (PLC) is a generic term used to refer to an optical circuit consisting of a light waveguide. In the same way as an electronic integrated circuit (IC), it is formed on the surface of a substrate using technologies such as thin-film formation, photolithography, and dry etching. Silicon is used as the substrate and silica glass as the waveguide. The merit of the PLC is that it provides a low-loss connection with optical fiber because the PLC and the optical fiber are both made of silica, and they both have a core size of the micrometer order.

Planar technology allows a much tighter density of components given that all functions are can be performed on a single PWC chip. The end result is a much smaller device and smaller footprint for the OEM manufacturer's equipment. This is a key metric for new systems as Central Office Space is in short supply. This report provides the findings of ElectroniCast Consultants' study of PWC modules consumed in optical communication applications.

The worldwide review of 2010 plus the market forecast (2011-2015) is presented for PWC-based modules is segmented by the following functions:

- Consumption Value (US$, Million)
- Quantity (number/units: Thousand)
- Average Selling Prices (ASP $, each)

The ElectroniCast market data are segmented into the following geographic regions, plus a Global summary:

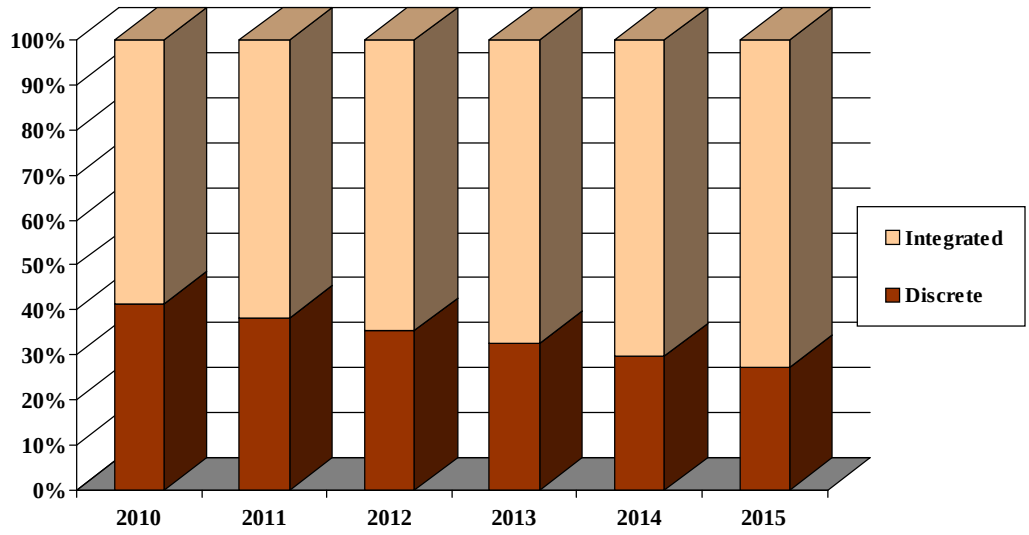
- The Americas (North America, Central and South America)
- EMEA (Europe, Middle Eastern countries, plus Africa)
- APAC (Asia Pacific)

The following is a list the PWC-based modules that we quantify in this market forecast study report.

- Discrete PWC Module
  - AWG Module
  - Switch Module
  - VOA Module
  - PLC Splitter Module
  - Other/Miscellaneous PWC Module
- Integrated Multifunction PWC Module

The global consumption value of planar waveguide circuit (PWC) modules will increase with strongly rising quantity growth partially offset by declining average prices. Worldwide PWC-based module consumption (value) is forecast to increase to $5.9 billion in 2015. The consumption value of integrated multifunction PWC modules held nearly 60% of the market share in 2010 and in 2015, the integrated multifunction PWC modules are forecast to hold over 70% of the worldwide consumption value. Note: Market forecast data in this study report refers to consumption (use) for a particular calendar year; therefore, this data is not cumulative data.

Figure 1
PWC Module Global Consumption Forecast
of Market Share (%), Based on Value
(Source: ElectroniCast Consultants)



Developments in Photonic Crystal Technology...

European scientists and engineers are working together on the COPERNICUS project, developing cutting-edge photonic crystal technology. The COPERNICUS project brings together eight European academic and industrial partners with high profiles in photonics, nanotechnology, modelling and developing new technologies for telecommunications and aerospace.

Coordinated by Thales Research and Technology, France, the Consortium is composed of The University of Nottingham UK; the Laboratory for Photonics and Nanostructures (LPN) and Optical Functions for Information and Communication Technologies (FOTON), both research units of the French National Centre of Scientific Research (CNRS); DTU Fotonik at the Technical University of Denmark; the University of Ferrara in Italy; and industrial partners u2t Photonics, Germany and Thales Systčmes Aéroportés, France.

COPERNICUS, which runs until the end of 2012, has received funding worth nearly €3 million from the European Commission's Information Society Technologies Program. Photonic crystals represent a 'disruptive' technology - meaning they have the potential to completely change the way things are currently done in this field. Photonic crystals are nanoscale materials, enabling unprecedented control of light and the miniaturization of key functions. Significant reductions in power consumption can also be achieved.

Project Coordinator, Alfredo de Rossi of Thales Research and Technology in France, said: "We believe that our approach has all the hallmarks of a highly disruptive technology with the potential to place Europe at the forefront of photonics."

The work comes at an important time for Europe: the photonics industry is growing rapidly and in September 2009 the European Commission designated photonics as one of five key enabling technologies for our future prosperity. According to the Photonics21 European Technology Platform, the world market for photonics products reached €270 billion in 2008, of which €55 billion was produced in Europe - a growth of nearly 30 per cent since 2005.

As well as technological developments, the project contributes to the structuring of the European Research Area.

Professor Eric Larkins, of the Department of Electrical and Electronic Engineering at The University of Nottingham, said: "We are actively supporting the transfer of knowledge and technology within the consortium and ultimately to the wider community. For example, we are producing technical tutorials for training in cutting-edge technologies. As the project progresses, these will be available through the project website to students and researchers outside the consortium."

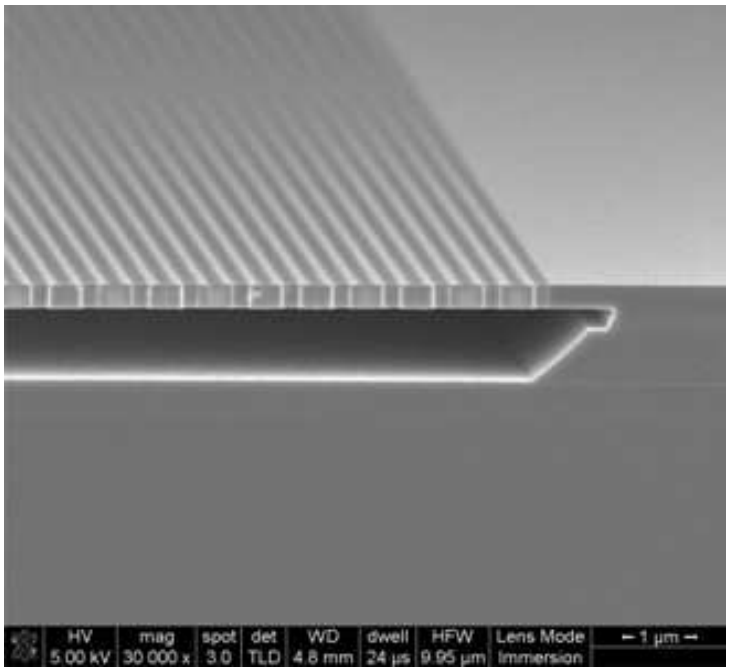
High Speed, Compact Demultiplexing Receivers A key aim of the COPERNICUS project is to develop very high speed, compact demultiplexing receivers, used to separate optical signals that have been transmitted together. These can be used where several light signals of different wavelengths, or colors, are transmitted together and must then be separated by the receiver so that the signal can be reconstructed. To achieve this, the consortium will target technological breakthroughs in ultra-compact integrated optical devices including switches, filters and detectors.

Photonic devices will address the pressing need for low-power, ultra-high bandwidth data links in server farms, optical storage networks and on-board internet/entertainment systems, where demand is driving the data bandwidth and technology integration level rapidly upwards. Next generation telecom systems will also benefit from these devices.

This technology is also expected to play an important role in the convergence of photonics and electronics, where the high-speed, ultra-low power consumption and extreme compactness of this technology makes it ideal for a wide range of uses.

More information is available on the project website http://www.coperniusproject.eu
Provided by University of Nottingham

Figure 2
Example of InGaAsP Photonic Crystal Membrane
(Source: COPERNICUS: A European Commission Framework 7 Project, Number 249012)



European Commission's GALACTICO Project…

Nokia Siemens Networks of Espoo, Finland has joined the European Commission's GALACTICO project to develop compact, cost-efficient, silicon-based photonic circuits for Gigabit Ethernet (GbE), focused on coherent optical communication systems.

The three-year research program (launched last October) aims to uniquely blend three of the most established integration materials — indium phosphide (InP), gallium arsenide (GaAs), and silicon (Si) — on a common silicon-based platform to address the high-performance, volume production and low-cost requirements of the next generation of GbE, and eventually Terabit, optical transponders. The total budget of the project is €4.02m, with €2.9m of that coming from the European Commission (EC) via its Seventh Framework Program (FP7), Information and Communication Technologies (ICT).

Along with Nokia Siemens Networks, the eight other partners of the GALACTICO consortium — comprising university research centers and companies from several European countries — are: IHP GmbH (Germany); Constelex Ltd (Greece); Telecom Italia S.P.A (Italy); U2T Photonics UK Ltd (UK); U2T Photonics AG (Germany); Technische Universität Berlin (Germany); Institute of Communication and Computer Systems, National Technical University of Athens (Greece); and Universidad Politecnica de Valencia (Spain).

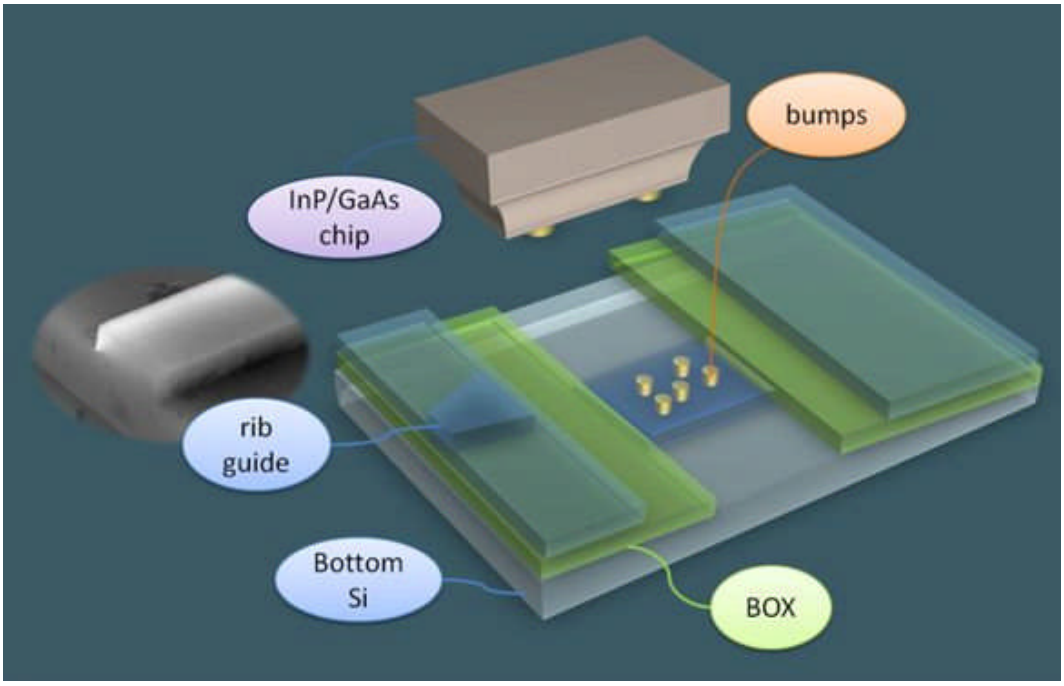
"Currently system vendors require their own photonic integration technology to deliver a practical and economically feasible 100GbE system solution," says GALACTICO project coordinator Lars Zimmermann. "Our project aims to develop low-cost and small-size 100GbE interfaces, and provide integrated coherent transmitters and receivers that deliver a massive amount of aggregate bandwidth," he adds.

"We have been at the forefront of the transition from 10 and 40Gbps networks to 100G and beyond," says Uwe Fischer, head of optical networks product management at Nokia Siemens Networks. "With our expertise in the optical transport domain, we will provide specifications for the components to be developed as well as participate in the ensuing lab demos and field trials," he adds.

Hybridization of components The key objective in the GALACTICO hybrid integration is the definition of a high precision, generic assembly process. Conventional integration techniques increase alignment tolerances by employing waveguide/component tapering. However, staying below 2dB penalty requires sub-micron precision. In order to achieve this precision, GALACTICO will address alignment in the 3-axis of integration.

GALACTICO SOI integration technology will exploit the existence of the buried oxide layer in the platform. This layer will act as an "intrinsic" alignment plane (in y-direction). The position of the buried oxide will be well defined in the SOI wafer and will be used to align to the optical axis of the waveguide and the hybrid device (see Figure 3). Web-Site: http://www.ict-galactico.eu/

Figure 3
Example of SOI PLC Technology: Hybridization of Components
(Source: GALACTICO: A European Commission Framework 7 Project)



Nanolasers on Silicon…

Engineers at the University of California, Berkeley, have grown nanolasers directly onto a silicon surface, an achievement that could lead to a new class of faster, more efficient microprocessors, as well as to powerful biochemical sensors that use optoelectronic chips. They describe their work in a paper published February 6 in an advanced online issue of the journal Nature Photonics.

"Our results impact a broad spectrum of scientific fields, including materials science, transistor technology, laser science, optoelectronics and optical physics," said the study's principal investigator, Connie Chang-Hasnain, UC Berkeley professor of electrical engineering and computer sciences.

The increasing performance demands of electronics have sent researchers in search of better ways to harness the inherent ability of light particles to carry far more data than electrical signals can. Optical interconnects are seen as a solution to overcoming the communications bottleneck within and between computer chips.

Because silicon, the material that forms the foundation of modern electronics, is extremely deficient at generating light, engineers have turned to another class of materials known as III-V semiconductors to create light-based components such as light-emitting diodes (LEDs) and lasers. But the researchers pointed out that marrying III-V with silicon to create a single optoelectronic chip has been problematic. For one, the atomic structures of the two materials are mismatched.

"Growing III-V semiconductor films on silicon is like forcing two incongruent puzzle pieces together," said study lead author Roger Chen, a UC Berkeley graduate student in electrical engineering and computer sciences. "It can be done, but the material gets damaged in the process." Moreover, the manufacturing industry is set up for the production of silicon-based materials, so for practical reasons, the goal has been to integrate the fabrication of III-V devices into the existing infrastructure, the researchers said.

"Today's massive silicon electronics infrastructure is extremely difficult to change for both economic and technological reasons, so compatibility with silicon fabrication is critical," said Chang-Hasnain. "One problem is that growth of III-V semiconductors has traditionally involved high temperatures – 700 degrees Celsius or more – that would destroy the electronics. Meanwhile, other integration approaches have not been scalable."

The UC Berkeley researchers overcame this limitation by finding a way to grow nanopillars made of indium gallium arsenide, a III-V material, onto a silicon surface at the relatively cool temperature of 400 degrees Celsius. "Working at nanoscale levels has enabled us to grow high quality III-V materials at low temperatures such that silicon electronics can retain their functionality," said Chen.

The researchers used metal-organic chemical vapor deposition to grow the nanopillars on the silicon. "This technique is potentially mass manufacturable, since such a system is already used commercially to make thin film solar cells and light emitting diodes," said Chang-Hasnain.

Once the nano-pillar was made, the researchers showed that it could generate near infrared laser light – a wavelength of about 950 nanometers – at room temperature. The hexagonal geometry dictated by the crystal structure of the nanopillars creates a new, efficient, light-trapping optical cavity. Light circulates up and down the structure in a helical fashion and amplifies via this optical feedback mechanism.

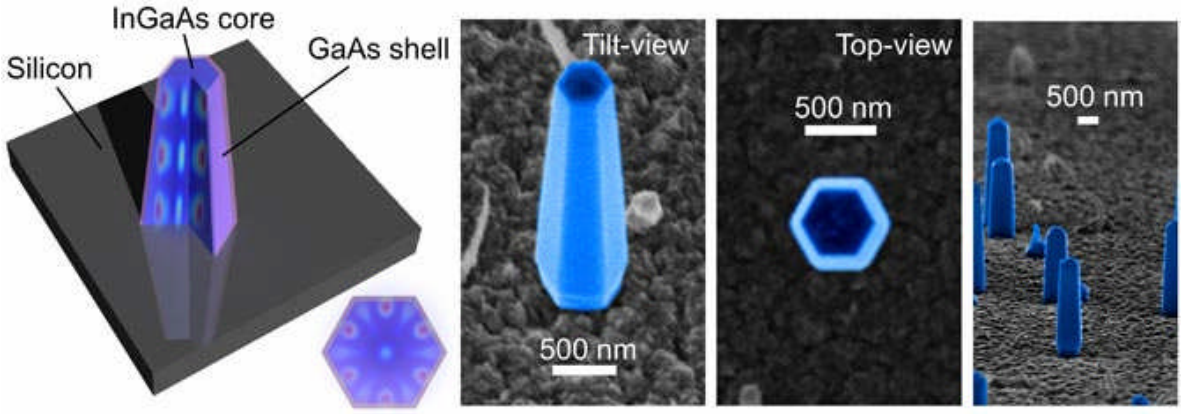
The unique approach of growing nanolasers directly onto silicon could lead to highly efficient silicon photonics, the researchers said. They noted that the miniscule dimensions of the nanopillars – smaller than one wavelength on each side, in some cases – make it possible to pack them into small spaces with the added benefit of consuming very little energy. "Ultimately, this technique may provide a powerful and new avenue for engineering on-chip nanophotonic devices such as lasers, photodetectors, modulators and solar cells," said Chen.

"This is the first bottom-up integration of III-V nanolasers onto silicon chips using a growth process compatible with the CMOS (complementary metal oxide semiconductor) technology now used to make integrated circuits," said Chang-Hasnain. "This research has the potential to catalyze an optoelectronics revolution in computing, communications, displays and optical signal processing. In the future, we expect to improve the characteristics of these lasers and ultimately control them electronically for a powerful marriage between photonic and electronic devices."

The Defense Advanced Research Projects Agency and a Department of Defense National Security Science and Engineering Faculty Fellowship helped support this research. SOURCE: Sarah Yang, Media Relations; 2011 UC Berkeley News Center; Web-Site: http://newscenter.berkeley.edu/

The unique structure of the nano-pillars grown by UC Berkeley researchers strongly confines light in a tiny volume to enable subwavelength nanolasers. Images on the left and top right show simulated electric field intensities that describe how light circulates helically inside the nanopillars. On the bottom right is an experimental camera image of laser light from a single nanolaser. (Source: Connie Chang-Hasnain Group)

Figure 4
Example of Nano-Pillars
(Source: 2011 UC Berkeley News Center)



Financial News…

GigOptix, Inc. to Acquire Endwave Corporation GigOptix, Inc. (OTCBB:GGOX), a leading supplier of high performance electronic and electro-optic components that enable next generation 40G and 100G optical networks, announced (February 7, 2011) that it has signed a definitive merger agreement to acquire Endwave Corporation (Nasdaq:ENWV), a leading provider of high frequency RF solutions and semiconductor products for the wireless mobile backhaul communications, satellite communications, electronic instruments and defense and security markets. The combined company will retain the name GigOptix, Inc. to become a high speed, high frequency leader for optical and wireless communications. The acquisition is expected to close in the second quarter of this year.

Under the terms of the merger agreement, all outstanding shares of Endwave common stock, including those issuable upon settlement of outstanding restricted stock units, and outstanding in-the-money Endwave stock options, will be converted into shares of GigOptix common stock such that immediately after the merger, such shares represent approximately 42.5% of all outstanding GigOptix common stock. Based on the number of shares of Endwave and GigOptix common stock outstanding as of January 31, 2011, approximately 9.1 million shares of GigOptix common stock will be issued to holders of Endwave common stock, registered stock units and stock options.
http://www.gigoptix.com/

$50 Million Secondary and Primary Transaction in CyOptics JVP, a leading Israeli venture capital fund, has led a $50 million investment in CyOptics, Inc. ("CyOptics"), a leader in Indium Phosphide (InP) optical chip and component technologies. The transaction entailed the purchase of shares from several existing shareholders and the financing of additional growth capital for the Company. Joining the round were existing CyOptics investors: Sprout Group, Birchmere Ventures and Eurofund.

CyOptics generated over $100 million in revenues in 2010 and ended the year with a strong sales backlog, granting good visibility into 2011. The company serves more than 100 customers worldwide, including telecom system OEMs, module level suppliers, and the major defense contractors.

JVP, a global venture capital firm with over $820mm under management, is represented on the CyOptics board by its founding partner, Erel Margalit, who serves as the Company's Chairman. JVP will nominate an additional member to the Board of Directors following this transaction. For additional information: Fiona Darmon, VP Investor Relations JVP: fiona@jvpvc.com | 212.479.5155 (US) | +972.52.695.4400 (Israel)

Advaned Photonix Wins $625K Contract Advanced Photonix has won a $625,000 initial purchase commitment from an unnamed Chinese telecom systems provider to supply its 40-gigabit-per-second high-speed optical receiver, the BR-40D, for long haul data communications. The provider is a key supplier to telecom markets in China, India, Brazil and Russia. The sale will come through API subsidiary Picometrix.

Picometrix general manager Rob Risser, who is also CFO of API, said the sale "confirms that our efforts at penetrating the China OEM market are beginning to bear fruit and could provide significant future revenue. This design win is only one of several design wins with tier 1 OEMs based in China that were are pursuing." Risser said API expects more sales of both its 40 gigabit-per-second and 100-Gbps products "that will move to volume production status during the next fiscal year."
Web-site: www.advancedphotonix.com
Contact: Richard Kurtz, Advanced Photonix, Inc. - IR@advancedphotonix.com

Gould wins multimillion dollar Life of Type Buy (LOTB) Contract Gould Fiber Optics, a manufacturer and supplier of passive fiber-optic and planar components and integrated modules, was selected as the lead optical fiber splitter supplier supporting the modernization and life extension of the U.S. Navy's Trident Missile Guidance System. Gould has been awarded a multimillion dollar Life of Type Buy (LOTB) contract to supply several thousands of premium-grade polarization-maintaining fiber splitters through March 2012.

Gould has worked with the prime contractors for modernization of the Trident Guidance System, Draper Laboratory, and its inertial sensor subcontractor, Honeywell, to develop high-performance optical fiber splitters for fiber optic gyroscopes. "We see this contract bringing significant value to Gould and our customers as they rely on us for state-of-the-art solutions in passive optical components and subsystems designed and built by our engineers, technicians and other support staff," said Gould Technology general manager Saeed Pilevar. "This further enhances our advantages in capacity, reliability, performance, and flexibility."
SOURCE: http://www.gouldfo.com/gfo/news.aspx

ELENZA Closes $24 Million Series B Financing ELENZA Inc. (formerly Ocular Optics, Inc.), announced the completion of a $24 million Series B round of financing, which will be used to support the clinical development and technology commercialization of ELENZA's patented Electro-active AutoFocal Intraocular Lens (IOL) to address the cataract extraction market and future opportunities associated with the correction of presbyopia. This capital placement is also expected to fund clinical and regulatory activities required to obtain CE mark in Europe and other international markets.

The Series B placement represented investments from the Company's original investors, The Carlyle Group (Washington, DC) and Delphi Ventures (Menlo Park, CA), as well as new investors, the Itochu Corporation (Tokyo, Japan) and a strategic corporate investor from the ophthalmic industry.

"We see great promise in ELENZA's next generation Accommodating IOL technology and we are pleased to follow on our initial investment with strong corporate strategic and financial partners to fund product development, while ultimately setting the course for clinical approvals and future commercialization," said Jim Bochnowski, General Partner of Delphi Ventures. "It is also our privilege to recognize the leadership of Rudy Mazzocchi as President and Chief Executive Officer of ELENZA, an experienced medical device entrepreneur who was recruited to secure this financing and to develop the structural organization of ELENZA, along with Amitava Gupta, PhD as Chief Technical Officer, who will be responsible for the achievement of their product design and development program."

Rudy Mazzocchi brings 25 years of senior management and financing experience in the medical technology industry. He has founded and led four early-stage medical device companies from development through successful acquisitions in fields ranging from cardiology to neurosurgery. He started his career as Founding CEO of MICROVENA Corporation, now a publicly traded company (NASDAQ: EVVV), and later served as a General Partner of Accuitive Medical Ventures (Duluth, Georgia).

"I am excited to be a part of ELENZA as President and CEO and I believe that ELENZA's patented IOL technology will give rise to the world's first Electro-active AutoFocal IOL that will provide patient benefits beyond those of existing implantable lenses," said Mr. Mazzocchi. "I look forward to leveraging my expertise in financing, operations, product and clinical development to bring this product to market as efficiently as possible."

As ELENZA's Executive Vice President and CTO, Dr. Gupta most recently was a Senior Principal Research Fellow, then VP of R&D at Johnson & Johnson Vistakon followed by being Executive VP of R&D at Innotech from 1991 to 1997, which was later sold to Johnson & Johnson in 1997. Prior to Innotech, Dr. Gupta was VP of R&D at another intraocular lens company, Ioptex, which sold to Smith and Nephew and was recently appointed a Visiting Fellow at the Center for Vision at Oxford University. Dr. Gupta received his Ph.D. in chemical physics from Caltech in 1975.

Contact: Rudy Mazzocchi / CEO; Email: rudy@elenza.com
Source: http://www.elenza.com/

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