Advance Program

Monday, 20 August 2007

California/Powell

8:45 AM - 12:00 PM

Session PLE: PLENARY SESSION
Session Co-Chairs: S.J. Ben Yoo, *University of California – Davis, Davis, CA, USA*
Dominique Chiaroni, *Alcatel Lucent, Nozay, France*

8:45 AM - 9:15 AM **Conference Welcome**

PLE1 9:15 AM - 10:00 AM

Next Generation Photonic Switching, R. C. Alferness*, Alcatel-Lucent, Holmdel, NJ, USA*

BIO: Rod C. Alferness is currently the Bell Laboratories Research Senior Vice President, Alcatel-Lucent. His previous position was the Bell Laboratories Optical Networking Research Senior Vice President. Rod also was the Chief Technical Officer and Advanced Technology and Architecture Vice-President of the Optical Networking Group, Lucent Technologies. Prior to that role, he was head of the Photonics Networks Research Department of Lucent Bell Laboratories, Holmdel, New Jersey.

Rod joined Bell Labs in 1976 after receiving a Ph.D. in physics from the University of Michigan where his thesis research, under the supervision of Professor Emmett Leith, concerned optical propagation in volume holograms. His early research at Bell Labs included the demonstration of novel waveguide electro-optic devices and circuits - including switch/modulators, polarization controllers, tunable filters - and their applications in high capacity lightwave transmission and switching systems. This research led to the early development of titanium diffused lithium niobate waveguide modulators that are now deployed as the high-speed signal-encoding engine in fiber optic transmission systems around the world. Dr. Alferness has also made contributions in photonic integrated circuits in InP, including widely tunable lasers, as well as in photonic switching systems and reconfigurable WDM (wavelength-division-multiplexed) optical networks. In the mid-90's, he was an originator and the Bell Labs Program Manager for the DARPA funded MONET project which demonstrated the feasibility of wavelength routed optical networks that are now being implemented for both backbone and metro networks. Dr. Alferness has authored over 100 papers, holds 35 patents and has authored five book chapters.

Dr. Alferness is a member of the National Academy of Engineering He is a Fellow of the Optical Society of America and the IEEE Lasers and Electro-Optics Society (LEOS). Dr. Alferness received the 2005 IEEE Photonics Award. He has served as an elected member of the LEOS AdCom and was the President of IEEE LEOS in 1997. He was General Co-Chair of the 1994 Optical Fiber Communications Conference (OFC'94). Dr. Alferness has served as Associate Editor for Optics Letters and for Photonic Technology Letters. He has served on many IEEE and OSA committees, including fellows and awards committees. Dr. Alferness also currently serves on the European Conference on Optical Communication (ECOC) Executive Management Committee. He served as the Editor-in-Chief of the IEEE and OSA-sponsored Journal of Lightwave Technology from 1995-2000. He served as an elected member of the Optical Society of America Board of Directors from 2001-2003 and is currently the president-elect of OSA.

ABSTRACT: After many years of research, highly anticipated early adoption followed by a hard bust, a first generation of optical switches in the form or ROADMs and cross-connects is currently being deployed in both long haul and metro DWDM networks. Work remains to cost reduce, expand functionality and enhance the performance of these switches and to mature the network control systems. However, research focus has shifted to address the role of photonics to build higher layer switch/routers whose capacity requirements have been driven by rapidly expanding data, particularly video, traffic. The challenges are substantial but there has been some substantial progress. In this talk, we examine the opportunity, options and likely scenarios for next generation photonics in switching.

10:00 AM - 10:30 AM **COFFEE BREAK**

PLE2 10:30 AM - 11:15 AM

Switching Architectures for Optical Networking Systems, J. Berthold*, Ciena Corporation, Linthicum, MD, USA*

BIO: Joseph Berthold is Vice President, Network Architecture at CIENA, where he has worked since early 1997. There he contributes to the understanding of future network architecture directions, the definition of CIENA's networking products, and is responsible for coordination of CIENA's work in industry standards. He is also president of the Optical Internetworking Forum.

ABSTRACT: Dynamic optical networking systems, based on electronic switching, have seen broad deployment. We will discuss reasons for making the photonic layer dynamic, and examine switching system architectures that may make increasing use of photonic elements.

PLE3 11:15 AM - 12:00 PM

Next Generation Networks: NTT's View and Plan, H. Shinohara*, NTT Corporation, Musashino-shi, Tokyo, Japan*

BIO: Mr. Hiromichi Shinohara has been a Vice President of NTT, Executive Director of NTT Information Sharing Laboratory Group since June 2007.

Mr. Shinohara joined NTT Laboratories in 1978. He has consistently been spending his carrier to realize FTTH. In addition, he has recently been engaged in strategic planning and promoting of research and development for NGN architecture and platform technologies.

ABSTRACT: NTT's "Medium-Term Management Strategy" shows policies for the construction of NGN that is of high quality, flexible and secure. Some technology developments in building the NGN are presented.

12:00 PM – 2:00 PM LUNCH BREAK

2:00 PM - 3:00 PM

Session SYMP1: SYMPOSIUM ON OPTICAL BUFFERS AND THEIR IMPACTS ON PHOTONIC SYSTEMS AND NETWORKS - PART I
Session Chair: S.J. Ben Yoo, *University of California – Davis, Davis, CA, USA*

SYMP1.1 2:00 PM - 2:15 PM (Invited)

Optical Buffers in the Photonic Internet, N. W. McKeown*, Stanford University, Stanford, CA, USA*

ABSTRACT NOT AVAILABLE

SYMP1.2 2:15 PM - 2:30 PM (Invited)

In Search of the Elusive All-Optical Packet Buffer, R. S. Tucker, S. S. Mughal, and K. Hinton*, University of Melbourne, Parkville, VIC, Australia*

We provide an overview of potential technologies for all-optical buffering in optical packet switches. We describe the properties of a range of buffer architectures and describe the limitations of all-optical delay line buffers.

SYMP1.3 2:30 PM - 2:45 PM (Invited)

All-Optical RAM-based Buffer for Packet Switch, K.-I. Kitayama, S. Arakawa, and M. Murata *Osaka University, Suita, Osaka, Japan*, S. Matsuo, M. Notomi, R. Takahashi, and Y. Itaya*, NTT Corporation, Atsugi-shi, Kanagawa, Japan*

A new 5-year-long government-supported R&D program, aiming at all-optical RAM buffer will be presented. Focuses are on nano-structured optical RAM devices, its optical interface, buffer design and scheduling as well as its system performance evaluation.

SYMP1.4 2:45 PM - 3:00 PM (Invited)

Resonantly Enhanced All Optical Buffers on a Silicon Chip, F. Xia, L. Sekaric and Y. A. Vlasov*, IBM Research, Yorktown Heights, NY, USA*

We investigated ultra-compact optical buffers using cascaded ring resonators and photonic crystal waveguides on silicon-on-insulator platform. Group delay exceeding 500ps was realized at 20Gbps, corresponding to buffering of 10bits using up to 100 cascaded resonators.

3:00 PM - 3:30 PM Panel Discussion

3:30 PM – 4:00 PM COFFEE BREAK

4:00 PM - 5:30 PM

Session SYMP2: SYMPOSIUM ON OPTICAL BUFFERS AND THEIR IMPACTS ON PHOTONIC SYSTEMS AND NETWORKS - PART II
Session Chair: Keren Bergman, *Columbia University, New York, NY, USA*

SYMP2.1 4:00 PM - 4:15 PM (Invited)

Tunable All-Optical Delays in Optical Waveguides, A. L. Gaeta*, Cornell University, Ithaca, NY, USA*

I will review recent work demonstrating tunable delays in optical fibers. Several promising techniques exist that are capable of producing maximal delays from a few pulse widths to over 1000 pulse widths.

SYMP2.2 4:15 PM - 4:30 PM (Invited)

160 Gb/s All-Optical Packet Switching Field Experiment, H. J. S. Dorren, O. Raz, E. Tangdiongga, Y. Liu, M. T. Hill, H. de Waardt, A. M. J. Koonen and G. Khoe, *Eindhoven University of Technology, Eindhoven, The Netherlands*, J. Herrera, J. Marti, F. Ramos*, Universidad Politécnica de Valencia, Valencia, Spain*, G. Maxwell, and A. J. Poustie*, Centre for Integrated Photonics, Ipswich, Suffolk, UK*, and H. C. H. Mulvad*, Technical University of Denmark, Lyngby, Denmark*

We discus an all-optical packet switching experiment over 110 km of field installed optical fiber. The switching node is controlled by solely photonic control circuits.

SYMP2.3 4:30 PM - 4:45 PM (Invited)

Optoelectronic Buffer based on CMOS RAM, R. Takahashi, T. Nakahara, R. Urata, J.-K. Seo and H. Suzuki, *NTT Corporation, Atsugi, Kanagawa, Japan*

An optoelectronic buffer consisting of optical interfaces and CMOS RAM is promising for future optical packet-switched routers, with its ability to process arbitrary-length ultrafast asynchronous optical packets and support flexible IP-related services (QoS, ToS, multicast routing, etc.).

SYMP2.4 4:45 PM - 5:00 PM (Invited)

MMI-BLD Optical Flip-Flop for All-Optical Packet Switching, M. Takenaka, K. Takeda, Y. Kanema, and Y. Nakano, *University of Tokyo, Tokyo, Japan*, M. Raburn, *Infinera, Sunnyvale, CA, USA*, T. Miyahara, *Mitsubishi Electric Corporation, Hyogo, Japan*, and H. Uetsuka, *Hitachi Cable Ltd., Hitachi-shi, Ibaraki, Japan*

We have demonstrated all-optical packet switching, in which an MMI-BLD optical flip-flop worked as a label memory. The optical flip-flop allowed self-routing of multiple-wavelength packets with 338-ps switching time and 14-dB on-off ratio.

5:00 PM - 5:30 PM Panel Discussion

6:30 PM – 8:00 PM **CONFERENCE RECEPTION – ROOM OF THE DONS**

Tuesday, 21 August 2007

Room of the Dons

8:30 AM - 10:00 AM

Session TuA1: PHOTONIC INTERCONNECTS
Session Chair: Keren Bergman, *Columbia University, New York, NY, USA*

TuA1.1 8:30 AM - 8:45 AM

An Optimized Non-Blocking SOA Switch Architecture for High Performance Tb/s Network Interconnects, E. T. Aw, A. Wonfor, R. V. Penty and I. H. White, *University of Cambridge, Cambridge, UK*, M. Glick, *Intel Corporation, Pittsburgh, PA, USA*

A practical non-blocking 32x32 SOA based switch architecture is presented which minimises the number of required cascaded stages while also requiring relatively few SOAs. This switch is robust and suitable for 8x10Gb/s wavelength striped operation.

TuA1.2 8:45 AM - 9:00 AM

QoS Support in Data Vortex Network with Latency Differentiated Cylindrical Paths, Q. Yang, *Harvey Mudd College, Claremont, CA, USA*

Differential latency paths are provided along the cylinders of Data Vortex network to support traffics of different levels of service. The simulation result demonstrates effective and improved routing performance in overall throughput and latency.

TuA1.3 9:00 AM - 9:30 AM (Invited)

High Capacity Optically Switched Interconnects for Computer Network Applications, M. Glick, *Intel Corporation, Pittsburgh, PA, USA*, A. Wonfor, E. T. Aw, R. V. Penty and I. H. White, *University of Cambridge, Cambridge, UK*

We summarize the needs for high-capacity interconnects, specifically for short reach applications and review the challenges for optically switched interconnects. We present recent work on our near term solution, SWIFT, for a centrally controlled, single switch fabric, not requiring optical buffering or optical delay lines.

TuA1.4 9:30 AM - 10:00 AM (Invited)

The OSMOSIS Optical Packet Switch for Supercomputers: Enabling Technologies and Measured Performance, R. R. Grzybowski, B. Hemenway, M. Sauer, *Corning, Inc., Corning, NY, USA*, C. Minkenberg, F. Abel, P. Mueller and R. P. Luijten, *IBM*

California/Powell

8:30 AM - 10:00 AM

Session TuB1: OPTICAL PACKET SWITCHING TECHNOLOGIES
Session Chair: Ian H. White, *University of Cambridgem Cambridge, UK*

TuB1.1 8:30 AM - 9:00 AM (Invited)

Tunable Optical Delay Lines for Switching and Processing, A. E. Willner, *University of Southern California, Los Angeles, CA, USA*

Tunable optical delay lines have many applications for high-performance switching and procssing. We will explore the enabling technologies for achieving tunable optical delay lines, various figures-of-merit, and critical engineering challenges.

TuB1.2 9:00 AM - 9:15 AM

Optical Parametric Amplification for Slow Light in Random Birefringence Fibers, M. Santagiustina, C. G. Someda, L. Schenato, L. Palmieri, A. Galtarossa, and E. Bettini, *Università degli Studi di Padova, Padova, Italy*

The effects of random birefringence on slow light parametric amplification are numerically studied. Different polarization rotation for signal, idler and pump limits walk-off induced distortions but also reduces gain and induced time delay.

TuB1.3 9:15 AM - 9:30 AM

All-Optical Packet Routing based on Integrable 2x2 Switch for Data Packets up to 160 Gbit/s, G. Berrettini, *Scuola Superiore "S. Anna", Pisa, Italy*, P. Ghelfi, A. Bogoni and L. Poti, *CNIT, Pisa, Italy*

An all-optical, integrable, ultra-fast 2x2 spatial switch based on Cross-Gain-Modulation in Semiconductor Optical Amplifiers able to process signals up to 160Gbit/s is demonstrated. Penalty measurements confirm the effectiveness of the proposed scheme in cascade configurations.

TuB1.4 9:30 AM - 9:45 AM

High-Extinction-Ratio (> 55 dB) Port Selection by using a High-Speed $LiNbO_3$ Optical Switch with Intensity Trimmers, A. Chiba, T. Kawanishi, T. Sakamoto, and M. Izutsu, *National Institute of Information and Communications Technology, Koganei, Tokyo, Japan*, and K. Higuma, *Sumitomo Osaka Cement Co. Ltd.,*

Research, Ruschlikon, Switzerland

We discuss the technologies and architectural innovations that enabled us to build a demonstration system, OSMOSIS, exhibiting HPC level optical performance for 64 ports @ 40 Gb/s data paths across an SOA based optical crossbar, and report on the implementation of the electronic central controller.

Funabashi, Chiba, Japan

We demonstrated 55-dB extinction ratio port selection using an integrated $LiNbO_3$ 2×2 optical switch with two intensity trimmers, in addition to a possibility of its quick response less than 0.1 ns.

TuB1.5 9:45 AM - 10:00 AM

Novel Transparent Optical-Code-based Label Swapping Technique using Multiport Encoder/Decoder, Y. Awaji, *National Institute of Information and Communications Technology, Tokyo, Japan*, S.-M. Koh, and K.-I. Kitayama, *Osaka University, Suita, Osaka, Japan*

We proposed a novel technique of all-optical label swapping for optical code (OC)-based label switching. It can be implemented by using single multiport optical en/decoder which is equipped with a set of switch fabric, without any local light sources.

10:00 AM - 10:30 AM COFFEE BREAK

10:30 AM - 12:30 PM

Session TuA2: METRO NETWORKS
Session Chair: Ken-ichi Sato, *Nagoya University, Nagoya, Japan*

TuA2.1 10:30 AM - 10:45 AM

Wavelength-Packet-Selective ROADM-Enabled Granularity-Flexible WDM Network, N. Kataoka, N. Wada, T. Miyazaki , *National Institute of Information and Communications Technology, Koganei, Tokyo, Japan*, K. Sone, Y. Aoki, H. Miyata, S. Kinoshita, H. Onaka *Fujitsu Laboratories Ltd., Kawasaki, Kanagawa, Japan*, and K.-I. Kitayama, *Osaka University, Suita, Osaka, Japan*

A novel granularity-flexible wavelength-packet-selective ROADM at 40Gbit/s based on optical code label switching is presented. A field trial of 640 Gbit/s throughput wavelength-packet-selective ROADM is demonstrated in 16-channel WDM ring network.

TuA2.2 10:45 AM - 11:00 AM

Cascadability Issues in a Multi-Service Optical Packet Ring Network, D. Chiaroni, M. Le Pallec, C. Simonneau, S. Borne, D. Bayart and J.-P. Hamaide, *Alcatel-Lucent, Nozay, France*

A multi-service optical packet ring for the metro area are presented in this paper. Cascadability issues through theoretical analysis and experimental investigations indicate that an optical packet technology could be a competitive solution for the next generation of metro networks.

TuA2.3 11:00 AM - 11:15 AM

Simple Node Architectures for Connection of Two ROADM Rings using Hierarchical Optical Path Routing, K. Ishii, H. Hasegawa and K.-I. Sato, *Nagoya University, Nagoya, Aichi, Japan*

We propose a wavelength assignment algorithm for full mesh node connectivity of two connected, bidirectional ring networks. It is proved to minimize the necessary number of wavelengths. We also propose novel ring-connecting nodes that can reduce switch size by 90-50% compared to conventional arrangement.

TuA2.4 11:15 AM - 11:30 AM

100 Gbits/s Packet Ring Architectures, L. Aguirre-Torres and M. Roth, *Corrigent Systems, San Jose, CA, USA*

We present a method for scaling packet ring network transmission capacity from 10Gbits/s to 100Gbits/s. It introduces the concept of high capacity packet rings, and describes a hashing mechanism for load balancing and enhanced resiliency over the high capacity network links.

TuA2.5 11:30 AM - 12:00 PM (Invited)

Multi-Degree ROADM's with Agile Add-Drop Access, V. Kaman, R. J. Helkey, *Calient Networks, Inc, Goleta, CA, USA* and

10:30 AM - 12:30 PM

Session TuB2: PHOTONIC INTERCONNECTING SYSTEMS & TECHNOLOGIES
Session Chair: Lars Thylen, *Royal Institute of Technology, Kista, Sweden*

TuB2.1 10:30 AM - 11:00 AM (Invited)

IntraChip Optical Networks for a Future Supercomputer-on-a-Chip, J. A. Kash, *IBM Research, Yorktown Heights, NY, USA*

Si photonics for on- and off-chip communications in future multicore microprocessor chips is considered. Using 3D integration to combine an on-chip optical network plane with a separate microprocessor plane can significantly improve the performance/watt of multicore chips.

TuB2.2 11:00 AM - 11:30 AM (Invited)

WDM Optical Packet Interconnection for Petascale Ultra-High-Performance Computing Systems, H. Onaka, S. Kinoshita, and Y. Aoki, *Fujitsu Laboratories Ltd., Kawasaki, Kanagawa, Japan*

WDM optical packet interconnection for peta-flops ultra-high-performance computing systems using multi-gate SOA broadcast-and-elect switch architecture is described. Fundamental results of system experiment are shown in this paper.

TuB2.3 11:30 AM - 11:45 AM

Ultrafast Optoelectronic Switching of an Optically Clocked Transistor Array, R. Urata, R. Takahashi, T. Suemitsu, and T. Nakahara, *NTT Corporation, Atsugi-shi, Kanagawa, Japan*

We investigate the design and optimization of an optically clocked transistor array (OCTA) OEIC for high-speed serial-to-parallel and parallel-to-serial conversion of asynchronous burst optical packets. >100-Gb/s switching operation is achieved in a proof-of-principle demonstration.

TuB2.4 11:45 AM - 12:00 PM

Modelling and Implementation of Photonic Digital Subsystem for Bit Comparison, A. Das Barman, S. Debnath, M. Scaffardi, L. Poti and A. Bogoni, *CNIT, Pisa, Italy*

This paper reports an accurate and fast simulation tool describing photonic SOA-based digital processing schemes. It is validated through an implementation of photonic bit comparator. Important design guidelines are extracted by the proposed tool.

TuB2.5 12:00 PM - 12:15 PM

Ultra-fast All-optical Interconnection Network Fully Based on Modular Integrable Photonic Digital Processing, N. Andriolli, G. Berrettini, P. Castoldi, *Scuola Superiore "S. Anna", Pisa, Italy*, M. Scaffardi, L. Poti and A. Bogoni, *CNIT, Pisa, Italy*

We present a modular architecture of an all-optical interconnection network capable of forwarding 160 Gb/s fixed-length packets. It uses

J. E. Bowers, *University of California - Santa Barbara, Santa Barbara, CA, USA*

We review a cost-effective multi-degree ROADM that can support up to 100% add-drop traffic capacity with unparalleled agility and minimal pre-planning. The ability of this ROADM to share and minimize the need for transponders to the lowest possible required is discussed for network level savings.

TuA2.6 12:00 PM - 12:30 PM (Invited)

Recent Advances on Node Technologies in Photonic Networks, Y. Hibino and M. Jinno, *NTT Corporation, Yokosuka, Kanagawa, Japan*

The photonic nodes with optical switches have been developing from 2 degrees (ROADM) in ring networks to multidegrees in mesh networks. Here we review recent advances on the node technologies in the photonic networks.

photonic digital processing subsystems built combining a single integrable module which exploits cross gain modulation in a semiconductor optical amplifier.

TuB2.6 12:15 PM - 12:30 PM

All-Optical Header Recognition Using a Semiconductor Optical Amplifier Switch Matrix, M. Dagenais, S. S. Saini, *University of Maryland, College Park, MD, USA*, F. Toudeh-Fallah, R. Gyurek and P. Donner, *Cisco Systems, Inc., San Jose, CA, USA*

A 1 x 8 semiconductor optical amplifier switch is demonstrated. Experimental results are presented recognizing all possible addresses of a 3-bit sub-set out of an 8-bit address at 10 Gb/s. Noise propagation through the switch is studied.

12:30 PM – 2:00 PM LUNCH BREAK

Willard 1 & 2

2:00 PM - 3:30 PM

Session TuP: Poster Session

TuP1 Polarization Switching in a 1.5 μm Wavelength Single-Mode Vertical Cavity Surface Emitting Laser under Modulated Optical Beam Injection Control, K. H. Jeong, and S. H. Lee, *Inha University, Incheon, Korea*

We report an experimental demonstration of potentially high-speed polarization switching in a 1.5 μm wavelength single-mode VCSEL under modulated injection laser beam control. The polarization switching up to 200 MHz between the two inherent linear polarization modes of the VCSEL was demonstrated.

TuP2 All Optical Switching Triode based on Cross-Gain Modulation in Semiconductor Optical Amplifier, J.-H. Huh, H. Homma, H. Nakayama and Y. Maeda, *Toyota Technological Institute, Nagoya, Aichi, Japan*

This work realized that all-optical triode based on negative feedback optical amplification effect in InGaAsP/ InP semiconductor optical amplifiers (SOAs) and functioned as an optical switching device with high output modulation degree up to 8 GHz.

TuP3 Analysis of Optical Signal Regenerating Performance by Nonlinear Directional Coupler Loaded with SOA and Long-Period Grating, T. Ochiai, *Waseda University, Tokyo, Shinjuku, Japan*

We propose a nonlinear directional coupler loaded with a semiconductor optical amplifier (SOA) and a long-period grating for an all-optical signal regenerator. As a result of numerical simulation, we confirmed the potential of an optical signal regeneration with reshaping and regenerating.

TuP4 Performance Evaluation of Wavelength Conversion at 160 Gbit/s using XGM in Quantum-Dot Semiconductor Optical Amplifiers in MZI Configuration, J. F. Pina, *Nokia Siemens Networks, Alfragide, Portugal*, H. J. A. da Silva, *Instituto de Telecomunicações, Coimbra, Portugal* and P. N. Monteiro, *Siemens S.A., Amadora, Portugal*

This paper assesses the performance of a wavelength converter based on Cross-Gain Modulation in Quantum-Dot Semiconductor Optical Amplifiers in an interferometer. Patterning-effect free wavelength conversion is achieved with no extinction ratio degradation at 160 Gbit/s.

TuP5 Self-Holding Optical Shutter with Smectic Liquid Crystal Cell, S. Kobayashi, T. Sakamoto, K. Hasuda, and A. Kakuta, *Chitose Institute of Science and Technology, Chitose, Hokkaido, Japan*, Y. Fujii, and S. Noka, *Photonic Science Technology, Inc., Chitose, Hokkaido, Japan*

A self-holding optical shutter consisting of a smectic liquid crystal (SLC) cell was demonstrated at 1550 nm. The maximum extinction ratio was 33 dB. The measured return loss of the cell was 42 dB.

TuP6 Analysis of Unidirectional Grating-Assisted Co-Directional Couplers by Transfer Matrix Method, B. R. West and D. V. Plant, *McGill University, Montreal, QC, Canada*

The unidirectional grating-assisted co-directional coupler is the basis for a new generation of photonic devices. We analyze this device by the transfer matrix method, which leads to a simple explanation of its unidirectional coupling properties.

TuP7 Versatile Optical Switch Technology for Dynamic Optical Networking, S. Yu, *University of Bristol, Bristol, Avon, UK*

Device technology and application functions of an active vertical coupler optical switch are described. The technology can deliver multiple switching functions with the same hardware, therefore is very versatile for many networking applications.

TuP8 Multi-Physics Model of MOEMS-based Switch for All-Optical Interconnection Networks, I. Plander and M. Stepanovsky, *University of Trencin, Trencin, Slovakia*

This work describes a multi-physics model of MOEMS-based optical switch for all-optical interconnection networks. The model covers four physical areas – mechanical, hydro-dynamical, electrical and optical ones. The paper gives results of the micro-mirror system simulation and control.

TuP9 Giant Optical Non-Linearity Induced by a Single Quantum-Dot in a Semi-Conducting Microcavity, A. Auffèves-Garnier, A. Mosset, M. Munsch, *Laboratoire Aimé Cotton, Saint Martin d'Hères, France*, J.-P. Poizat, *CNRS, Saint Martin d'Hères, France*, C. Simon,

Laboratoire Aimé Cotton, Geneva, Switzerland and J.-M. Gerard*, Commissariat à l'Énergie Atomique, Grenoble, France*

A single quantum dot in a micropillar in Purcell regime provides a giant optical non-linearity. We will show that this effect should be observable using state-of-the-art devices, and present the ongoing experiments.

TuP10 A Proposal for the Next Generation Low-Cost, High QoS and Capacity, Fair, and Adaptable Group Division Multiple Optical Access Networks (GDMOAN), A. F. Kamal*, Georgia Institute of Technology, Atlanta, GA, USA*

Present-day optical networks suffer from high-cost, low-QoS, low-capacity, low-scalability, unfairness, inflexibility, and short-distance. Group Division Multiple Optical Access (GDMOA) is the next-generation optical-access-network technology that diminishes these drawbacks with feedback- and prediction- based bandwidth allocation.

TuP11 Broadband Integrated Optical Isolators, T. Zaman, X. Guo, and R. J. Ram*, Massachusetts Institute of Technology, Cambridge, MA, USA*

An integrated waveguide isolator design in InGaAsP/InP is proposed which achieves a maximum isolation greater than 40 dB and maintains 25 dB of isolation over the C-band.

TuP12 Characterization and Performance Analysis of LPCVD Germanium-on-Silicon C-Band Photodiodes, J. S. Orcutt, O. O. Olubuyide, N. DiLello, J. L. Hoyt, and R. J. Ram*, Massachusetts Institute of Technology, Cambridge, MA, USA*

Spatially-resolved photo response and bias dependent modulation measurements of large area vertically-illuminated germanium photodiodes are presented. These measurements are compared with finiteelement device simulations to theorize possible sources of performance limitations revealed by different measurement conditions.

TuP13 SPECTS O-CDMA Field Trials using Sub-Picosecond Pulses and Integrated Encoders/Decoders across 80.8-km and 150-km Link, N. K. Fontaine, C. Yang, R. P. Scott, V. J. Hernandez, F. M. Soares, R. G. Broeke, *University of California – Davis, Davis, CA, USA,* K. Perry, G. Nowak, *MIT Lincoln Laboratory, Lexington, MA, USA*, W. Cong, K. Okamoto, B. H. Kolner, Z. Ding, J. P. Heritage, and S. J. B. Yoo*, University of California – Davis, Davis, CA, USA*

We compare two field demonstrations of SPECTS-OCDMA on an 80.8-km link and 150-km link using a fully-integrated, polarization independent arrayed-waveguide grating (AWG)-based encoders/decoders, a ultra-stable optical frequency comb generator and a tunable dispersion slope compensator.

TuP14 Monolithically Integrated InP Photonic Micro Systems on a Chip for O-CDMA and OAWG Applications, S. W. Seo, F. M. Soares, J. H. Baek, W. Jiang, N. K. Fontaine, R. P. Scott, C. Yang, D. J. Geisler, J. Yan, R. G. Broeke, J. Cao, *University of California – Davis, Davis, CA, USA,* F. Olsson, S. Lourdudoss, *Royal Institute of Technology, Kista, Sweden*, A. H. Pham, and S. J. B. Yoo*, University of California – Davis, Davis, CA, USA*

A monolithically integrated InP chip for optical arbitrary waveform generation and/or pulse-coding/decoding is demonstrated using a 20-GHz AWG pair and 10 high-speed phase modulators. The fabrication and performance of the InP chip will be presented.

TuP15 Efficient Performance Optimization for Ultrafast All-Optical Switching in SOA-MZI Devices, J. P. Wang, B. S. Robinson, S. J. Savage, S. A. Hamilton, *MIT Lincoln Laboratory, Lexington, MA, USA*, E. P. Ippen, *Massachusetts Institute of Technology, Cambridge, MA, USA*, R. Mu, H. Wang, J. Sarathy, and B. B. Steganov, *Alphion Corporation, Princeton Junction, PA, USA*

We present a simple method for optimization of ultrafast switching performance in semiconductor optical amplifier Mach-Zehnder interferometer (SOA-MZI) devices. By simultaneously measuring switching dynamics over all possible interferometer bias points, we acquire an extinction map which accurately identifies operating conditions for high extinction and optimal switching.

3:30 PM – 4:00 PM COFFEE BREAK

4:00 PM - 5:30 PM

Session TuA3: Reconfigurable Optical Networks
Session Chair: Giancarlo Prati, *Scuola Superiore "S. Anna", Pisa, Italy*

TuA3.1 4:00 PM - 4:15 PM

Lightweight RSVP-TE Extensions to Account for Shared Regenerators in Translucent Optical Networks, N. Sambo, N. Andriolli, A. Giorgetti, L. Valcarenghi and P. Castoldi *, Scuola Superiore "S. Anna", Pisa, Italy*, and F. Cugini*, CNIT, Pisa, Italy*

Lightweight GMPLS signaling extensions are proposed to account for shared regenerators in translucent optical networks during lightpath set up. Low blocking is obtained without requiring any routing protocol modification.

TuA3.2 4:15 PM - 4:30 PM

Hybrid Photonic Switch Matrix for Sub-Wavelength Switching, L. S. Tamil*, University of Texas at Dallas, Richardson, TX, USA*

Exploiting the wavelength-time-space switching in semiconductor optical amplifiers, a multi-terabit optical switch matrix capable of sub-wavelength switching has been demonstrated.

TuA3.3 4:30 PM - 4:45 PM

Design for Ultra-compact High-Speed Semiconductor Photonic

4:00 PM - 5:30 PM

Session TuB3: Silicon Photonics
Session Chair: John E. Bowers, *University of California – Santa Barbara, Santa Barbara, CA, USA*

TuB3.1 4:00 PM - 4:30 PM (Invited)

Controlling Light with Light in Silicon Micro-Resonators, M. Lipson*, Cornell University, Ithaca, NY, USA*

ABSTRACT NOT AVAILABLE

TuB3.2 4:30 PM - 5:00 PM (Invited)

Silicon Photonic CMOS Technologies, C. Gunn*, Luxtera, Inc., Carlsbad, CA, USA*

ABSTRACT NOT AVAILABLE

TuB3.3 5:00 PM - 5:15 PM

Maximizing the Thermo-Optic Tuning Range of Silicon Photonic Structures, F. Gan, T. Barwicz, M. A. Popovic, M. Dahlem, C. W. Holzwarth, P. T. Rakich, H. I. Smith, E. P. Ippen and F. X. Kaertner*, Massachusetts Institute of Technology, Cambridge, MA, USA*

We demonstrate 20nm thermo-optic tuning in silicon microring resonators with 16nm free spectral range (FSR), the largest reported full-FSR thermal tuning, with a tuning efficiency of 28μW/GHz,

Switch by High-Δ Structures and Bend Waveguides for Large-Scale Switching Fabric, Y. Ueda, *Waseda University, Shinjuku, Tokyo, Japan*

We investigate the structural design for size reduction of a high-speed semiconductor photonic switch. As a result, it is shown that the device size can be drastically reduced, and high density of switch elements as large as ~200 elements /mm^2 can be attained.

TuA3.4 4:45 PM - 5:00 PM

Protecting Wavelengths in a DWDM Network Using a Minimal Number of Optical Transponders, M. Boduch, *Tellabs Operations Inc., Naperville, IL, USA*

A Method of protecting wavelengths in a DWDM network is described. The method substantially reduces the number of transponder modules.

TuA3.5 5:00 PM - 5:30 PM (Invited)

Architecture, Control, and Management of Optical Switching Networks, B. Mukherjee, *University of California - Davis, Davis, CA, USA*

We present dynamic circuit switching (DCS) as a new paradigm for telecom backbone networks. DCS is well suited for optical networks and can support emerging services such as bandwidth-on-demand more efficiently than other switching technologies.

enabling telecom microphotonic tunable filters.

TuB3.4 5:15 PM - 5:30 PM

Power Penalty of High-Data-Rate Transmission Delay through a Silicon Photonic Crystal Slow-Light Waveguide, B. G. Lee, J. F. McMillan, A. Biberman, B. A. Small, C. W. Wong and K. Bergman, *Columbia University, New York, NY, USA*

The power penalty of a silicon photonic crystal slow-light waveguide, which can be used for optical buffering, is characterized experimentally and with simulations. The distortion, caused by dispersion near the mode onset, imposes a design performance trade-off between the obtainable delay and the tolerable degradation.

7:00 PM - 10:00 PM **CONFERENCE BANQUET ABOARD THE *CHARDONNAY COMMODORE***
ARRIVE AT PIER 40 BY 6:45 PM

Wednesday, 22 August 2007

Room of the Dons

8:30 AM - 9:45 AM

Session WA1: OPTICAL ACCESS
Session Chair: Rodney S. Tucker, *University of Melbourne, Parkville, VIC, Australia*

WA1.1 8:30 AM - 9:00 AM (Invited)

Next Generation PONs using Amplification, P. Chanclou, N. Genay, Z. Belfqih, F. Saliou, Q. Liu and T. Soret, *France Telecom R & D, Lannion, France*

This work aims at the evaluation of access solution using several types of amplifiers in order to upgrade PON systems. The optical budget gain and performance are compared in different configurations.

WA1.2 9:00 AM - 9:15 AM

Phase-Encrypted Secure Communication technique for GPONs, T. Ajmal, E. Hugues-Salas, R. Razavi, T. Quinlan, G. Zervas, D. Simeonidou, and S. D. Walker, *University of Essex, Colchester, Essex, UK*

We present an FPGA-based physical layer phase-encryption technique suitable for applications in high speed passive optical networks. The macroscopic cryptography technique offers completely opaque communication over trans-oceanic distances, gigabit date rates and multiple wavelengths.

WA1.3 9:15 AM - 9:30 AM

Traffic Growth and Provisioning for Integrating WDM in PONs, F. Clarke, S. Sarkar, and B. Mukherjee, *University of California – Davis, Davis, CA, USA*

We explore an evolutionary upgrade of PONs to incorporate WDM. We investigate traffic growth models to facilitate integration of WDM in an existing PON by adding new channels on-demand as new users join the network.

California/Powell

8:30 AM - 10:00 AM

Session WB1: MULTIFUNCTIONAL PHOTONIC INTEGRATION
Session Chair: Rajeev J. Ram, *Massachusetts Institute of Technology, Cambridge, MA, USA*

WB1.1 8:30 AM - 8:45 AM

Demonstration of Optical TTL Based Selective-3R in OLS Network Testbed with Label Rewriting and Fiber Transmission, B. Xiang, *University of California - Davis, Davis, CA, USA*

We propose and experimetnally demonstrate an optical-TTL-based selective-3R regeneration scheme in an OLS testbed with fiber transmission. This scheme cognitively employs 3R when necessary. The experiment achieves burst mode clock recovery and error free operation.

WB1.2 8:45 AM - 9:00 AM

Fast All-Optical Switching for Label-Payload Separation with a 1x2 SOA-MZI Switch by Asymmetric Control Light, J. Kurumida, T. Morita, Y. Tatara, H. Uenohara, and K. Kobayashi, *Tokyo Institute of Technology, Yokohama, Kanagawa, Japan*

An all-optical 1x2 switching scheme using asymmetric control light of SOA-MZI for label-payload separation is proposed. Fast four-bit time domain label at 40 Gb/s was separated experimentally. A slow gain recovery effect was found and a simulation revealed the effective way to reduce it.

WB1.3 9:00 AM - 9:30 AM (Invited)

The Advantages of PIC-based Digital Optical Networks, D. F. Welch, *Infinera, Sunnyvale, CA, USA*

Photonic Integrated Circuit (PIC) based fiberoptic telecommunication systems have changed the implementation of bandwidth management functions in optical transport networks, resulting in the Digital Optical Network.

WA1.4 9:30 AM - 9:45 AM

Increasing Optical Security with OCDMA using Optical XOR, I. Glesk, Y-K. Huang, K.S. Kravtsov, and P.R. Prucnal, *Princeton University, Princeton, NJ, USA*

We designed, built, and demonstrated scalable incoherent Optical CDMA testbed with One-time Pad security which enables users to communicate with each other at the OC-24 rate per user with raw BER of less than 10^{-12}.

WB1.4 9:30 AM - 10:00 AM (Invited)

Functional Integrated Optical Label Swapping and Tunable Wavelength Conversion Modules, D. J. Blumenthal, *University of California - Santa Barbara, Santa Barbara, CA, USA*

ABSTRACT NOT AVAILABLE

10:00 AM - 10:30 AM COFFEE BREAK

10:30 AM - 12:15 PM

Session WA2: NOVEL DEVICES
Session Chair: Ming C. Wu, *University of California – Berkeley, Berkeley, CA, USA*

WA2.1 10:30 AM - 11:00 AM (Invited)

Photonic Crystal Lasers, A. Scherer, O.J. Painter, Z. Zhang, *California Institute of Technology, Pasadena, CA, USA*, Y. Qiu, *Jet Propulsion Laboratory*, Pasadena, CA, USA, and T. Yoshie, *Duke University, Durham, NC, USA*

We compare photonic crystal lasers with other microcavities for future switching and spectroscopy systems. High speed and efficiency along with massive lithographic integration makes these lasers particularly interesting for optical switching and signal processing.

WA2.2 11:00 AM - 11:30 AM (Invited)

InP based Quantum Dot Mode-Locked Lasers for Photonics Switching Applications, A. Shen, A. Accard, B. Dagens, G.-H. Duan, *Alcatel Thales III-V Lab, Palaiseau, France*, and F. Lelarge, *Alcatel Thales III-V Lab, Marcoussis, France*

An overview of InP based quantum dot mode-locked laser for photonic switching applications is given. In particular, the performance for all-optical clock recovery and optical sampling is discussed.

WA2.3 11:30 AM - 11:45 AM

Tuning Dynamics of Micromachined Surface-Emitting Lasers with Broadband Long-Wavelength Coverage, B. Koegel, H. Halbritter, S. Jatta, P. Meissner, *Technical University Darmstadt, Darmstadt, Germany*, P. Debernardi, *Politecnico di Torino, Torino, Italy*, M. Maute and M.-C. Amann, *Technical University of Munich, Garching, Germany*

Dynamic tuning characteristics of micromachined surface-emitting lasers with broadband wavelength coverage (>55nm) around 1.55µm and up to 1.8mW singlemode power are presented. Electro-thermal actuation enables full scale wavelength switching in milliseconds with durable long-term operation.

WA2.4 11:45 AM - 12:00 PM

Dynamic Switching of a 10GHz Quantum Dot Mode-Locked Laser using an Integrated Quantum Dot Switch, H. Wang, A. R. Rae, M. G. Thompson, R. V. Penty, I. H. White, *University of Cambridge, Cambridge, UK* and A. R. Kovsh, *Innolume GmbH, Dortmund, Germany*

The performance of an integrated QD switch, exhibiting on-chip gain in excess of 15dB and saturation powers in excess of 12dBm for both through and cross configurations, is presented. The device allows for the processing of picosecond pulses generated by a QD mode-locked laser diode.

WA2.5 12:00 PM - 12:15 PM

Optically Triggered Monostable and Bistable Flip-Flop Operation of a Monolithic Semiconductor Ring Laser, S. Yu, Z. Wang, G. Yuan, *University of Bristol, Bristol, UK*, G. Giuliani, *University of Pavia, Pavia, Italy*, and M. Sorel, S. Furst, *University of Glasgow, Glasgow, Scotland, UK*

A monolithic semiconductor ring laser (SRL) is demonstrated to operate as an optical monostable and bistable that can be triggered

10:30 AM - 12:30 PM

Session WB2: PHOTONIC LOGIC TECHNOLOGIES
Session Chair: Harmen J.S. Dorren, *Eindhoven University of Technology, Eindhoven, The Netherlands*

WB2.1 10:30 AM - 10:45 AM

Photonic Transistors based on Gain and Absorption Manipulation of Optical Interference, Y. Huang and S.-T. Ho, *Northwestern University, Evanston, IL, USA*

A novel semiconductor photonic transistor employing gain and absorption manipulation of optical interference is proposed. These devices could have a Transistor Figure of Merits 100,000 times higher than third order nonlinearity approaches and are highly attractive.

WB2.2 10:45 AM - 11:00 AM

All-Optical NAND/NOR Logic Gates with Passive Nonlinear Etalon Exploiting Absorption Saturation in Semiconductor MQWs, C. Porzi, *Scuola Superiore "S. Anna", Pisa, Italy*, M. D. Guina, *Tampere University of Technology, Tampere, Finland*, A. Bogoni and L. Poti, *CNIT, Pisa, Italy*

We demonstrate NAND and NOR operation through nonlinear etalon embedding multiple quantum wells semiconductor saturable absorber. The cavity is designed to exhibit an inverse saturable absorber behavior. The device is passive, compact, and polarization independent.

WB2.3 11:00 AM - 11:15 AM

N-bit All-Optical Pattern Matching by Cross Gain Modulation in Semiconductor Optical Amplifiers, M. Scaffardi, E. Lazzeri, L. Poti and A. Bogoni, *CNIT, Pisa, Italy*

A new scheme for all-optical N-bit pattern matching is presented. It is implemented for the comparison of 2-bit patterns at 10 Gb/s. The maximum power penalty on the output signal is 0.5 dB.

WB2.4 11:15 AM - 11:30 AM

All-Optical Swapping of Spectral Amplitude Code Labels for Packet Switching, P. Seddighian, L. A. Rusch *Université Laval, Quebec, QC, Canada*, and V. Baby, C. Habib, L. R. Chen, S. LaRochelle, *McGill University, Montreal, QC, Canada*

We demonstrate error-free all-optical label swapping, recognition, and switching for variable-length packets in packet-switched networks using multi-wavelength labels.

WB2.5 11:30 AM - 12:00 PM (Invited)

Faster Switching with Semiconductor Optical Amplifiers, R. J. Manning, R. Giller, X. Yang, R. P. Webb and D. Cotter, *Tyndall National Institute, Cork, Ireland*

We review methods to increase the switching speeds of semiconductor optical amplifiers (SOAs), including the use of filters and the Turbo-Switch configuration. We also consider the optimisation of the SOA confinement factor and optical area.

WB2.6 12:00 PM - 12:30 PM (Invited)

All-Optical Flip-Flops using Injection-Locked Fabry-Perot Laser Diodes, Y. H. Won, J. S. Cho, Y. D. Jeong and N. L. Hoang, *Information and Communication University, Daejon, Korea*

by an optical pulse, showing potential for all-optical 2R regeneration and all-optical Flip-Flop applications.

All-optical flip-flops (AOFFs) using optical bistability of injection-locked FP-LDs are demonstrated. To increase performance of the AOFF, single-mode FP-LDs are introduced as an auxilary beam source that sutains the state of AOFF or as state memory to increase an on-off contrast ratio up to 35dB.

12:30 PM - 2:00 PM LUNCH BREAK

2:00 PM - 3:30 PM

Session WA3: OPS/OBS
Session Chair: Yoshiaki Nakano, *Tokyo University, Tokyo, Japan*

WA3.1 2:00 PM - 2:30 PM (Invited)

Paradigm Shift for Commercially Viable OPS/OBS with Shared Buffer and Wavelength Converter, J.-K. K. Rhee, J.-H. Kim, J. Han, J. Im, *Information and Communication University, Daejeon, Korea* and J. Choi, *KT Corporation, Daejeon, Korea*

Performance of optically transparent packet and burst switching is significantly improved by true buffers, even in a shared manner, rather than by wavelength converters in WDM OPS and OBS. A novel design rule is proposed, aiming at commercial feasibility.

WA3.2 2:30 PM - 2:45 PM

160 (16λ x 10 Gbit/s) Gbit/s Colored Optical Packet Switching and Transmission over 100 km using IP/Optical-Packet Converters, Burst-Mode Packet Transceiver and Transient-Response-Suppressed EDFA, H. Furukawa, N. Wada, Y. Awaji, and T. Miyazaki, *National Institute of Information and Communications Technology, Koganei, Tokyo, Japan*

Error-free 160 (16λ x 10) Gbit/s optical packet switching and 100-km-transmission is demonstrated by transient-response-suppressed EDFAs, multiple label-processor of ultra-fast processor (<100 ps), burst-mode packet transmitter/receiver, and IP/Optical-packet converters with IP-packet-loss-rate $<10^{-6}$ and bit-error-rate $<10^{-9}$.

WA3.3 2:45 PM - 3:00 PM

Multi-Hop Transmission with Wavelength Conversion for Collision Resolution in PLZT Matrix Switch-based Optical Burst Switching Node Prototype, A. Al Amin, K. Shimizu, M. Takenaka, Y. Nakano, *University of Tokyo, Meguro-ku, Japan*, R. Inohara, K. Nishimura, M. Usami, *KDDI R&D Laboratories, Kamifukuoka, Saitama, Japan*, Y. Takita, Y. Kai, H. Onaka, *Fujitsu Limited, Kawasaki, Kanagawa, Japan*, T. Miyahara, Y. Miyazaki, K. Motoshima, T. Hatta, *Mitsubishi Electric Corporation, Itami, Hyogo, Japan* M. Ono, Y. Kondo, J. Kageyama, N. Sugimoto, *Asahi Glass Co. Ltd., Yokohama, Kanagawa, Japan*, Y. Urino, *NEC Corporation, Kawasaki, Japan*, and H. Uetsuka, *Hitachi Cable Ltd., Hitachi-shi, Ibaraki, Japan*

Multi-hop cascadibility of a PLZT matrix switch-based optical burst switching node prototype is presented. Using a 50km recirculating loop setup and a 4x4 matrix switch, more than 10hop transparency at 10Gb/s was achieved. Hop-by-hop wavelength conversion for contention resolution and signal reshaping effect was confirmed.

WA3.4 3:00 PM - 3:15 PM

Optical Switching Node with Different Shared Devices for Contention Avoidance and Its Performance, S. Yatsuo, H. Tode, K. Murakami, *Osaka University, Suita, Osaka, Japan*, K. Nishimura and M. Usami, *KDDI R&D Laboratories, Fujimino, Saitama, Japan*

The switching behavior on a switching node that shares both TWCs and FDLs for contention avoidance is newly established and its performance is evaluated. Finally, effective composition of both devices for contention avoidance is examined.

WA3.5 3:15 PM - 3:30 PM

Photonic Switching and the Energy Bottleneck, J. Baliga, R. Ayre, K. Hinton and R. S. Tucker, *University of Melbourne,*

2:00 PM - 3:30 PM

Session WB3: PLC & APPLICATIONS
Session Co-Chairs: Katsunari Okamoto, *University of California-Davis, Davis, CA, USA* and Loukas Paraschis, *Cisco Systems, Inc., San Jose, CA, USA*

WB3.1 2:00 PM - 2:15 PM

Efficient Thermal Tuning for Second-Order Silicon Nitride Microring Resonators, R. Amatya, *Massachusetts Institute of Technology, Cambridge, MA, USA*

Efficient thermal tuning of 52μW/GHz are analyzed for high-index-contrast second-order filters, with demonstration of 4.5GHz/K of tuning. Precise center wavelength stability of approximately 100MHz is obtained with temperature feedback controller. Their compact size, low tuning power, low crosstalk make these resonators attractive for photonic integration.

WB3.2 2:15 PM - 2:30 PM

Integrated Optical Switch, Variable Attenuator and Power Monitor Tap Chip for 40-Channel PLC ROADM, R. Narevich, *NeoPhotonics, San Jose, CA, USA*, E. Narevicius, *University of Texas at Austin, Austin, TX, USA*, I. Vorobeichik, A. Liu, W. Long, C. Ho, H. Xu and J. Lam, *NeoPhotonics, San Jose, CA, USA*

We present design and performance details of an integrated optical switch, attenuator and tap chip based on adiabatic mode multiplexer for 40-channel PLC ROADM. Our approach enables higher than 48dB switch shut-off attenuation and isolation.

WB3.3 2:30 PM - 3:00 PM (Invited)

Photonic Lightwave Circuits, K. Okamoto, *University of California - Davis, Davis, CA, USA*

Integrated-optic waveguide devices become more and more complicated to realize high functionality. Numerical simulations are prerequisite for the design of waveguide devices. Planar lightwave circuits provide various important functionalities for optical wavelength division multiplexing, time division multiplexing, code division multiplexing systems.

WB3.4 3:00 PM - 3:30 PM (Invited)

The Value of Wavelength Reconfigurability and Switching in Optimizing the Transport Layer for Packet Traffic, L. Paraschis and O. Gerstel, *Cisco Systems, Inc., San Jose, CA, USA*

Reconfigurable OADM and wavelength directional switching are increasingly valuable in optical transport. We evaluate the network benefits from the resulting capacity planning flexibility that scales to Tb/s, along with the associated enabling technologies.

Parkville, VIC, Australia

The energy consumption of the Internet is growing exponentially. We examine the potential of photonic switching to reduce energy consumption by determining the contribution of cross connects and buffers to the total energy consumption of the Internet.

3:30 PM - 4:00 PM COFFEE BREAK

4:00 PM - 5:00 PM

Session WA4: OPTICAL NETWORKING TESTBEDS
Session Chair: Loukas Paraschis, *Cisco Systems, Inc., San Jose, CA, USA*

WA4.1 4:00 PM - 4:30 PM (Invited)

NOBEL II: Network Approaches and Results of the Project, H. Rohde and C. Gruber, *Nokia Siemens Networks, Munich, Germany*

This paper presents the main topics and results achieved by the IST Integrated Project NOBEL in its second phase.

WA4.2 4:30 PM - 5:00 PM (Invited)

Multi-Granular Optical Path Networking Technologies, K.-I. Sato, *Nagoya University, Nagoya, Japan*

This paper investigates the prospects and challenges of hierarchical optical path networks. The key enabling technologies are demonstrated that include hierarchical optical path network design algorithms and a newly developed waveband filter.

4:00 PM - 5:00 PM

Session WB4: OPTICAL SIGNAL PROCESSING & REGENERATION
Session Chair: Bryan S. Robinson, *MIT Lincoln Laboratory, Lexington, MA, USA*

WB4.1 4:00 PM - 4:15 PM

DPSK Packet-Level Power Equalization by means of Nonlinear Polarization Rotation in an SOA, M. Presi, S. Gupta, N. Calabretta, G. Contestabile and E. Ciaramella, *Scuola Superiore "S. Anna", Pisa, Italy*

We expreimentally characterized at 10 and 40 Gb/s the optical packet power equalisation capability of the non-linear polarization-rotation effect in an SOA. We found at 40Gb/s a maximum input dynamic range tolerance of 12 dB.

WB4.2 4:15 PM - 4:30 PM

Experimental Demonstration of an All-Optical Clock and Data Recovery Technology for 10 Gb/s NRZ-DPSK Signals, Z. Zhu, B. Xiang, S. J. Yoo, *University of California - Davis, Davis, CA, USA*, and L. Paraschis, *Cisco Systems, Inc., San Jose, CA, USA*

We demonstrate an all-optical clock-and-data recovery technology for 10-Gb/s NRZ-DPSK signals. With a relatively simple configuration, the clock-recovery scheme achieves less than 1.5-ps RMS jitter for signals after fiber transmission. The pattern-dependence of data-recovery is within 0.5-dB at BER 10^{-9}.

WB4.3 4:30 PM - 4:45 PM

Experimental Study of the Impact of Input Signal Suppression on the Performance of a Cascaded SOA-MZI Wavelength Converter., J. A. Summers, M. L. Masanovic, D. J. Blumenthal, *University of California - Santa Barbara, Santa Barbara, CA, USA*, and V. Lal, *Infinera, Sunnyvale, CA, USA*

We study the impact of input signal suppression on the performance of a two-stage cascaded SOA-based wavelength converter. Error-free operation at 2.5Gbps is shown for suppression as small as 6.5dB.

WB4.4 4:45 PM - 5:00 PM

A Study on the Timing Adjustable Optical Regenerator using Cross Phase Modulation based on Semiconductor Optical Amplifiers, Y. Takanashi, J. Kurumida, H. Uenohara, and K. Kobayashi, *Tokyo Institute of Technology, Yokohama, Kanagawa, Japan*

We propose the timing adjustable optical regenerator using a SOA-MZI. With long carrier lifetime, we confirmed fixed output timing at 40Gb/s regardless of input timing fluctuation.

5:00 PM – 6:00 PM CLOSING SESSION – ROOM OF THE DONS

END OF PROGRAM