

### Editorial

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## Optical Data Interconnects Required

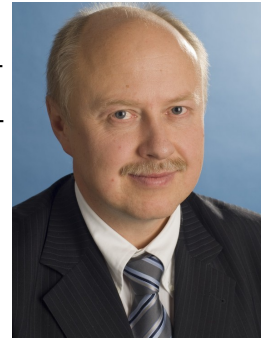
During the last three years more information has been generated, stored and transmitted than in the whole previous history of the mankind, and this trend will continue in the future, driven by strategic fields such as bio-medical, advanced material, aerospace and cyber-technologies. Such exponential growth has its price, however. The recent data (2010) from Environmental Leader, the leading daily trade publication on energy, environmental and sustainability news, show that Data Centers are now responsible for 3% of all energy consumption in the United States.

The most of the power used in data processing is consumed by copper interconnects: by intrachip, interchip, inter-system and intra-system copper links. For intra- and inter-systems links, up to 98% of the power launched in the cables by the input/output (I/O) devices dissipated as heat, and only 2% is used for actual data transmission. Optical data interconnects are the solution to this untenable situation.

The main workhorse of optical interconnects is the vertical cavity surface-emitting laser (VCSEL). Until recently, however, it was believed that scaling up the speed of the VCSEL, while keeping the same current density needed for reliable operation, is "mission impossible". VI Systems GmbH has solved this impasse, and demonstrated error-free 850 nm VCSEL operation at 25 Gb/s at temperatures above 100°C and at current densities well below 10 kAmp/cm<sup>2</sup>, even lower than that used for 10 Gb/s transmission.

Further advances can be expected with new ideas of the design improvement targeting lower current densities and higher temperature stability of the transmitter at 40 Gb/s (see figure below) and higher bit rates. Moreover the devices (both current-modulated and more advanced electro-optically-modulated VCSELs) are proved to have linear performance matching the needs for advanced encoding schemes and paving the way towards 100 Gb/s transmission at longer distances and at lower power consumption levels of the driver ICs.

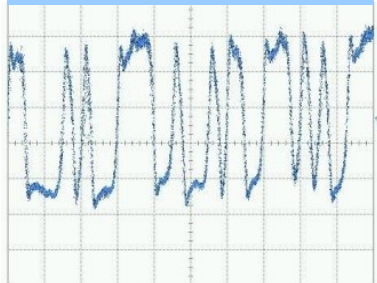
The computing industry understands that the only possible salvation is to use optical interconnects instead of copper cables. Indeed, according to the industry consensus the IBM 10-petaflops Blue Waters supercomputer (2011) will utilize one million optical interconnects, while the Exaflops-scale computing system will use about 1 billion optical links each with 40% of the cost and power consumption being in optics. The current size of the copper computer, datacom and telecom interconnect markets stands at about \$47 billion (10% growth per annum).



Nikolay Ledentsov,  
CEO of  
VI Systems



a TO-can sized fiber-coupled 40 Gb/s optical module



Non-Return-to-Zero Pseudo-Random Bit Sequence (PRBS 27-1) at 40 Gbit/s using VI Systems VCSEL and receiver modules for the total optical power of about -5 dBm. The bit pattern corresponds to 6.5 Signal-to-Noise ratio revealed in the Eye Diagram

# Member News

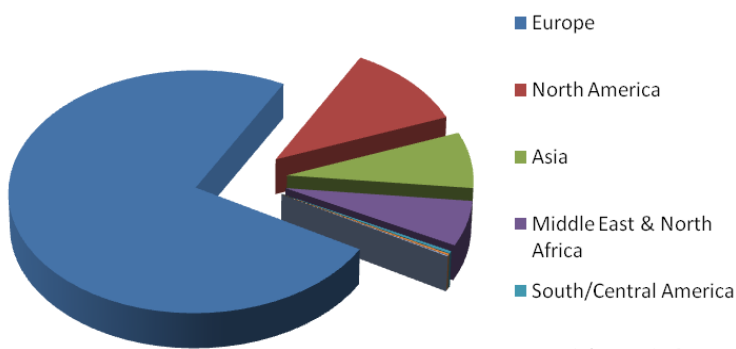
## A good year for ECOC 2010

ECOC is Europe's largest optical communication conference and exhibition event. ECOC 2010 which took place in **Turin on September 20-22, 2010** attracted nearly 5000 visitors, exhibitors and conference delegates. ECOC reaches an international audience with over **71%** of attendees arriving from non-host countries.

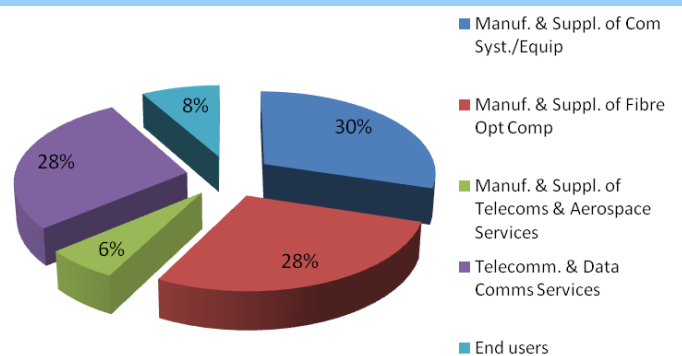
ECOC 2011 will be held in Geneva and organised by EPIC member **Swisslaser Net**. EPIC organised the Symposium on Optical Networking for Future Broadband Internet Services.



Breakdown by geographical areas



Main activities of ECOC 2010 visitors



Many EPIC members participated in the Equipment Exhibition and Technical Presentations. Tom Pearsall was in Turin and met EPIC members present at ECOC 2010



Peter Van Daele, INTEC    Laurent Fulbert, CEA LETI    Gunther Vollrath, Aifotec    Stéphane Gosselin, Orange Labs    Christoph Harder, Swisslaser    Peter Rajek, Annett Fuhrmann, Sandra Steffan and Andreas Chudek, behind, u<sup>2</sup>t Photonics



Alistair Poustie, left and Graeme Maxwell, CIP Technologies    Andrew Robertson and David Smith, CIP Technologies    Eric Borgne, Persyst, Nicéphore Nicolas and Etienne Decerle, Yenista    Wolfgang Schlaak, Fraunhofer HHI    Laetitia Vincent 3S Photonics & Christian Lafrance, Avensys

## Symposium on Optical Networking for Future Broadband Internet Services

EPIC and the University of Peloponnese co-organized and presented the **Symposium on Optical Networking for Future Broadband Internet Services**, a main event of ECOC 2010 on **22 September 2010** in **Turin**.



About 100 participants attended following program:

*Optical Networking for Future Broadband Internet Services is the promise to enable access to a vast array of information resources, unlimited by our location or time of day.*

*The objective of this symposium is to grasp the essential aspects and demonstrate the vital role of optical networking as the essential infrastructure for the Internet*

### Technical Program Committee:

- Stephane Gosselin, Orange Labs
- Andrew Houghton, European Commission
- Ken-ichi Sato, Nagoya University
- Christian Simonneau, Alcatel-Lucent
- Martin Schell, Heinrich Hertz Institute

### Introduction

- Alexandros Stavdas – University of Peloponnese, Greece  
*An Essential Infrastructure for the Future Internet*

### The Challenges

- Ken-Ichi Sato, Nagoya University, Japan  
*Role of optics and electronics in creating future broadband network*
- Sergi Figuerola, I2CAT, Spain  
*GEYSERS: a Generalized Architecture for Services over Dynamic Infrastructures*
- Esther Le Rouzic, Orange Labs, France  
*Network evolution and the impact in Core networks*

### Architectures

- Juan Fernández-Palacios, Telefonica, Spain  
*Evolutionary approach towards Ultra-High Capacity and QoS aware transport networks*
- Andreas Gladisch, Deutsche Telekom, Germany  
*Optical technologies, the enabler of the efficient Internet?*
- Klaus Schmidt-Schynowski, Nokia Siemens Networks, Germany  
*On the influence of High Split, Long Reach, High Data Rate Access Technologies on the Core Network Services.*
- Dominique Chiaroni, Alcatel-Lucent, France  
*New Generation Access and Metro Networks: challenges and opportunities*

### Conclusions

- Andy Houghton, European Commission, Belgium  
Tom Pearsall, EPIC, France

EPIC posted the report in electronic format on the new EPIC Extranet for the benefit of EPIC members. Subsequently EPIC produced and distributed a CD-report including all presentations to all attendees.



Alexandros Stavdas  
University of Peloponnese



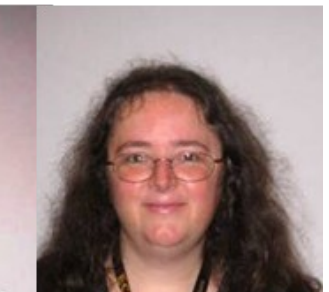
Tom Pearsall,  
EPIC



Ken-Ichi Sato,  
Nagoya University



Sergi Figuerola  
I2CAT



Esther Le Rouzic  
Orange Labs



Juan Fernández-Palacios,  
Telefonica



Andreas Gladisch  
Deutsche Telekom



Klaus Schmidt-Schynowski,  
Nokia Siemens Networks



Dominique Chiaroni,  
Alcatel-Lucent



Andy Houghton,  
European Commission

## EPIC and Yole Développement to publish LED Market & Technology Report

On 30 November 2010, Yole Développement and EPIC have published a collaborative Market & Technology report on LEDs that analyses the trends and challenges of the LED market and manufacturing technologies in 2010.

The report focuses on main market metrics of the LED industry from LED chips, packaged LED to LED fixtures and luminaires in various applications. It provides market volumes (units), ASP (\$) and market value (M\$) for LED business on each market segments and highlights the most recent progress in LED technology developments.

This report, with a commercial value of 11.000 euros, is provided to EPIC members at no extra charge as part of their annual membership fee. EPIC and Yole Développement will be marketing this report to non-members. <http://www.yole.fr/>



## EPIC launches Photonics Channel on YouTube

In June 2010 EPIC filmed four videos of EPIC members in the Paris Area. Didier Sauvage, 3S Photonics, Olivier Acher, Horiba Jobin Yvon, Samuel Bucourt, Imagine Optic and Patrick Maine, Quantel presented the activities of their respective organization. The videos are now running in sequentially on the EPIC website <http://epic-assoc.com/video-meet-a-member/>

At this occasion EPIC created a Photonics Channel on the very popular YouTube website. Please have a look at the EPIC photonics platform on YouTube, and send us your comments and suggestions.

<http://www.youtube.com/user/EPICphotonics>  
<http://epic-assoc.com/video-meet-a-member/>



## IQPC Intelligent Transportation Lighting: EPIC Presents Latest Market Data for LED Lighting

On 25 August 2010, EPIC presented market analysis for LED lighting at the IQPC Workshop on Lighting in Transportation in Hamburg. The world-wide market for LEDs rose by 10% in 2009, in spite of the economic recession, and the negative prediction of Strategies Unlimited. The leading market application is back-lighting units for flat-panel displays and television.

Overall market volume exceeded 44 billion in-spec LEDs and \$6 billion. Cree Research is now the 2nd largest manufacturer of chips, after Nichia. EPIC member Philips logged LED revenues of \$1billion, evenly divided between chips and luminaires. Philips foresees these revenues doubling in 2010.

EPIC member AIXTRON is the leading vendor of LED manufacturing reactors. Company revenues doubled during 2009 and continue to show strong growth. AIXTRON sales continue to be a good predictor of LED manufacturing activity.

Conference Chairs: Prof. Dr. Alexander von Hoffmann, Steinbeis Transfer Center and Wilfried Pohl, General Manager, Bartenbach GmbH. Complete proceedings are available on the EPIC extranet

### Programme

#### Market overview

Thomas P. Pearsall, Secretary General, EPIC  
*Market Developments for LED and OLED Lighting*

#### LED Technology – technical challenges, innovative solutions

Deepak Loomba, Managing Director & CEO, De Core Science & Technologies Ltd, India  
*New Horizons in transport lighting use of maneuverability through LEDs*

Dr. Adrian Mahlkow, Group LED Physicist OUT e.V.  
*Thermal management of LED*

Adrian HR Rawlinson, Managing Director, Marl International Limited: Case study railway  
*Sky is the Limit for LED Lighting*

Prof. Dr. Alexander von Hoffmann, Director, Steinbeis Transfer Center  
*Optical Simulation of LED Systems*

#### Measurement and standardisation of LEDs

Andreas Scholtz, Standardization Officer, OSRAM GmbH  
*Standardization of LED products*

Peter Läßle, Sales Manager Instrument Systems GmbH

*White Light LEDs: The challenge of measuring the light of the 21st century*

**OLEDs – a future technology on the rise**

Andreas Haldi, Customer Project Manager, Novaled AG  
*OLED technology and applications in the transport industry*

Mario Wanninger, Head of Engineering, Delvis GmbH  
*OLED technology – state-of-the-art applications for vehicle interiors*

**Improving LED performance**

Dietmar Czekay, Head of Sales, SBf Spezialleuchten Wurzen GmbH  
*Maximising LED lifetime and efficiency*

**The impact and description of light**

Prof. Dr. Christoph Schierz, Head of Faculty Lighting Engineering, Technical University Ilmenau  
*Effect of light colour on human physiology*

Peter van der Burgt, Application Engineer, Philips Lighting

*Communication of colour rendering properties of light sources*

René Peter Berthold Head of Product Design Interior Lighting, Hella Innenleuchten-Systeme GmbH  
*Coloured light applications in transportation*

**Lighting in practice**

Wilfried Pohl, General Manager, Bartenbach GmbH  
*New concepts for transport lighting*

Carsten Kohlmeier-Beckmann, Manager Lighting Systems New Development, Airbus Operations  
*LED in Airbus – Experience and Challenges*

Dr. Ralph Paetzold, Manager Productline Strategy, Diehl Aerospace GmbH  
*Realising a high-quality lighting system for Aircraft*

Dr. Stephan Malkmus, Optical Designer, OEC AG  
*Tailored optics for innovative illumination concepts  
Cross industry insight*

Harald Hemmer Lichttechnik / Projektplanung iGuzzini illuminazione Germany GmbH  
*LED technology for innovative street lighting luminaires*



IQPC audience, about 60 people attended the meeting

## NEXPRESSO project launched

Beginning on 1st July, NEXPRESSO, the “Network for EXchange and PRototype Evaluation of photonicS componentS and Optical systems” is a three-year EC-funded project and a projection of the highly successful ACCORD initiative, which aims to provide support for SMEs in commercializing their prototypes.



Objectives of the NEXPRESSO projects are:

- Purchase at marginal cost pre-competitive photonic devices from innovative European companies and put them in the hands of European researchers and students, at no net cost to the university or to the company that furnished the devices and
- Facilitate transfer of device evaluation results to potential end-users, assisting companies to access new markets and new applications.

In a recent interview with *Electro Optics* Tom Pearsall declared: “Unlike almost every other European Commission-funded project, we’re not looking at precompetitive research to develop an idea into a technology. We’re looking to support the critical stage between prototype development and presence in the marketplace,” a stage that has been dubbed the ‘Valley of Death.’”

The key challenge Pearsall identifies for the NEXPRESSO project is to find a sustainable funding mechanism. In the ACCORD project, the aim was to show this was a popular and productive exchange mechanism. “The ACCORD project was wildly successful,” said Pearsall. “In the NEXPRESSO project, we don’t have to prove it’s a good idea any more. What we have to find is people that are interested to adopt these exchange programs. We think those people are regional development or national development authorities, such as the Photonics Knowledge Transfer Network in the UK, for example.”

The 1st Call to European companies for photonic components and systems closed on 8 October 2010. 33 Companies submitted proposals. The project will now ask for responses from universities.

The NEXPRESSO Consortium partners are:

- Interuniversity Microelectronics Center
- European Photonics Industry Consortium
- Multitel
- Haute Ecole Spécialisée de Suisse Occidentale
- Sagem Défense Sécurité
- Wroclaw University of Technology
- Scottish Optoelectronics Association
- Perfos
- Opticsvalley

all of them except SOA being EPIC members.

Project website: <http://www.nexpresso.eu/>

## Members Vote for Workshop Topics 2011

As usual in September / October, EPIC solicited its members regarding the choice of the upcoming workshops to be organised in 2011. The list of suggested topics was the following:

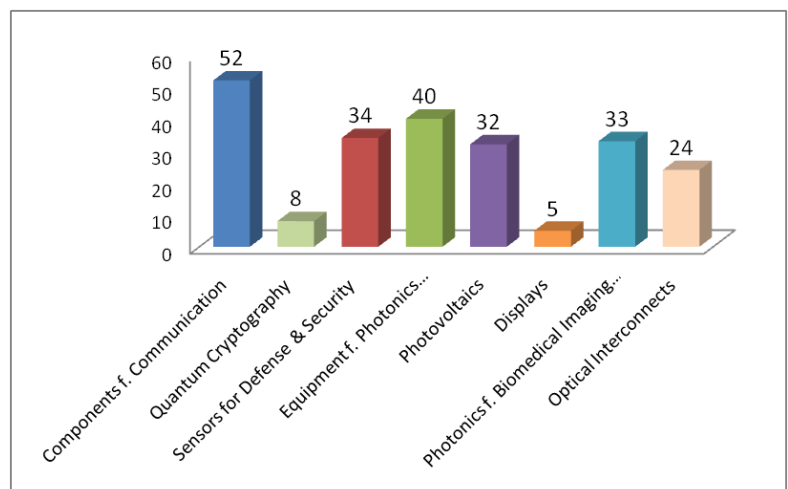
- Components for Communication
- Quantum Cryptography
- Sensors for Defense & Security
- Equipment for photonics manufacturing
- Photovoltaics
- Projection displays
- Photonics for biomedical imaging & spectroscopy
- Optical interconnects

When voting closed on 29 October EPIC members indicated a preference for:

1. Components for Communication with 52 points
2. Equipment for photonics manufacturing with 40 points
3. Sensors for Defense & Security with 34 points
4. Photonics for biomedical imaging & spectroscopy with 33 points
5. Photovoltaics with 32 points.

EPIC presented these results to the Governing Board at the quarterly meeting on 16 November, 2010 who has approved workshops on Components for communication and Equipment for photonics manufacturing.

In addition, EPIC organises workshops or symposia on Communication Technologies. In 2011 there will be a workshop within ECOC 2011 in Geneva, Switzerland on 18-22 September, and a workshop within the FTTH Council Annual Meeting which will take place on 9-10 February in Milan, Italy.



## EPIC visits members Polyphotonix and u<sup>2</sup>t in Durham UK

Tom Pearsall travelled to Durham to discuss current business and funding opportunities with EPIC members Polyphotonix and u<sup>2</sup>t. In addition EPIC also held meetings with PETEC (the Printable Electronics Technology Centre) and the UK Knowledge Transfer Network. Meetings took place at NETPark, a well-funded and growing innovation center in Sedgefield, the constituency of former Prime Minister Tony Blair.

### Polyphotonix

Polyphotonix is a start-up focussed on



**POLYPHOTONIX**

low-cost, large-area Polymer LED deposition. Applications for large-area advertising and high-end fashion were on display. New procedures are under development for producing active OLED thin films. Polyphotonix is seeking partners for upcoming EU calls for proposals.

Contact: Richard Kirk, CEO [richard@polyphotonix.com](mailto:richard@polyphotonix.com) - [www.polyphotonix.com](http://www.polyphotonix.com)

### u<sup>2</sup>t

EPIC member u<sup>2</sup>t has a branch location at NET-Park that specializes in very high speed modulators based on GaAs Mach-Zehnder design. Steve Clements, Managing Director, and Matthew O'Keefe, Head of New Business Development, presented the product, explaining that the u<sup>2</sup>t GaAs Mach-Zehnder design has intrinsic performance advantages over conventional quantum-well absorption modulators.

Contact: Steve Clements, Managing Director [steve.clements@u2t.co.uk](mailto:steve.clements@u2t.co.uk) - [www.u2t.com](http://www.u2t.com)



**u<sup>2</sup>t photonics**

### PETEC

Steven Spruce presented PETEC. PETEC works on process technologies, from chemical formulation to printing of organic materials, primarily polymer-based. The principal application is printing of electronic backplanes using organic thin-film transistors. The main application sector is electronic "paper" displays.



**petec** ...the future inspired

PETEC seeks to develop bilateral contracts with industry to develop elements of the processing technologies including prototype demonstrations. They do not have facilities for pilot production.

PETEC is also involved in collaborative R&D projects through the Northern Way Initiative to develop Printed Electronics. This is an emerging disruptive global technology, with a current market around \$1bn, estimated growth to \$48bn by 2017, rising towards \$300bn by 2027. The leading global printed electronics substrate supplier is DuPont Teijin Films. The programme has invested £5.7m with a £2.1m committed private sector match.

The PETEC funding model is: 1/3 public, 1/3 bilateral contracts and 1/3 collaborative projects. At the present time, there are 46 employees of which 21 are scientists and 16 are process engineers.

Contact: Martin Walkinshaw,  
Project Manager [martin.walkinshaw@uk-cpi.com](mailto:martin.walkinshaw@uk-cpi.com)

### UK-Knowledge Transfer Network PPE

The KTN has been collapsing its network into a more condensed organisation. The KTN Photonics division is now headed by Steve Welch. Ric Allott is heading up Photonics and Plastic Electronics technologies which provide solutions from carbon reduction resulting in massively reduced energy consumption. Ric Allott is a Director with specific responsibility for Plastic Electronics, Ultra-Efficient Lighting and Display Technologies. Contact: Ric Allott, Director Photonics and Plastic Electronics [ric.allott@espktn.org](mailto:ric.allott@espktn.org)

Also reporting to Steve Welch are Phil Cooper, Sensors and Instrumentation KTN. The Sensors & Instrumentation Knowledge Centre builds on support for UK sensing innovation reaching back over 10 years; and Alastair Wilson, Photonics Components. Wilson is co-director of the photonics subgroup of Plastic electronics and photonics. The PPE KC has prioritised key areas such as Photovoltaics, Ultra-Efficient Lighting, Plastic Electronics, Optical Communications, Ultra High Speed Broadband Communications and Healthcare.

## HHI Demonstrates 32 Gbaud Real-time Multi-format Transmitter for Higher-order Modulation Formats

A highlight of the exhibition at ECOC 2010 was the demonstration by EPIC member Fraunhofer Institute for Telecommunications / Heinrich-Hertz-Institute of the fastest and most versatile multiformat transmitter for optical fiber communications.

Jonas Hilt, HHI engineer and system developer, was on site to explain the innovation. "HHI and Micram Microelectronic have designed and manufactured the first real-time FPGA-based multiformat transmitter, including real-time coding, bit-mapping and electronic pre-distortion. It can operate at 32 GBaud and corresponds to a data rate of 256 GBit/sec per wavelength for polarization-multiplexed 16QAM coding."

A major priority in optical fiber communications is increasing the volume of data carried by an optical fiber. Traditionally, the approach is to increase the bit rate. A recent trend is to introduce higher-order modulation schemes based on phase-shift keying. Emerging technologies leading to 100 GBit/sec Ethernet and higher spectral efficiency borrow for techniques used in radio transmission, including coherent detection, distortion compensation in the electronic domain, and wavelength division multiplexing. The system demonstrated by HHI was in full operation, converting a digital bit stream at 265 GBit/sec into quadrature phase-shift keying and 16Q analog modulation formats. The digital to analog conversion produces 32 G samples/sec with 6-bit resolution.

Hans-Joachim Grallert, Managing director of HHI and Epic Board member told EPIC News: "The digital innovations of the future depend on the ultrafast networks of the future. With this new instrument, the HHI-Micram team has taken a huge step toward that future".

Your contact: [jonas.hilt@hhi.fraunhofer.de](mailto:jonas.hilt@hhi.fraunhofer.de)



**Fraunhofer**  
**Institut**  
**Nachrichtentechnik**  
**Heinrich-Hertz-Institut**



Jonas Hilt, Research Engineer at HHI and developer of the Vega multiformat transmitter