Notes

● Market Watch ●

8:30 a.m.–10:30 a.m.
Panel IV: State of the Optical Industry: Achievements, Challenges and Path to Profitability
Moderator: Myo Ohn, Director, Avanex Corp., USA
Speakers:
State of the Optical Industry: A Wall Street Perspective, *Paul Bonenfant, Morgan Keegan & Co., USA*
Optical Components and Subsystems: A View From Wall Street, *Todd Koffman, Raymond James & Associates, USA*
A Macro View of the Optical Component Industry, *Andrew Schmitt, Nyquist Capital, USA*
Market Realities and Investment Opportunities, *Shoa-kai Liu, Rustic Canyon Partners, USA*

11:00 a.m.–1:00 p.m.
Panel V: From 10G to 40G to 100G to ...?: What's Happening in the Fast-Moving World of High-Speed Components and Systems?
Moderator: Niall Robinson, Mintera Corp., USA
Speakers
Bandwidth Virtualization: Preparing the Network for 100 Gb and Beyond, *David Welch, Infinera, USA*
Smaller Modules and Higher Bit Rates—The Evolution of the Transceiver Space, *Drhupad Trivedi, JDSU, USA*
PMD Components for 100G: Leverage from 40G and New Development for 100G, *Dave Clark, Sierra Monolithics, Inc., USA*
Innovation Frontier in High-Speed Opto-Electronics, *Hans-Jürgen Schmidtke, Nokia Siemens Networks, USA*
Transmission Systems for 40G and 100G Optical Transport, *Trent Coroy, Xtera Communications, USA*
100 Gb/s Ethernet Transport Technologies Enlarging the 10/40Gb/s Markets, *Yutaka Miyamoto, NTT Network Innovation Labs, Japan*

1:30 p.m.–3:30 p.m.
Panel VI: Reconfigurable Optical Networks: Beyond Core ROADMs?
Moderator: Paul Bonenfant, Morgan Keegan & Co., USA
Speakers:
Optimal Technology for ROADMs: PLC, Liquid Crystal or MEMS? *Krishna Bala, Xtellus, USA*
Agile Optical Technologies for Next Generation Networks, *David Gudmundson, JDSU, USA*
Packet Optical Networking and the ROADM Evolution, *Rod Naphan, Fujitsu Network Communications, USA*
Business Advantages of Zero-Touch Photonic Networks, *Tom Goodwin, Alcatel-Lucent, USA*
Evolving towards Optical Circuit Switching, *Stu Elby, Verizon, USA*
Optical Network Evolution at AT&T, *Mehran Esfandiari, AT&T Corp., USA*

Room 4

8:00 a.m.–10:00 a.m.
OThA • Optical Switching II
David J. Blumenthal; Univ. of California at Santa Barbara, USA, Presider

OThA1 • 8:00 a.m.
Optically Labeled 100Gbit/s Packet Signals Passing through 8 Straight-Line OWSS Nodes and 240km Fiber, *Jianjun Yu[1], Zhensheng Jia[1,2], Lei Zong[1], Lei Xu[1], Philip Nan Ji[1], Gee Kung Chang[2], Ting Wang[1]; [1]NEC Labs America, USA, [2]Georgia Tech, USA.* We have experimentally demonstrated labeled 100Gbit/s optical packet signals passing through 8 straight line OWSS nodes and 240km transmission fiber for the first time. The BER performance for the optical packet signals has been evaluated.

OThA2 • 8:15 a.m.
Hybrid Packet/Circuit SCM Optical Label Switching Node with Priority Based Routing Capabilities, *Gustavo Puerto, Beatriz Ortega, Alfonso Martínez, Daniel Pastor, José Capmany; ITEAM Res. Inst., Spain.* We present a 10 Gb/s hybrid optical node with a built-in controller programmed to identify circuit and packet connections and make the routing decisions including contention resolution schemes according to the label priority information.

Room 5

8:00 a.m.–9:45 a.m.
OThB • Emerging Technologies
Dominic A. Schupke; Siemens, Germany, Presider

OThB1 • 8:00 a.m. Invited
100G and DWDM: Application Climate, Network and Service Architecture, *Donn C. Lee; Facebook Inc., USA.* Current devices at both the switching and DWDM level are ill-equipped to deal with increasing bandwidth demands. Ethernet switches are falling further behind and no suitable building blocks for large-scale services exist.

Room 6B

8:00 a.m.–9:45 a.m.
OThC • Modulators
Karl Kissa; JDSU, USA, Presider

OThC1 • 8:00 a.m.
A Hybrid Silicon Evanescent Electroabsorption Modulator, *Ying-hao Kuo, Hui-Wen Chen, John E. Bowers; Univ. of California at Santa Barbara, USA.* A new way to make high speed modulators using Si waveguides is demonstrated. The hybrid silicon evanescent electroabsorption modulator with offset AlGaInAs quantum wells has an extinction ratio over 10dB and modulation bandwidth over 16GHz.

OThC2 • 8:15 a.m.
10 Gbit/s Semi-Insulating Buried Heterostructure Loss-Less Reflective Amplified Modulator for Wavelength Agnostic Networks, *Nicolas Dupuis, Alexandre Garreau, Christophe Jany, Jean Decobert, Francois Alexandre, Romain Brenot, Jean Landreau, Nadine Lagay, Florence Martin, Daniele Carpentier, Christophe Kazmierski; Alcatel-Thales III-V Lab, France.* We integrated an AlGaInAs modulator-amplifier using Semi-Insulating Buried Hetrostructure and Selective Area Growth. The reflective component exhibits insertion gain, operates at 10Gbit/s over 80nm and links bi-directional 10km SMF up to 60°C.

Room 6C

8:00 a.m.–10:00 a.m.
OThD • Optical Wireless Integration
Ting Wang; NEC Labs, USA, Presider

OThD1 • 8:00 a.m. Invited
Super Broadband Optical Wireless Access Technologies, *Gee-Kung Chang[1], Zhensheng Jia[1], Jianjun Yu[2], Arshad Chowdhury[1], Ting Wang[2], Georgios Ellinas[3]; [1]Georgia Tech, USA, [2]NEC Labs America, USA, [3]Univ. of Cyprus, Cyprus.* Network enabling technologies and architectures for delivering super-broadband wireless services at >1Gb/s over optical access networks are reviewed. Cost-efficient optical mm-wave generation, optical OFDM, and hierarchical architecture design for fixed and mobile users are discussed.

Room 6D

8:00 a.m.–10:00 a.m.
OThE • Planar Lightwave Circuits
Hiroshi Takahashi; NTT Photonics Labs, Japan, Presider

OThE1 • 8:00 a.m.
Interleaved Waveband MUX/DEMUX Developed on Single Arrayed-Waveguide Grating, *Shoji Kakehashi[1], Hiroshi Hasegawa[1], Ken-ichi Sato[1], Osamu Moriwaki[2]; [1]Nagoya Univ., Japan, [2]NTT Corp., NTT Photonics Labs, Japan.* We propose a novel interleaved waveband MUX/DEMUX developed on a single AWG. The device configuration is very simple and resolves the major difficulties raised by the previously proposed concatenated AWG arrangement.

OThE2 • 8:15 a.m.
Ultra-Wide-Band Adiabatic Coupler as a Building Block for 2x32 PLC Splitter, *Romanas Narevich, Russell D. Blume, Calvin Ho, Nizar Kheraj, Day V. Le, Wilson Long, Kenneth A. McGreer, Anthony J. Ticknor; NeoPhotonics Corp., USA.* We demonstrate adiabatic wavelength insensitive 2x2 PLC coupler with less than 0.6dB variation over 1260-1630nm range and better than 0.25dB PDL. We use it to build process tolerant 2x32 splitter having excellent optical performance.

Room 6E

8:00 a.m.–10:00 a.m.
OThF • Fiber Lasers I
Namkyoo Park; Seoul Natl. Univ., Republic of Korea, Presider

OThF1 • 8:00 a.m.
Side-Mode Suppressed Multiwavelength Fiber Laser and Broadcast Transmission, *Kwanil Lee[1], Sang Bae Lee[1], Ju Han Lee[2], Chul Han Kim[2], Young-Geun Han[3]; [1]Korea Inst. of Science and Technology, Republic of Korea, [2]Univ. of Seoul, Republic of Korea, [3]Hanyang Univ., Republic of Korea.* We demonstrate a side-mode suppressed multi-wavelength fiber laser by use of a semiconductor optical amplifier (SOA) with a coupled ring cavity configuration. Using this light source, we have experimentally investigated transmission performance in WDM-PON.

OThF2 • 8:15 a.m.
A Novel Fiber Laser Source for Optical Generation of Highly Stable Tunable RF/Microwave Frequency Signal, *Jihong Geng, Sean Staines, Shibin Jiang; NP Photonics Inc., USA.* A new approach, i.e., a CW dual-frequency Brillouin fiber laser pumped by two independent single-frequency Er-doped fiber lasers, was demonstrated for the generation of tunable low-noise RF/microwave optical signals, which have the Hz-level frequency stability.

Room 6F

8:00 a.m.–10:00 a.m.
OThG • PMD and All Optical Processing
Peter Winzer; Alcatel Lucent Bell Labs, USA, Presider

OThG1 • 8:00 a.m. Tutorial
PMD Compensation at Ultra-High Bit Rates, *Andrew Weiner; Purdue Univ., USA.* This tutorial discusses novel optical equalization methods, based on wavelength-parallel processing and sensing, for compensation of severe polarization mode dispersion (PMD). Experiments performed over a wide range of time scales are reviewed.

Andrew Weiner is the Scifres Distinguished Professor of Electrical and Computer Engineering at Purdue University. His research focuses on ultrafast optical signal processing; he is especially well known for pioneering the field of femtosecond pulse shaping. Prof. Weiner has authored approximately 200 journal papers and has served as Secretary/Treasurer of IEEE LEOS, as a Vice-President of the International Commission on Optics, and as Chair of the Conference on Lasers and Electro-optics and the International Conference on Ultrafast Phenomena. He is a Fellow both of the IEEE and the Optical Society of America and has won numerous awards for his research.

Room 7

8:00 a.m.–10:00 a.m.
OThH • Microwave Photonics
Thomas Clark; JHU Applied Physics Lab, USA, Presider

OThH1 • 8:00 a.m. Tutorial
Microwave Photonics, *Jianping Yao; Univ. of Ottawa, Canada.* Microwave photonics is an interdisciplinary area that studies the interaction between microwave and optical waves for the generation, distribution, control and processing of microwave/millimeter-wave signals. An overview of microwave photonics techniques will be presented.

Jianping Yao received the PhD degree in Electrical Engineering from the Université de Toulon, France, in 1997. He joined the School of Information Technology and Engineering, University of Ottawa, Ontario, Canada, in 2001, where he is a Professor, Director of the Microwave Photonics Research Laboratory, and Director of the Ottawa-Carleton Institute for Electrical and Computer Engineering. He holds a uOttawa Research Chair in Microwave Photonics. From 1999 to 2001, he held a faculty position in the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore. Dr. Yao has published over 160 papers in refereed journals and conference proceedings.

Room 8

8:00 a.m.–9:40 a.m.
NThA • Optical Components
Yoshinori Hibino; NTT Photonics Labs, Japan, Presider

NThA1 • 8:00 a.m.
Performance Margin Considerations for SFP+ Transceivers, *Ahmet Balcioglu; Vitesse Semiconductor Corp, USA.* Worst-case SFP+ channel characteristics were studied and the bottleneck of the link is identified. EDC's with 300m capabilities and improved SFP+ connector are required to achieve the performance margins needed for successfully deploying SFP+ transceivers.

NThA2 • 8:20 a.m.
Link Testing and Margin Evaluation in IEEE 802.3aq™ [1] LRM Based Systems, *Carlo Tosetti[1], Adam Carter[2], David G. Cunningham[3]; [1]Cisco Photonics Italy, Italy, [2]Cisco Systems, USA, [3]Avago Technologies, UK.* We examine a way to select a worst case Multi-Mode (MM) fiber cable for stressed-like sensitivity testing during the optical qualification of 10GBASE-LRM transceivers.

Room 9

8:00 a.m.–10:00 a.m.
NThB • FTTX Today
Frank J. Effenberger; Huawei USA, USA, Presider

NThB1 • 8:00 a.m.
Capacity Enhancement and System Demonstration of a WDM-Capable G-PON Compliant to ITU-T G.984.5, *Kent McCammon[1], Shing-Wa Wong[2]; [1]AT&T Labs, Inc, USA, [2]Stanford Univ., USA.* We tested G-PON with four gigabit-rate CWDM signals spanning C and L bands consistent with the ITU-T G.984.5 Recommendation. The hybrid system demonstrated has a combined 10 Gbps downstream capacity and 2 Gbps upstream capacity.

NThB2 • 8:20 a.m.
Costs per Home Connected: The Impacts of Automated Fiber Management on Fiber-to-the-Home Deployments, *Sandy Roskes[1], Avigdor Shlomovits[1], Joe Teixeira[1], Ze'ev Ganor[1], Joseph Finn[2], Nee Ben Gee[2], Michael Lane[2], Tiejun Xia[2], William Uliasz[2], Glenn Wellbrock[2]; [1]FiberZone Networks, USA, [2]Verizon Communications, USA.* We demonstrate the economic impact of Automated Fiber Management (AFM) in FTTH networks, specifically to defer capital costs and reduce operating costs by automating testing, provisioning, maintenance, troubleshooting, and grooming operations.

Room 4

OThA • Optical Switching II—Continued

OThA3 • 8:30 a.m.
Experimental Demonstration of Multicast-Capable Variable Bandwidth Colored Packet Switching Using SOA Switch and Stacked OC Label Processing, *Nobuyuki Kataoka[1], Kyosuke Sone[2], Naoya Wada[1], Yasuhiko Aoki[2], Susumu Kinoshita[2], Hiroshi Onaka[3], Tetsuya Miyazaki[1], Kenichi Kitayama[4]; [1]NICT, Japan, [2]Fujitsu Labs Ltd., Japan, [3]Fujitsu Ltd., Japan, [4]Osaka Univ., Japan.* We propose multicast-capable variable bandwidth colored packet switching using SOA based broadcast-and-select switch and stacked optical-code label processing. Three-node operation of 10Gbit/s x 10λ optical packet multicasting is experimentally demonstrated.

OThA4 • 8:45 a.m.
Tunable Time-Slot-Interchange of 40-Gb/s Optical Packets Using Conversion/Dispersion-Based Tunable 100-ns Delays, *Louis C. Christen, Omer F. Yilmaz, Scott Nuccio, Xiaoxia Wu, Irfan Fazal, Alan E. Willner; Univ. of Southern California, USA.* We demonstrate tunable time-slot-interchange of 40-Gb/s optical data packets using a conversion-plus-dispersion-based tunable 100-ns delay element. Separate 182-bit packets are converted onto separate wavelengths, delayed relative to one another, and re-inserted into new packet time-slots.

OThA5 • 9:00 a.m.
320Gb/s Multi-Wavelength Optical Packet Switching with Contention Resolution Mechanism Using PLZT Switches, *Katsuya Watabe[1], Mamoru Takagi[1], Keita Machida[2], Takuo Tanemura[1], Hideaki Imaizumi[1], Yoshiaki Nakano[1], Hiroyuki Morikawa[1]; [1]Univ. of Tokyo, Japan, [2]Keio Univ., Japan.* In this paper, we demonstrate 320 Gb/s Multi-wavelength Optical Packet Switching with contention resolution mechanism based on feed-forward input buffers. The feasibility has been confirmed by monitoring the waveforms and the eye-diagrams of output signals.

Room 5

OThB • Emerging Technologies—Continued

OThB2 • 8:30 a.m.
Cost-Efficient Routing in Mixed-Line-Rate (MLR) Optical Networks for Carrier-Grade Ethernet, *Marwan M. Batayneh[1], Dominic A. Schupke[2], Marco Hoffmann[2], Andreas Kirstaedter[2], Biswanath Mukherjee[1]; [1]Univ. of California at Davis, USA, [2]Nokia-Siemens, Germany.* We study cost-efficient routing in a MLR WDM network for carrier-grade Ethernet. We also study the benefits of a MLR network compared to a Single-Line Rate (SLR) network.

OThB3 • 8:45 a.m.
Carrier-Grade Ethernet over WDM under Maximum Transmission Range (TR) Constraints of Signals, *Marwan M. Batayneh[1], Dominic A. Schupke[2], Marco Hoffmann[2], Andreas Kirstaedter[2], Biswanath Mukherjee[1]; [1]Univ. of California at Davis, USA, [2]Nokia-Siemens, Germany.* We study the problem of determining the optimal TR for high-rate carrier-grade Ethernet. We show that since traffic grooming can be combined with signal regeneration, the optimal TR value also depends on the traffic volume.

OThB4 • 9:00 a.m.
Cost Comparison of Networks Using Traditional 10 and 40 Gb/s Transponders versus OFDM Transponders, *Adriana Bocoi[1], Matthias Schuster[2], Franz Rambach[3], Dominic A. Schupke[3], Christian A. Bunge[2], Bernhard Spinnler[3]; [1]Technische Univ. München, Germany, [2]Technische Univ. Berlin, Germany, [3]Nokia Siemens Networks GmbH & Co. KG, Germany.* OFDM allows flexible adjustment of transmission data rate according to channel properties. We propose to use OFMD transponders and calculate the cost at which OFDM networks result in lower CAPEX compared to traditional networks.

Room 6B

OThC • Modulators—Continued

OThC3 • 8:30 a.m. Invited
Compact 111-Gbit/s Integrated RZ-DQPSK Modulator Using Hybrid Assembly Technique with Silica-Based PLCs and $LiNbO_3$ Devices, *Takashi Yamada[1], Yohei Sakamaki[1], Tomohiro Shibata[1], Akimasa Kaneko[1], Akihide Sano[2], Yutaka Miyamoto[2]; [1]NTT Photonics Labs, NTT Corp., Japan, [2]NTT Network Innovation Labs, NTT Corp., Japan.* We developed a compact RZ-DQPSK modulator using six arrayed optical phase modulators with an LN waveguide, two PLCs with 1 x 2 couplers and a U-turned waveguide. This modulator exhibited good 111-Gbit/s CSRZ-DQPSK modulation performance.

OThC4 • 9:00 a.m.
Transmission of 10 Gbps Duobinary Signals Using an Integrated Laser-Mach Zehnder Modulator, *Leif A. Johansson[1], Larry A. Coldren[1], Ping-Chiek Koh[2], Yuliya A. Akulova[2], Greg A. Fish[2]; [1]Univ. of California at Santa Barbara, USA, [2]JDSU, USA.* Generation and transmission of 10 Gbps duobinary signals is demonstrated using an integrated widely-tunable SGDBR laser and Mach-Zehnder modulator over a wavelength range of 1538nm - 1564nm.

Room 6C

OThD • Optical Wireless Integration—Continued

OThD2 • 8:30 a.m.
10Gb/s Free-Space Optical Transmission Using OFDM, *Neda Cvijetic, Dayou Qian, Ting Wang; NEC Labs America, USA.* We report the first experimental demonstration of 10 Gb/s free-space optical transmission using orthogonal frequency division multiplexing (OFDM). The OFDM system provides superior performance, with a 3 dB improvement in receiver sensitivity over NRZ OOK.

OThD3 • 8:45 a.m.
Photonic Pulse Generation and Modulation for Ultra-Wideband-over-Fiber Applications, *Jianqiang Li[1], Kun Xu[1], Hao Huang[1], Jian Wu[1], Jintong Lin[1], Songnian Fu[2], Ming Tang[2], Ping Shum[2]; [1]Beijing Univ. of Posts and Telecommunications, China, [2]Nanyang Technological Univ., Singapore.* We experimentally demonstrate a simple scheme for ultra-wideband (UWB) monocycle and doublet pulse generation employing two Mach-Zehnder modulators. Based on this scheme, an easy approach to pulse shape modulation is proposed for UWB-over-fiber applications.

OThD4 • 9:00 a.m.
Local-Oscillator-Free Wireless-Optical-Wireless Data Link at 1.25 Gbit/s over a 40 GHz Carrier Employing Carrier Preservation and Envelope Detection, *Jorge Seoane, Idelfonso Tafur Monroy, Kamau Prince, Palle Jeppesen; COM•DTU, Technical Univ. of Denmark, Denmark.* A local-oscillator-free wireless-optical-wireless system at 1.25 Gb/s over a 40 GHz carrier and 100 km of NZDSF is demonstrated employing optical half-wave rectification, carrier remodulation and envelope detection.

Room 6D

OThE • Planar Lightwave Circuits—Continued

OThE3 • 8:30 a.m. Invited
Integrated Photonic Devices for OCDMA Using Silica Planar Lightwave Circuit Technology, *Koichi Takiguchi; NTT Photonics Labs, NTT Corp., Japan.* Recent advances in integrated photonic devices for OCDMA fabricated with silica PLC technology are reviewed. Encoders/decoders for one-dimensional (time or wavelength) and two-dimensional (both time and wavelength) encoding procedures and their applications are reported.

OThE4 • 9:00 a.m. Invited
PLZT Waveguide Devices for High Speed Switching and Filtering, *Keiichi Nashimoto; EpiPhotonics Inc., USA.* High-speed optical switches were developed in electro-optic (Pb,La)(Zr,Ti)O_3 (PLZT) waveguides. A 1x2 optical path switch showed <2.5 ns switching time. An 8x1 wavelength selective switch based on a tunable AWG showed 15 ns switching time.

Room 6E

OThF • Fiber Lasers I—Continued

OThF3 • 8:30 a.m. Invited
Fiber Lasers for Frequency Standards in Optical Communications, *Nathan R. Newbury, W. C. Swann, I. Coddington; NIST, USA.* Optical light with millihertz relative frequency stabilities and subfemtosecond timing jitter can be produced from stabilized cw or mode-locked fiber lasers. We will discuss the generation, fiber-optic distribution and some applications of these coherent sources.

OThF4 • 9:00 a.m.
Multi-Bound Solitons in a FM Mode-Locked Fiber Laser, *Le N. Binh[1], Nhan D. Nguyen[1], Thanh L. Huynh[1,2], Huy Q. Lam[2]; [1]Monash Univ., Australia, [2]Nayang Technological Univ., Singapore.* We report, for the first time, experimental observation of multi-solitons in an active FM mode-locked fiber laser. Not only bound soliton pairs but also triple- and quadruple-soliton bound states can be generated.

Room 6F

OThG • PMD and All Optical Processing—Continued

OThG2 • 9:00 a.m.
All-Order PMD Compensation via VIPA Based Pulse Shaper, *Houxun Miao[1], Andrew M. Weiner[1], Leo Mirkin[2], Peter J. Miller[2]; [1]Purdue Univ., USA, [2]CRI, Inc., USA.* We demonstrated full compensation of ~ 15 ps optical pulses distorted by all-order polarization mode dispersion (PMD) effects to more than 100 ps by using a virtually imaged phased-array (VIPA) based transmission pulse shaper.

Room 7

OThH • Microwave Photonics—Continued

OThH2 • 9:00 a.m.
Time-Multiplexed Photonically Enabled Radio-Frequency Arbitrary Waveforms with 10-GHz Update Rate, *Chen-Bin Huang, Daniel E. Leaird, Andrew M. Weiner; Purdue Univ., USA.* For the first time to our knowledge, radio-frequency arbitrary waveforms are reported with 10 GHz waveform update rate by integrating wavelength switching, optical frequency comb generation and spectral line-by-line shaping.

Room 8

NThA • Optical Components—Continued

NThA3 • 8:40 a.m.
High Channel Low Loss Optical Splitter Using Silica-Based PLC on Quartz Substrate, *Toshiaki Tsuda[1], Junichi Hasegawa[2], Kazutaka Nara[2]; [1]Telecommunications Co. Optical Components Dept., Furukawa Electric Co., Ltd., Japan, [2]FITEL Photonics Lab, Furukawa Electric Co., Ltd., Japan.* We have designed and fabricated the 2x32 optical splitter and the 1x64 optical splitter with the low insertion loss <16.5dB and <19.3dB, respectively for 1.31μm-band and 1.49μm-1.55μm-band by using silica-based PLC on a quartz substrate.

NThA4 • 9:00 a.m. Invited
Silicon Photonics: A Low Cost Integration Platform for Datacom and Telecom Applications, *Mehdi Asghari; KOTURA, Inc., USA.* Si photonics technology as a platform for the realization of cost effective products for telecom and datacom applications is reviewed and recent progress in the area is reported.

Room 9

NThB • FTTX Today—Continued

NThB3 • 8:40 a.m.
Pseudowire System with VCCV Insertion (VI) in Optical Access Networks, *Si Yin, Yuanqiu Luo, Nirwan Ansari, Ting Wang; NEC Labs America, USA.* We propose a VCCV insertion (VI) scheme to tackle the pseudowire system data transmission in optical access networks. We build a state space model for VI and prove VI scheme is both controllable and stable.

NThB4 • 9:00 a.m.
1:N OLT Redundant Protection Architecture in Ethernet PON System, *Keiji Tanaka, Yukio Horiuchi; KDDI R&D Labs Inc., Japan.* We have proposed and demonstrated a cost-effective 1:N OLT redundant protection architecture using an optical switch. We have confirmed its practical feasibility by validating automatic restoration of a broadcasting TV service in an EPON system..

Room 4

OThA • Optical Switching II—Continued

OThA6 • 9:15 a.m.
Novel Non-Blocking Low Loss Scalable WSS Architecture, *Rich Jensen[1], Andrew Lord[2]; [1]Polatis, USA, [2]British Telecom, UK.* This paper describes a novel, strictly non-blocking optical switch, scalable from a few wavelengths to hundreds of fibres worth of DWDM. The approach makes highly efficient use of low loss wavelength selective switches and couplers.

OThA7 • 9:30 a.m.
Direction-Independent Add/Drop Access for Multi-Degree ROADMs, *Sashisekaran Thiagarajan, Loudon Blair, Joseph Berthold; Ciena Corp., USA.* We analyze system costs and associated tradeoffs for implementing direction-independent add/drop access for multi-degree ROADMs employing 1xK Wavelength Selective Switches (WSS) and 3D-MEMS-based mirror array switches.

Room 5

OThB • Emerging Technologies—Continued

OThB5 • 9:15 a.m.
An Experiment of Controlling Gigabit Wide Area Ethernet by GMPLS Supporting Layer-2 Switching Capability, *Daisuke Ishii, Kou Kikuta, Satoru Okamoto, Naoaki Yamanaka; Keio Univ., Japan.* An experiment of virtual private line setup over GMPLS controlled Wide Area Ethernet is presented. It was confirmed that four usage types of Layer-2 label switched paths supposed in Wide Area Ethernet were successfully established.

OThB6 • 9:30 a.m.
Experimental Performance Evaluation of High Speed TCPs in Traffic-Driven LOBS Network Testbed, *J. Wu, Y. W. Yin, S. R. Cai, X. B. Hong, J. T. Lin; Beijing Univ. of Posts and Telecommunications, China.* The traffic-driven labeled optical burst switching network testbed is demonstrated in this paper. The performance of several high speed TCPs are experimentally evaluated over the testbed. The results show that HSTCP has the best performance.

Room 6B

OThC • Modulators—Continued

OThC5 • 9:15 a.m.
Lossless 10-Gbit/s InP n-p-i-n Mach-Zehnder Modulator Monolithically Integrated with Semiconductor Optical Amplifier, *Takako Yasui, Yasuo Shibata, Ken Tsuzuki, Nobuhiro Kikuchi, Yoshihiro Kawaguchi, Masakazu Arai, Hiroshi Yasaka; NTT Photonics Labs, NTT Corp., Japan.* Full C-band 10-Gbit/s 100-km SMF transmission of NRZ signals is demonstrated using a lossless InP n-p-i-n Mach-Zehnder modulator monolithically integrated with a semiconductor optical amplifier. A power penalty of less than 1.5 dB is confirmed.

OThC6 • 9:30 a.m.
Periodic Loading and Selective Undercut Etching for High-Impedance Traveling-Wave Electroabsorption Modulators, *Matthew M. Dummer[1], Jonathan Klamkin[1], Erik J. Norberg[1], James W. Raring[2], Anna Tauke-Pedretti[3], Larry A. Coldren[1]; [1]Univ. of California at Santa Barbara, USA, [2]Sandia Natl. Labs, USA, [3]AFRL, USA.* For the first time, selective undercut etching and periodically loaded electrodes are combined to improve impedance and velocity matching for traveling-wave electroabsorption modulators. These devices are fabricated in a platform compatible with widely tunable lasers.

Room 6C

OThD • Optical Wireless Integration—Continued

OThD5 • 9:15 a.m.
An Experimental Demonstration of UWB-IR-over-Fiber System, *Masanori Hanawa[1], Kazuhiko Nakamura[1], Takahiro Tomita[1], Kohei Mori[1], Akinori Matsui[2], Yasuaki Kanda[2], Koji Nonaka[3], Nobuyasu Kitaoka[3]; [1]Univ. of Yamanashi, Japan, [2]Saitama Inst. of Technology, Japan, [3]Kochi Univ. of Technology, Japan.* A full experimental demonstration of a UWB-IR-over-Fiber system, including BER measurements after radio transmission, is reported. The BER in 255.8Mbit/s was almost 10-3 under the maximum EIRP of -41.3dBm/MHz defined by the FCC.

OThD6 • 9:30 a.m.
Wimedia-Defined, Ultra-Wideband Radio Transmission over Optical Fibre, *Yossef Ben-Ezra[1], Moshe Ran[1], E. Borohovich[1], A. Leibovich[1], Manoj P. Thakur[2], Roberto Llorente[3], Stuart D. Walker[2]; [1]Holon Inst. of Technology, Israel, [2]Univ. of Essex, UK, [3]Nanophotonics Technology Ctr., Spain.* We demonstrate combined wireless and optical fibre channel transmission of Wimedia-defined, MB-OFDM, UWB radio by directly modulation of 4.8GHz VCSELs. Range extension to 400m for multi-cell HDTV sharing is achievable with low-cost remote antenna units.

Room 6D

OThE • Planar Lightwave Circuits—Continued

OThE5 • 9:30 a.m.
Polarization Insensitive MZI-Based DQPSK Demodulator with Asymmetric Half-Wave Plate Configuration, *Yusuke Nasu[1], Manabu Oguma[1], Hiroshi Takahashi[1], Yasuyuki Inoue[1], Hiroto Kawakami[2], Eiji Yoshida[2]; [1]NTT Photonics Labs, Japan, [2]NTT Network Innovation Labs, Japan.* We present an DQPSK demodulator with a silica-based PLC type MZI, where a half-wave plate is asymmetrically allocated to reduce polarization dependent frequency shifts, and demonstrate an error-free 43-Gbit/s demodulation for any incident SOP.

Room 6E

OThF • Fiber Lasers I—Continued

OThF5 • 9:15 a.m.
Multiwavelength Raman Fiber Ring Lasers with Continuous Wavelength Spacing Tunability, *Young-Geun Han[1], Xinyong Dong[2], Ju Han Lee[3], Kwanil Lee[4], Sang Bae Lee[4]; [1]Hanyang Univ., Republic of Korea, [2]Dept. of Electrical Engineering, Hong Kong Polytechnic Univ., Hong Kong, [3]School of Electrical and Computer Engineering, Univ. of Seoul, Republic of Korea, [4]Korea Inst. of Science and Technology, Republic of Korea.* We investigate a flexibly tunable multiwavelength Raman fiber ring laser with continuous wavelength spacing tunability and a high SNR of more than ~45 dB incorporating a superimposed chirped fiber Bragg grating.

OThF6 • 9:30 a.m. Invited
Fiber Lasers for Secure Key Distribution, *Jacob Scheuer; Tel-Aviv Univ., Israel.* We study a new concept for secure key distribution based on establishing laser oscillations between sender and receiver. The eavesdropping difficulty can be increased arbitrarily, making it an intriguing alternative to quantum key distribution systems.

Room 6F

OThG • PMD and All Optical Processing—Continued

OThG3 • 9:15 a.m.
Polarization Splitter Based on Hybrid Coupler with Long Range Surface Plasmon Polariton and Dielectric Waveguide(s), *Fang Liu, Ruiyuan Wan, Yi Rao, Yidong Huang, Wei Zhang, Jiangde Peng; Tsinghua Univ., China.* A novel polarization splitter, which is based on the hybrid coupler with long range surface plasmon polariton and dielectric waveguide(s), is researched. Pure TM light and TE light with high extinction ratio can be realized.

OThG4 • 9:30 a.m.
All-Optical Sampling in a Multiple Quantum Well Saturable Absorber, *Douglas A. Reid[1], Paul J. Maguire[1], Liam P. Barry[1], Quang-Trung Le[2], Sebastien Lobo[2], Mathilde Gay[2], Laurent Bramerie[2], M. Joindot[2], Jean-Claude Simon[2], D. Massoubre[3], Jean-Louis Oudar[3], Guy Aubin[3]; [1]Dublin City Univ., Ireland, [2]FOTON-ENSSAT / PERSYST Platfrom, France, [3]LPN-CNRS, France.* The use of multiple-quantum-well saturable absorbers in all optical sampling of high repetition rate pulse trains is presented. Measurements of a 40GHz pulse train were made using a device with a response time of 5ps.

Room 7

OThH • Microwave Photonics—Continued

OThH3 • 9:15 a.m.
DSP Based Coherent Receiver for Phase-Modulated Radio-over-Fiber Optical Links, *Darko Zibar[1], Idelfonso Tafur Monroy[1], Christophe Peucheret[1], Leif A. Johansson[2], John E. Bowers[2], Palle Jeppesen[1]; [1]Dept. of Communications Optics and Materials, COM-DTU, Denmark, [2]Dept. of Electrical and Computer Engineering, Univ. of California at Santa Barbara, USA.* A novel DSP based coherent receiver for phase modulated radio-over-fiber optical links is reported. Using the proposed digital receiver, signal demodulation of 1.25 Gb/s ASK-modulated 10 GHz RF carrier is experimentally demonstrated.

OThH4 • 9:30 a.m.
Spectrum Slicing-Based, High-Q, Photonic Microwave Filter Using the Combination of Incoherent Continuous-Wave Supercontinuum and Dispersion-Profiled Fiber, *Ju Han Lee[1], You-Min Chang[2], Sang Bae Lee[3]; [1]School of Electrical and Computer Engineering, Univ. of Seoul, Republic of Korea, [2]College of Electronics and Information, Kyung Hee Univ., Republic of Korea, [3]Korea Inst. of Science and Technology (KIST), Republic of Korea.* We experimentally demonstrate the combined use of an ultra-broadband, continuous-wave supercontinuum and a dispersion-profiled fiber to implement a high-performance photonic microwave filter based on the spectrum-slicing architecture. A Q-factor as high as 140 is achieved.

Room 8

NThA • Optical Components—Continued

Room 9

NThB • FTTX Today—Continued

NThB5 • 9:20 a.m. Invited
Optical Testing for Passive Optical Networks, *Walt Soto; iPON Systems, USA.* This paper reviews the demand for and the current status of PON optical diagnostics. Special focus is given to methods of optical testing that use capabilities that are incorporated into the transmission equipment itself.

Room 4	Room 5	Room 6B	Room 6C	Room 6D

OThA • Optical Switching II—Continued

OThA8 • 9:45 a.m.
Design and Evaluation of a Buffered Time-Wavelength Crossconnect, *Arush Gadkar, Suresh Subramaniam; George Washington Univ., USA.* We examine the impact of Fiber Delay Line (FDL) configurations on a crossconnect's performance by looking at its scheduling ability. The FDLs are shared per crossconnect, and our model incorporates feedback and wavelength conversion capabilities.

OThD • Optical Wireless Integration—Continued

OThD7 • 9:45 a.m.
Converged Fixed and Radio-over-Fiber Link Employing Optical Envelope Detection and Optically Injected DFB Laser, *Kamau Prince, Idelfonso Tafur Monroy; COM.DTU, Denmark.* We present 2.5 Gb/s all-optical RF signal down-conversion from 20 GHz by exploiting an optically-injected DFB. We demonstrate converged transmission of this signal with a baseband PON over a common 70 km fiber link.

OThE • Planar Lightwave Circuits—Continued

OThE6 • 9:45 a.m.
Investigation of a Synchronized Flattop AWG Using a Low Coherence Interferometric Method, *Zhipeng Wang[1], Yung-Jui (Ray) Chen[1], Christopher R. Doerr[2]; [1]Dept. of Computer Science and Electrical Engineering, Univ. of Maryland, Baltimore County, USA, [2]Bell Labs, Alcatel-Lucent, USA.* We present a new measurement scheme that investigates the synchronized flattop AWG waveguide design using low coherent interferometric method. It is a powerful diagnosis tool that measures spectral dependence of mode profiles.

10:00 a.m.–4:00 p.m. Exhibit Hall Open

10:00 a.m.–12:00 p.m. Coffee Break, *Exhibit Halls B–G,* **and Joint Poster Session II,** *Exhibit Hall B*

Notes

Room 6E	Room 6F	Room 7	Room 8	Room 9
OThF • Fiber Lasers I—Continued	**OThG • PMD and All Optical Processing—Continued**	**OThH • Microwave Photonics—Continued**		
	OThG5 • 9:45 a.m. **All-Optical 40 GHz Time-Domain Fourier Transformation Using XPM with a Dark Parabolic Pulse,** *Toshihiko Hirooka, Masataka Nakazawa; Tohoku Univ., Japan.* All-optical 40-GHz time-domain Fourier transformation is demonstrated by XPM with a dark parabolic pulse. Dispersion slope induced distortion is successfully eliminated. The time interval for eliminating distortions is expanded into a full bit slot.	**OThH5 • 9:45 a.m.** **Multi-User UWB-over-Fiber System Based on High-Chip-Count Phase Coding,** *Yitang Dai, Jianping Yao; Microwave Photonics Lab, Canada.* High-chip-count, phase-coded direct-sequence Ultra Wideband (UWB) signals for multiple access communications are generated in the optical domain, based on which a multi-user UWB-over-fiber system is proposed. A dual-user system is experimentally demonstrated.		

10:00 a.m.–4:00 p.m. Exhibit Hall Open

10:00 a.m.–12:00 p.m. Coffee Break, *Exhibit Halls B–G,* **and Joint Poster Session II,** *Exhibit Hall B*

Notes

10:00 a.m.–12:00 p.m.
JThA • Joint Poster Session II

1. Fibers and Optical Propagation Effects

JThA1
Self-Induced Fast Light in Optical Fibers Using Stimulated Brillouin Scattering without Any Pump Sources, *Taiji Sakamoto, Takashi Yamamoto, Kazuyuki Shiraki, Toshio Kurashima; NTT Access Network Service Systems Labs, Japan.* We present a method for realizing pulse advancement induced by stimulated Brillouin scattering in optical fibers without any pump sources. A pulse advancement of 13.65 ns is achieved with this self-induced fast light method.

JThA2
Fast Light Improvement Using Periodic Bending of Erbium-Doped Fiber, *Peng-Chun Peng[1], Wei-Che Kao[2], Chun-Ting Lin[2], Jyehong Chen[2], Po Tsung Shih[2], Sien Chi[3,2]; [1]Natl. Chi Nan Univ., Taiwan, [2]Natl. Chiao Tung Univ., Taiwan, [3]Yuan Ze Univ., Taiwan.* This investigation for the first time, experimentally demonstrates the fast light improvement in an erbium-doped fiber. The time advance is increased over 140 % by the periodic bending of erbium-doped fiber.

JThA3
Narrow Band Optical Parametric Amplification for Slow Light in Randomly Birefringent Fibers, *Luca Schenato, Marco Santagiustina, Carlo G. Someda; Univ. of Padova, Italy.* The effects of random birefringence in narrowband parametric amplification for slow light has been numerically investigated showing that the reduction of the mean gain directly causes the reduction of the mean delay for small birefringence.

JThA4
A Transition Matrix Analysis of the Hinge Model, *David Yevick[1], Michael A. Reimer[1], Maurice O'Sullivan[2]; [1]Univ. of Waterloo, Canada, [2]Nortel, Canada.* We adapt the transition matrix procedure to time-dependent effects in communication systems and subsequently calculate the outage-time statistics resulting from polarization mode dispersion (PMD) in the hinge model.

JThA5
Evaluation of Induced Form-Birefringence and PMD in Dispersion-Compensating Hole-Assisted Fibers, *Shailendra K. Varshney, Kunimasa Saitoh, Masanori Koshiba; Hokkaido Univ., Japan.* The birefringence and polarization-mode dispersion characteristics of dispersion-compensating hole-assisted fibers are analyzed numerically. It is revealed that distortion in air-holes leads to high birefringence and also shifts the dispersion by ±2% to its optimum value.

JThA6
An Equivalent Rectangle Approximation Based Staircase Concatenation Method for Wedge Shaped Fiber, *Xu Liu, Lin Chen, Xiaohan Sun; Southeast Univ., China.* A three dimensional equivalent rectangle approximation-staircase concatenation method is proposed to analyze lightwave propagation and mode field evolution in wedge shaped fiber more precisely than FD-BPM method which is validated numerically and experimentally.

JThA7
A Lensed Fiber for Butt Coupling Between High-Index Contrast Waveguides and Single-Mode Fibers, *Kazuo Shiraishi[1], Makoto Kagaya[1], Kouichi Muro[1], Hidehiko Yoda[1], Haruhiko Tsuchiya[1], Chen Tsai[2]; [1]Utsunomiya Univ., Japan, [2]Univ. of California, Irvine, USA.* A lensed fiber with a convex-plano silicon microlens is proposed for butt-coupling between standard single-mode fibers and high-index contrast waveguides with fine modal-field diameters. The theoretical focused spot diameter is 0.56μm at the wavelength 1.55μm.

JThA8
Out-of-Plane Coupling Structures for Optical Printed Circuit Boards, *Nina Hendrickx[1], Jürgen Van Erps[2], Hugo Thienpont[2], Peter Van Daele[1]; [1]Ghent Univ., Belgium, [2]Vrije Univ. Brussel, Belgium.* We present an integrated total internal reflection mirror and pluggable coupler that can be used for out-of-plane coupling in an optical PCB. The coupling efficiency of both mirror configurations is measured and compared.

JThA9
Bend Insensitive Small Diameter Fibers for Optical Interconnection Systems, *Ryuichi Sugizaki, Masahito Morimoto, Katsuki Suematsu, Harumi Inaba, Iwao Shimotakahara, Takeshi Yagi; Furukawa Electric, Japan.* Bending loss insensitive small diameter fibers for optical interconnection systems using 1100nm high-speed VCSELs are designed and fabricated. 90°-bending with 1mm radius is achieved by fabricated 80μm cladding fibers using stress-free bending technique.

JThA10
Ultra-Compact Mach-Zehnder Interferometer Using Hollow Optical Fiber for High Temperature Sensing, *Yong-min Jung[1], H. Y. Choi[1], M. J. Kim[1], B. H. Lee[1], K. Oh[2]; [1]Gwangju Inst. of Science and Technology, Republic of Korea, [2]Yonsei Univ., Republic of Korea.* We have developed a compact fiber-optic Mach-Zehnder interferometer using hollow optical fiber spliced between standard single-mode fibers. Temperature sensitivity of 52pm/°C and dynamic range of 10dB are obtained over the range of 25~330°C at 1550nm.

JThA11
Inner Cladding Fiber Interferometer for the Simultaneous Measurement of Temperature and Strain, *Myoung Jin Kim, Young Ho Kim, Seok Han Kim, Gopinath Mudhana, Byeong Ha Lee; Gwangju Inst. of Science and Technology, Republic of Korea.* We propose an inner cladding fiber interferometer formed with a long-period fiber grating pair, which is insensitive to the external contact. We simultaneously measure temperature and strain by separating the grating-free-region and the grating region.

2. Amplifiers and Lasers: Fiber or Waveguide

JThA12
Integrated Er^{3+}/Yb^{3+} Co-Doped Silica Waveguide Amplifiers Longitudinally Pumped by Broad Area Lasers, *Veronica Toccafondo, Stefano Faralli, Fabrizio Di Pasquale; Scuola Superiore Sant'Anna, Italy.* We propose a new pumping scheme for Er^{3+}/Yb^{3+} co-doped waveguide amplifiers, based on evanescent pump light coupling from a multimode waveguide. Gain up to 4dB/cm can be achieved using broad area lasers at 980 nm.

JThA13
6.4-dB Enhancement of the Gain of a Raman-Assisted Fiber Optical Parametric Amplifier over the Sum of the Gains of Individual Amplifiers, *Shaohao Wang[1], Lixin Xu[2], P. K. A. Wai[1], H. Y. Tam[1]; [1]Hong Kong Polytechnic Univ., Hong Kong, [2]Univ. of Science and Technology of China, China.* We first reported a 6.4 dB enhancement of the gain of a hybrid Raman-assisted fiber optical parametric amplifier over the sum of the gains of the individual Raman and parametric amplifiers.

JThA14
Channel Power Coupling in Constant Gain Controlled Amplifiers, *D. C. Kilper, C. A. White, S. Chandrasekhar; Bell Labs, Alcatel-Lucent, USA.* Channel power coupling due to gain ripple and tilt in constant gain controlled erbium doped fiber amplifiers is measured in a transmission line and shown to grow in cascade.

JThA15
Super-Fast AGC-EDFA for the Burst-Mode Systems without Gain Excursion in 20-ns and 21-dB Ramped Input, *Yoichi Oikawa, Yoshiaki Horiuchi, Yoshiaki Tanaka, Masamichi Shiga, Noriyasu Shiga, Hiroshi Nagaeda; Trimatiz Ltd., Japan.* AGC-EDFA for the burst-mode signals is one of the most important devices in the next generation WDM. We have realized the AGC-EDFA without gain excursion in 20-ns and 21-dB ramped input with the high-speed VOA.

10:00 a.m.–12:00 p.m.
JThA • Joint Poster Session II—Continued

JThA16
Real Burst Traffic Amplification in Optically Clamped Amplifier, *Karin Ennser[1], Stefano Taccheo[1,2], Davide Careglio[3], J. Sole-Pareta[3], Javier Aracil[4]; [1]Inst. of Advanced Telecommunications, UK, [2]Politecnico di Milano, Italy, [3]Univ. Politècnica de Catalunya, Spain, [4]Univ. Autonoma de Madrid, Spain.* Optical burst amplification in a gain-stabilized amplifier is theoretically investigated using real burst traffic data. The results show that excellent performance are obtained for WDM transmission with negligible interplay due to burst arrival statistics.

JThA17
High-Repetition-Rate Pulsed-Pump Optical Parametric Amplification in Silicon Waveguides, *Xinzhu Sang, Ozdal Boyraz; Dept. of Electrical Engineering and Computer Science, Univ. of California at Irvine, USA.* The net parametric gain evolution inside the silicon waveguides for high speed optical communications is investigated. Pulsed-pump parametric amplification can be a chip-scale solution for high bit rate DWDM systems with pulse width <1ps.

3. Signal Measurement Distortion Compensation Devices and Sensors

JThA18
Fast Measurement of Polarization Mode Dispersion via Virtually Imaged Phased-Array Based Spectral Polarimetry, *Li Xu, Houxun Miao, Andrew M. Weiner; Purdue Univ., USA.* We experimentally demonstrate fast measurement of polarization mode dispersion (PMD) with large range (differential group delay <90ps) via high speed spectral polarimetry utilizing a virtually imaged phased array (VIPA) hyperfine spectra disperser.

JThA19
DPSK Data Quality Dependencies in a Microring-Based Transmitter and Receiver, *Lin Zhang[1], Yunchu Li[1], Muping Song[1,2], Raymond G. Beausoleil[3], Alan E. Willner[1]; [1]Dept. of Electrical Engineering, Univ. of Southern California, USA, [2]Dept. of Information and Electronic Engineering, Zhejiang Univ., China, [3]HP Labs, USA.* Ultra-small DPSK (de)modulators at 10 Gb/s, using silicon-based microrings, are proposed. Data quality of the microring-based DPSK is greatly dependent on operation conditions that can be optimized to improve eye-opening by up-to-7-dB.

JThA20
Evanescent Field Absorption Sensor in Aqueous Solutions Using a Defected-Core Photonic Crystal Fiber, *Xia Yu[1], Yi Sun[2], Ping Shum[1]; [1]Nanyang Technological Univ., Singapore, [2]Natl. Inst. of Education, Singapore.* A new absorption sensor is developed using a photonic crystal fiber with enhanced evanescent field. Excellent linearity is obtained between absorbance and concentration/length. The sensitivity is increased by 60 times compared with perpendicular direction measurement.

JThA21
Wavelength Meter Based on a Birefringent Medium and a Polarimeter, *Teresa Mengual, Borja Vidal Rodriguez, Javier Martí; Nanophotonics Technology Ctr., Univ. Politécnica de Valencia, Spain.* A simple technique to measure the frequency drift of monochromatic optical sources based on the polarization change caused by a birefringent material is demonstrated. Preliminary experimental results show a resolution of 0.8 pm.

JThA22
High Resolution Optical Phase Response Measurement Using Single Sideband Modulation, *Donald B. Adams, Christi Madsen; Texas A&M Univ., USA.* A high-resolution measurement to characterize the optical amplitude and phase is presented that uses single sideband modulation, a swept-wavelength tunable laser, and a Mach-Zehnder interferometer for frequency offset accuracy.

4. Switching Wavelength-Selective Filtering and Routing Devices

JThA23
InP-Based Arrayed-Waveguide Grating with a Channel Spacing of 10 GHz, *Francisco M. Soares[1], Wei Jiang[1], Nicolas K. Fontaine[1], Sang-Woo Seo[1], Jong Hwa Baek[1], Ronald G. Broeke[1], Jing Cao[1], Katsunari Okamoto[1], Fredrik Olsson[2], Sebastian Lourdudoss[2], S. J. Ben Yoo[1]; [1]Univ. of California at Davis, USA, [2]Royal Inst. of Technology, Sweden.* We realize a high-precision 10-channel InP-based Arrayed-Waveguide Grating (AWG) with a 10-GHz channel spacing. The AWG showed approximately 10dB excess-loss, 10 dB crosstalk, and 8.2 x 6.8 mm^2 dimensions.

JThA24
MEMS Based Channelized ROADM Platform, *Michelle Muha, Brian Chiang, Robert Schleicher; DiCon Fiberoptics, Inc., USA.* Integration of thin-film and MEMS technologies has created a new channelized ROADM platform. These hybrid devices provide filtering, switching and attenuation functions, with significant improvements in performance, scalability and flexibility for low port-count ROADM applications.

JThA25
Amplitude, Phase and Bandwidth Tunable High-Resolution Optical Spectrum Shaper and Its Application for Optical Communication Systems, *Shimako Anzai[1], Mitsuko Mieno[1], Yuki Komai[1], Naoya Wada[2], Takuya Yoda[3], Tetsuya Miyazaki[2], Kashiko Kodate[1]; [1]Japan Women's Univ., Japan, [2]Natl. Inst. of Information and Communications Technology, Japan, [3]Optoquest Co., Ltd., Japan.* A new high-resolution optical-spectrum control system is proposed and developed. It can control both amplitude and phase of spectrum with 10GHz resolution for whole C-band. bandwidth tunable, rectangular-shape pass-bands are achieved. Applications are also demonstrated.

JThA26
Fiber Switching with a Diffractive Mirror Structure: Insertion Loss and Crosstalk Analysis, *David Sinefeld, Dan M. Marom; Hebrew Univ. of Jeruslem, Israel.* We analyze the 1xK fiber switching performance when using a diffractive mirror in place of a tilting micromirror. Our findings demonstrate increasing insertion losses for larger fiber-counts and elevated crosstalk levels due to quantization effects.

JThA27
Design of Low-Loss One-Dimensional Planar-Photonic Crystal Coupled-Cavity Waveguides, *Yuki Kawaguchi, Kunimasa Saitoh, Masanori Koshiba; Hokkaido Univ., Japan.* We propose a novel design method for low-loss one-dimensional planar-photonic crystal coupled-cavity waveguide (CCW). The calculated intrinsic losses in the proposed CCW are 2 orders of magnitude lower than those in previously reported CCW structure.

JThA28
Novel Spectral Phase En/Decoder Based on Sampled Fiber Bragg Grating, *Meng Yan, Minyu Yao, Hongming Zhang; Tsinghua Univ., China.* We propose a novel spectral phase en/decoder based on sampled fiber Bragg grating. As a proof-of-principle, 15-chip spectral phase en/decoders are realized, and their en/decoding performance is verified by both numerical simulation and experimental demonstration.

JThA29
Automatic Apodization Profiling of Super Structured Fiber Bragg Gratings for OCDMA Coding Applications, *Antonio Teixeira, Pedro Teixeira, Berta Neto, Rogerio Nogueira, Paulo Andre; Inst. de Telecomunicacoes, Portugal.* We present an automatic method to profile the apodization of the coders and decoders used in OCDMA applications. This method is valid for any phase code enabling significant improvements on system performance.

JThA30
Spectrally Efficient Phase Encoded Optical CDMA System in Time Domain, *Santiago Tainta[1], María J. Erro[1], María J. Garde[1], Miguel A. Muriel[2]; [1]Univ. Pública de Navarra, Spain, [2]Univ. Politécnica de Madrid, Spain.* A novel WDM-compatible Spectrally Phase Encoded-Optical CDMA scheme based on second order dispersion is presented. Proof of concept results are given for a system transmitting at 2.5 Gbps within an 80 GHz optical window.

JThA31
Bi-Boundary FEM-BEM for Open Optical Waveguide Problems, *Bing Yu, Xiaohan Sun; Southeast Univ., China.* A Bi-boundary FEM-BEM for optical waveguides with open structure is proposed, which accelerates the analysis for the waveguides through an iterative approach between two boundaries. The method is validated by numerical examples.

10:00 a.m.–12:00 p.m.
JThA • Joint Poster Session II—Continued

5. Optoelectronic Devices

Modulators

JThA32
50 Gb/s Modulation and/or Detection with a Travelling-Wave Electro-Absorption Transceiver, *Marek G. Chacinski[1], Urban Westergren[1], Lars Thylén[1], Richard Schatz[1], Björn Stoltz[2]; [1]Dept. of Microelectronics and Applied Physics, Royal Inst. of Technology, Kista Photonic Res. Ctr., Sweden, [2]Syntune AB, Sweden.* Electro-Absorption-Transceiver (EAT) structures used as efficient Travelling-Wave Electro-Absorption-Modulator (TWEAM) as well as Travelling-Wave-Photo-Detector (TWPD) are investigated. Clear eye-openings at 50Gb/s for modulation and for detection are presented. Transmission over 2.2km and 5km SSMF were achieved.

JThA33
First Demonstration on the Non-Transparency of PPLN and Its Potential Application of CSRZ-to-RZ Format Conversion, *Jian Wang[1], Junqiang Sun[1], Xinliang Zhang[1], Dexiu Huang[1], Martin Fejer[2]; [1]Huazhong Univ. of Science and Technology, China, [2]Stanford Univ., USA.* We report the experimental observation on the transparency and non-transparency aspects of PPLN by using NRZ-DPSK, RZ-DPSK, CSRZ-DPSK, and CSRZ signals. Potential non-transparent applications of 40Gb/s tunable and multicasting CSRZ-to-RZ format conversions are experimentally demonstrated.

JThA34
High-Speed Dual-Parallel Mach-Zehnder Modulator Using Thin Lithium Niobate Substrate, *Tetsuya Kawanishi[1], Takahide Sakamoto[1], Akito Chiba[1], Masayuki Izutsu[1], Kaoru Higuma[2], Junichiro Ichikawa[2], Thomas Lee[3], Volker Filsinger[3]; [1]Natl. Inst. of Information and Communications Technology, Japan, [2]New Technology Res. Labs, Sumitomo Osaka Cement Co., Ltd., Japan, [3]SHF Communication Technologies AG, Germany.* We present a high-speed dual-parallel Mach-Zehnder modulator with thin substrate. Modulator frequency response was investigated by network analyzer and optical spectrum analyzer based techniques. Clear eye opening was achieved at 87 Gbaud with on-off-keying.

JThA35
Enhanced Performance and Flexibility in Silicon Modulators Based on a Coupled-Ring-Resonator Structure, *Yunchu Li[1], Lin Zhang[1], Muping Song[1], Yang Yue[1], Raymond Beausoleil[2], Alan Eli Willner[1]; [1]Univ. of Southern California, USA, [2]HP Labs, USA.* We propose and simulate a high-speed (up to 30 Gb/s) silicon-based coupled-ring modulator that requires small resonance shift and achieves higher extinction-ratio and bandwidth. Optimized chirp enables reach extension for 20-Gb/s NRZ data transmission.

JThA36
Monolithic Integration of GaAs/AlGaAs Phase Modulator and Photodetector for RF Photonics, *Mona Jarrahi, David A. B. Miller, Thomas H. Lee; Stanford Univ., USA.* We report the design and monolithic fabrication of phase modulator and photodetectors for RF photonics. We demonstrate phase modulation efficiency of $2700V^{-1}mm^{-1}$, and a bandwidth of 18GHz. Photodetectors response time is measured to be 8ps.

Detectors

JThA37
Large-Area Top-Illuminated InP-Passivated Mesa-Type InGaAs Pin Photodiodes for High-Bit-Rate Multi-Mode Fiber Applications, *Yoshihiro Yoneda, Ryuji Yamabi, Sosaku Sawada, Hiroshi Yano; Eudyna Devices Inc., Japan.* We demonstrate top-illuminated InGaAs pin photodiodes with both a large area (f56 μm) and low capacitance (212 fF) for 10 Gb/s MMF applications. The devices exhibit high-responsivity (0.88 A/W) and broad bandwidth (8.8 GHz).

JThA38
Optoelectronic Mixer with Low Up-Conversion Loss and Wide Up-Conversion Bandwidth by Use of Flip-Chip Bonding Near-Ballistic Uni-Traveling-Carrier Photodiode and Coupled-Line Filter, *Y.-S. Wu[1], C.-C. Chu[1], Jin-Wei Shi[1], J. M. Kuo[2], Y. C. Kao[2]; [1]Dept. of Electrical Engineering, Natl. Central Univ., Taiwan, [2]Intelligent Epitaxy Technology, Inc., USA.* We demonstrated optoelectronic mixers, which are constructed from near-ballistic uni-traveling-carrier photodiodes and band-pass filters. By utilizing strong nonlinearity of electron ballistic-transport, such module achieves low-up-conversion-loss (4.3dB) and wide-up-conversion-bandwidth (11GHz) under high-optical-power injection (16.6dBm) at 30GHz.

Signal Processing

JThA39
A Monolithic InP-Based Photonic Integrated Circuit for Optical Arbitrary Waveform Generation, *Wei Jiang[1], Francisco M. Soares[1], Sang-Woo Seo[1], Jong Hwa Baek[1], Nicolas K. Fontaine[1], Ronald G. Broeke[1], Jing Cao[1], John Yan[1], Katsunari Okamoto[1], Fredrik Olsson[2], Sebastian Lourdudoss[2], Anh-Vu Pham[1], S. J. Ben Yoo[1]; [1]Univ. of California at Davis, USA, [2]Royal Inst. of Technology, Sweden.* We demonstrate a compact monolithically-integrated InP optical arbitrary waveform generator, consisting of an arrayed waveguide grating pair with 10 GHz channel spacing, 10 high-speed optical amplitude modulators, and 10 high-speed optical phase modulators.

JThA40
Wavelength-Retaining 1 x 2 Optical Router for DPSK Signal Using Nonlinear Polarization Rotation in a SOA, *Alan Cheng, Mable P. Fok, Chester Shu; Dept. of Electronic Engineering and Ctr. for Advanced Res. in Photonics, The Chinese Univ. of Hong Kong, Hong Kong.* We demonstrate a wavelength-retaining optical switch for DPSK signal using nonlinear polarization rotation in a SOA. The bit-rate transparent 1x2 optical router operates over 20 nm with a power penalty less than 3 dB.

JThA41
A Novel Fast Programmable Optical Buffer with Variable Delays, *Xinwan Li[1], Limei Peng[2], Jianping Chen[1], Songbo Wang[1], Guiling Wu[1], Jialin Lu[1], Young-Chon Kim[2]; [1]Shanghai Jiaotong Univ., China, [2]Chonbuk Natl. Univ., Republic of Korea.* An optical fiber buffering structure was proposed by embedding 3J feed-forward optical fiber delay lines into a re-circulating loop. By using SOAs as the ON-OFF switches, this structure is fast programmable and scalable.

JThA42
Improvement of XPM Efficiency in InGaAs/AlAsSb Coupled Auantum Wells Using InAlAs Coupling Barrier for Intersubband Transition Optical Switch, *Masanori Nagase, Ryoichi Akimoto, Takasi Simoyama, Teruo Mozume, Toshifumi Hasama, Hiroshi Ishikawa; Natl. Inst. of Advanced Industrial Science and Technology (AIST), Japan.* The InGaAs/InAlAs/AlAsSb coupled quantum well is developed to use in Mach-Zehnder interferometric switch utilizing intersubband transition. Strong well-well coupling produced by this structure enhances cross phase modulation, which is effective in reducing the switching energy.

Other

JThA43
Two-Color Picosecond Pulse Generation Using Single-Stage Electro-Optic Mach-Zehnder Modulator, *Takahide Sakamoto, Isao Morohashi, Tetsuya Kawanishi, Masahiro Tsuchiya; Natl. Inst. of Information and Communications Technology, Japan.* We demonstrated twin-color picosecond pulse generation using Mach-Zehnder-modulator-based flat comb generator. Parabolic phase compensation of the comb with a dispersion-flattened fiber yields colorless operation. 10-GHz 4-ps pulse trains were simultaneously generated at two different wavelengths.

JThA44
R=1mm 90°-Bent Multi-Mode Optical Fiber, *Masahito Morimoto, Katsuki Suematsu; Furukawa Electric Co., Ltd., Japan.* We investigated the bending losses and the polarization dependent losses of 90° light beam deflection for multi-mode optical fibers (MMF) using small-radius 90°-bent optical fibers with low refractive index UV curable resin.

10:00 a.m.–12:00 p.m.
JThA • Joint Poster Session II—Continued

6. Digital Transmission Systems

Advanced Modulation Formats

JThA45
Polarization-Multiplexed 1 Gsymbol/s, 128 QAM (14 Gbit/s) Coherent Optical Transmission over 160 km Using a 1.4 GHz Nyquist Filter, *Hiroki Goto, Keisuke Kasai, Masato Yoshida, Masataka Nakazawa; Res. Inst. of Electrical Communication, Tohoku Univ., Japan.* We have transmitted a polarization-multiplexed 1-Gsymbol/s, 128 QAM (14-Gbit/s) coherent optical signal over 160 km using a 1.4-GHz Nyquist filter. A heterodyne technique was used between a frequency-stabilized C_2H_2 laser and high-speed local oscillator.

100G

JThA46
Comparison of 100Gb/s Transmission Performances between RZ-DQPSK and Polarization Multiplexed NRZ/RZ-DPSK with Automatic Polarization De-Multiplexer, *Toshiharu Ito, Emmanuel Le Taillandier de Gabory, Satomi Shioiri, Kiyoshi Fukuchi; NEC Corp., Japan.* Long-term transmission performances of polarization multiplexed 2x50Gb/s NRZ/RZ-DPSK signals, denoting good transmission performances but with larger PMD-induced BER fluctuations compared with 100Gb/s RZ-DQPSK, are successfully observed by constructing an automatic polarization de-multiplexer.

JThA47
Unrepeatered Transmission of 107 Gb/s RZ-DQPSK over 300km NZDSF with Bi-Directional Raman Amplification, *Mei Du[1], Jianjun Yu[2], Xiang Zhou[3]; [1]OFS Labs, USA, [2]NEC Labs America, USA, [3]ATT Labs, USA.* We demonstrate unrepeatered transmission of 107 Gb/s RZ-DQPSK signals over 300km non-zero dispersion-shifted fiber by using bi-directionally pumped Raman amplification. The single fiber type and moderate Raman pump powers are compatible with terrestrial network applications.

JThA48
100 Gbit/s All-Optical OFDM Transmission Using 4x25 Gbit/s Optical Duobinary Signals with Phase-Controlled Optical Sub-Carriers, *Kazushige Yonenaga[1], Akihide Sano[1], Etsushi Yamazaki[1], Fumikazu Inuzuka[1], Yutaka Miyamoto[1], Atsushi Takada[1], Takashi Yamada[2]; [1]NTT Network Innovation Labs, Japan, [2]NTT Photonics Labs, Japan.* This paper proposes 100-Gbit/s optical-OFDM transmission using the ODB format. An OFDM signal generated using a simple multi-carrier generator and multi-carrier modulator is successfully transmitted over a 20-km SMF and 100-km DSF without dispersion compensation.

Transmission

JThA49
Design and Performance Prediction in Meshed Networks with Mixed Fiber Types, *Jean-Christophe Antona, Emmanuel Seve, Alexandros Pitilakis, Petros Ramantanis, Sébastien Bigo; Alcatel R&I, France.* We carry out an extensive study of the accuracy of the weighted non-linear criterion to predict the performance of optical systems with mixed fiber types, over 10 or 40Gb/s configurations, based on various modulation formats.

JThA50
Impact of Routing on the Transmission Performance in a Partially Transparent Optical Network, *Thierry Zami, Annalisa Morea, Nicolas Brogard; Alcatel-Lucent France, France.* We present the impact on the OSNR penalty of the optical routing applied to the near channels of a given connection along its light-path. We compare this penalty to the one induced by point-to-point transmission

JThA51
XPM-Induced Degradation of Multilevel Phase Modulated Channel Caused by Neighboring NRZ Modulated Channels, *Jesper Bevensee Jensen[1], Gert Schiellerup[2], Christophe Peucheret[1], Torger Tokle[3], Palle Jeppesen[2]; [1]COM•DTU, Technical Univ. of Denmark, Denmark, [2]Tellabs Denmark A/S, Denmark, [3]OFS Fitel Denmark ApS, Denmark.* The impact of XPM from NRZ modulated channels on an 8-level phase modulated channel in a WDM system was investigated. Requirements on launch power are found. 400 km transmission was achieved with negligible penalty.

JThA52
On the Statistics of Intra-Channel Four-Wave Mixing in Phase-Modulated Systems, *Alan Pak Tao Lau, Sahand Rabbani, Joseph M. Kahn; Stanford Univ., USA.* The correlation functions of intra-channel four-wave mixing (IFWM) in phase-modulated systems are studied. Implementing a phase noise predictor derived from the correlation functions results in a 1 dB improvement for typical terrestrial links.

JThA53
Highly Efficient Method for BER Modeling in Quasi-Linear Fibers and Its Validation in a 40 Gb/s DWDM Testbed, *Vladimir S. Grigoryan, John Veselka, Harshad P. Sardesai; Ciena Corp., USA.* A novel ultra-fast quasi-analytical method capable of directly computing BER in terrestrial WDM systems within few minutes is presented and validated. The modeled BER results remarkably agree with 40 Gb/s duo-binary WDM testbed measurements.

JThA54
Histogram-Based Bit Error Ratio Estimator for Differential Modulation Formats, *Martin Windmann, Peter M. Krummrich; Univ. of Dortmund, Germany.* A histogram-based BER estimation method for differential modulation formats is analyzed. It is shown that this BER estimation approach yields more accurate results than conventional extrapolation methods with less simulated symbols.

JThA55
Experimental Performance Comparison of Duobinary Formats for 40 Gb/s Long-Haul Transmission, *Erwan Pincemin[1], Christophe Gosset[1], Laurent Dupont[2], Antoine Tan[1], Aude Bezard[1]; [1]France Telecom, France, [2]GET ENST Bretagne, France.* We experimentally compare performances of various duobinary formats for 40Gbps long-haul transmission. After having measured their robustness to ASE, CD, PMD and intra-channel nonlinearities, we show that transmission longer than 2000km can be envisaged.

7. Transmission Subsystems and Network Elements

JThA56
Precoding Based Peak-to-Average Power Ratio Reduction for Optical OFDM Demonstrated on Compatible Single-Sideband Modulation with Direct Detection, *Ömer Bulakçi[1], Matthias Schuster[2], Christian A. Bunge[2], Bernhard Spinnler[3]; [1]Technische Univ. München, Germany, [2]Technische Univ. Berlin, Germany, [3]Nokia Siemens Networks GmbH & Co. KG, Germany.* Clipping-aided precoding is suggested for effective PAPR reduction to improve performance of OFDM. Up to 3.7 dB PAPR reduction is shown. Performance improvements in required OSNR and dispersion tolerance are demonstrated on compatible SSB.

JThA57
Optical vs. Electronic Chromatic Dispersion Compensation in WDM Coherent PM-QPSK Systems at 111 Gbit/s, *Andrea Carena[1], Vittorio Curri[1], Pierluigi Poggiolini[1], Fabrizio Forghieri[2]; [1]Politecnico di Torino, Italy, [2]Cisco Photonics Italy srl, Italy.* We carried out a simulative study of optical dispersion management using inline DCUs vs. all-electronic dispersion compensation for PM-QPSK WDM systems at 111Gbit/s. All-electronic compensation performs better than dispersion management in high-dispersion fibers.

JThA58
Optical Monitoring for Nonlinearity Identification in CO-OFDM Transmission Systems, *Markus Mayrock, Herbert Haunstein; Inst. for Information Transmission, Univ. of Erlangen-Nureberg, Germany.* Optical monitoring at end-terminals is considered a cost efficient technique. Utilizing coherent detection allows separating linear and non-linear effects. Channel identification in CO-OFDM receivers is proposed as a candidate to achieve this objective.

10:00 a.m.–12:00 p.m.
JThA • Joint Poster Session II—Continued

JThA59
Experimental Evaluation of High-Rate LDPC Codes for PMD Compensation by Turbo Equalization, *Lyubomir L. Minkov[1], Ivan B. Djordjevic[1], Hussam G. Batshon[1], Lei Xu[2], Ting Wang[2,3], Milorad Cvijetic[3], Franko H. Kueppers[1,2]; [1]Univ. of Arizona, USA, [2]NEC Labs America, USA, [3]NEC Corp. of America, USA.* Several LDPC-codes with rate above 0.9 are proposed, and employed in PMD-compensation by LDPC-coded turbo-equalization. The block-circulant LDPC(15328,13893) is only 0.9dB away from the channel-capacity limit for DGD of 125ps (and NRZ transmission at 10-Gb/s).

JThA60
Parametric versus Non-Parametric Branch Metrics for MLSE-Based Receivers with ADC and Clock Recovery, *Stefan Langenbach[1], Gabriella Bosco[2], Pierluigi Poggiolini[2], Theo Kupfer[1]; [1]CoreOptics GmbH, Germany, [2]Politecnico di Torino, Italy.* We compare the performance of MLSE-based receivers with parametric and non-parametric channel estimation methods and characterize their sensitivity against quantization, sampling jitter, and intersymbol interference (ISI) overload.

JThA61
Dispersion Compensation of up to 25,200ps/nm Using IIR Filtering, *Gilad Goldfarb, Guifang Li; College of Optics & Photonics: CREOL & FPCE, USA.* Digital infinite impulse response filtering is used to compensate for 25,200ps/nm of chromatic dispersion at 10G Baud accumulated in a recirculating loop.

JThA62
Coherent Detection Using Optical Time-Domain Sampling, *Xin Chen[1], Inwoong Kim[2], Guifang Li[2], Hanyi Zhang[1], Bingkun Zhou[1]; [1]Dept. of Electronic Engineering, Tsinghua Univ., China, [2]CREOL, Univ. of Central Florida, USA.* Coherent optical time-domain sampling (COTDS) is proposed to relax the requirement for photodetector bandwidth and the speed of ADC and DSP. Transmission of 10-Gb/s BPSK signals over 220-km SSMF was demonstrated using 10-Gsa/s ADCs.

JThA63
Digital Timing Recovery for Coherent Fiber-Optic Systems, *Maxim Kuschnerov[1], Fabian N. Hauske[1], Edouard Gourdon[2], Kittipong Piyawanno[1], Berthold Lankl[1], Bernhard Spinnler[3]; [1]Federal Armed Forces Univ., Germany, [2]ENST de Bretagne, France, [3]Nokia Siemens Networks, Germany.* We present a novel, low-complexity, non-data aided (NDA) digital timing recovery algorithm operating at a rate of two samples per symbol. Exceeding performance improvements over standard methods are demonstrated for higher distortions.

JThA64
A Clustering-Based Channel Estimation Algorithm for MLSE in Optical Fiber Communication Systems, *Chuanchuan Yang[1], Feng Yang[2], Ziyu Wang[1]; [1]State Key Lab on Advanced Optical Communication Systems and Networks, Peking Univ., China, [2]Tsinghua Natl. Lab for Information Science and Technology, Tsinghua Univ., China.* Without assuming the channel memory length is known a priori to the receiver, we propose a clustering-based channel estimation algorithm for optical fiber communication systems, which can also induce a complexity-reduced MLSE receiver.

8. Optical Processing and Analog Subsystems

JThA65
A Radio-on-Hybrid WDM Transport System Based on Mutually Injection-Locked F-P LDs, *Wen-I Lin, Hai-Han Lu, Shah-Jye Tzeng, Ardhendu Sekhar Patra, Wan- Lin Tsai; Natl. Taipei Univ. of Technology, Taiwan.* A radio-on-hybrid WDM transport system employing mutually injection-locked F-P LDs is proposed and demonstrated. System performances evaluated by CNR/CSO/CTB/BER for transmission of CATV/LAN/ITS are improved. Our proposed systems are relatively simple and potentially low cost.

JThA66
Multiband UWB Pulse Generation Using Hybrid Photonic Microwave Filters, *Hongwei Chen, Ciyuan Qiu, Minghua Chen, Shizhong Xie; Tsinghua Univ., China.* A novel method for multiband ultra-wide band (UWB) pulse generation using hybrid photonic microwave filters is proposed and demonstrated. The generated pulses have bandwidths larger than 1.8GHz and can be used in multiband UWB systems.

JThA67
High Order Ultrawideband Pulse Generation from NRZ-DPSK Signals, *Jianji Dong[1], Xinliang Zhang[1], Jing Xu[1], Dexiu Huang[1], Songnian Fu[2], Ping Shum[2]; [1]Wuhan Natl. Lab for Optoelectronics, China, [2]Network Technology Res. Ctr., Singapore.* We present ultrawideband doublet and triplet generation from NRZ-DPSK signals based on optical fiber and filter. Doublet and triplet are obtained by locating the optical carrier at the peak and slope of the filter, respectively.

JThA68
Transmission Improvement in Fiber Radio Links Using Semiconductor Laser, *Peng-Chun Peng[1], Chun-Ting Lin[2], Wen-Jr Jiang[2], Jason (Jyehong) Chen[2], Po Tsung Shih[2], Fang-Ming Wu[1], Sien Chi[3,2]; [1]Natl. Chi Nan Univ., Taiwan, [2]Natl. Chiao Tung Univ., Taiwan, [3]Yuan Ze Univ., Taiwan.* This investigation experimentally demonstrates the performance improvement in fiber-radio links by using a semiconductor laser. This technique improves receiver sensitivity over 4.5 dB by increasing the optical modulation depth.

JThA69
Nonlinear Optical Crosstalk in Analog Phase-Modulated Wavelength-Division-Multiplexed Systems, *Hoon Kim[1], H. C. Ji[2], Jun Haeng Lee[3]; [1]Natl. Univ. of Singapore, Singapore, [2]Osaka Univ., Japan, [3]KDDI R&D Labs, Japan.* We report on the nonlinear inter-channel crosstalk in analog phase-modulated wavelength-division-multiplexed systems. The two-channel experimental results show a reduction of the crosstalk by ~15 dB, compared to intensity-modulated systems.

JThA70
All-Optical UWB Pulse Generation and Pulse Shape Modulation Based on XPM in NOLM, *Hao Huang, Kun Xu, Jianqiang Li, Jian Wu, Xiaobin Hong, Jintong Lin; Beijing Univ. of Posts and Telecommunications, China.* A novel scheme is experimentally demonstrated to generate ultrawide band (UWB) pulses by adopting a nonlinear optical loop mirror. A simple approach to implementing pulse polarity modulation based on this scheme is also proposed.

JThA71
Optical Beamforming Network with Multibeam Capability Based on a Spatial Light Modulator, *Teresa Mengual[1], Borja Vidal Rodriguez[1], Chrysavgi Stoltidou[2], Sebastian Blanch[2], Javier Martí[1], Lluís Jofre[2], Iain McKenzie[3], Juan Manuel Del Cura[4]; [1]Nanophotonics Technology Ctr., Univ, Politecnica de Valencia, Spain, [2]Univ. Politècnica de Catalunya, Spain, [3]European Space Agency, European Space Res. & Technology Ctr., Netherlands, [4]SENER, Ingeniería y Sistemas, Aerospace Div., Spain.* An optically-controlled phased array antenna based on a spatial light modulator is demonstrated. Far-field antenna patterns between 7.5 GHz and 8.5 GHz have been measured showing beam steering capability, amplitude distribution weighting and multibeam operation.

JThA72
SOA-Based Filter-Free Scheme for Optical Ultrawideband Monocycle Generation, *Xinliang Zhang, Jianji Dong, Jing Xu, Yang Wang, Dexiu Huang; Wuhan Natl. Lab for Optoelectronics, School of Optoelectronic Science and Engineering, Huazhong Univ. of Science and Technology, China.* We present SOA-based filter-free scheme for optical ultrawideband monocycle generation. Input power dynamic range larger than 16dB and wavelength-tunable range covering C-band are achieved. Two SOAs with different dynamics are compared in generating UWB signals.

10:00 a.m.–12:00 p.m.
JThA • Joint Poster Session II—Continued

JThA73
Generation of Carrier Suppressed Optical mm-Wave Signals Using Frequency Quadrupling and No Optical Filtering, *Chun-Ting Lin[1], Po Tsung Shih[1], Jason (Jyehong) Chen[1], Peng-Chun Peng[2], Sheng-Peng Dai[1], Wen-Qiang Xue[2], Sien Chi[1,3]; [1]Dept. of Photonics, Natl. Chiao Tung Univ., Taiwan, [2]Dept. of Applied Materials and Optoelectronic Engineering, Natl. Chi Nan Univ., Taiwan, [3]Dept. of Electrical Engineering, Yuan Ze Univ., Taiwan.* This work demonstrates a novel mm-wave generation using a frequency quadrupling technique. Only one external MZM is used and no optical filter is needed. It provides a simple and inexpensive choice for WDM RoF applications.

JThA74
Millimeter-Wave Frequency Multiplication Scheme Utilizing Optical Four-Wave Mixing without Notch Filter, *Huan Jiang, He wen, Xiaoping Zheng, Hanyi Zhang, Yili Guo; Tsinghua Univ., China.* We report a millimeter-wave (mm-wave) frequency multiplication scheme that uses optical four-wave mixing as analog multiplier of time-aligned carrier-suppressed signals. A proof-of-concept mm-wave frequency quadrupler is achieved without notch filter.

JThA75
Optimal Control of Tunable PMD Compensator Using Random Step Size Hill-Climbing Method, *Ken Tanizawa, Akira Hirose; Univ. of Tokyo, Japan.* We propose a search control method of PMD compensator to decrease the possibility being trapped at local maxima. Transmission simulations at 160 Gb/s show that the method controls PMD compensator more optimally than conventional method.

JThA76
Dispersion Penalty Mitigation Using Polarization Mode Multiplexing in Phase Diverse Analog Optical Links, *Shalabh Gupta[1], Ozdal Boyraz[2], Bahram Jalali[1]; [1]Univ. of California at Los Angeles, USA, [2]Univ. of California at Irvine, USA.* Polarization mode multiplexing of phase diverse Mach-Zehnder modulator outputs to mitigate dispersion penalty in band limited analog optical links and related systems is demonstrated. Link SNR is also improved by up to 3dB.

JThA77
Crosstalk and Distortion Caused by Four-Wave Mixing in a Subcarrier-Multiplexed WDM Lightwave Link, *Mary R. Phillips[1], Kuang-Yi Wu[2], Fernando X. Villarruel[2]; [1]Photonic Systems, Inc., USA, [2]Scientific Atlanta, A Cisco Co., USA.* Four-wave mixing in a two-channel WDM system operating near the fiber dispersion zero is found to cause crosstalk and distortion of subcarrier-multiplexed signals. We model the effect and find good agreement with measured data.

9. Networks

JThA78
Static vs. Dynamic Wavelength-Routed Optical Networks under Time-Varying Traffic, *Alejandra L. Zapata, Solange R. Ahumada; Univ. Técnica Federico Santa Maria, Chile.* Potential wavelength savings of dynamic WDM networks with respect to static ones are quantified under time-varying traffic. The traffic matrix with the highest traffic load (ρmax) determines the wavelength savings, observed only for ρmax<0.1-0.3.

JThA79
AMSON: An Extended Architecture for Adaptive Service Provisioning in Transport Networks, *Jie Zhang, Lei Wang, Xiuzhong Chen, Wanyi Gu; Beijing Univ. of Posts and Telecommunications, China.* We present an extended architecture for adaptive service provisioning in transport networks and develop an AMSON testbed for proof of the functional model of service plane.

JThA80
A Dual Metaheuristic Solution to the Min-RWA Problem, *Daniel O'Brien[1], Benoît Châtelain[1], François Gagnon[1], Christine Tremblay[1], Michel P. Bélanger[2], Éric Bernier[2]; [1]Univ. du Quebec - ETS, Canada, [2]Nortel, Canada.* A new routing and wavelength assignment (RWA) algorithm for all-optical networks is introduced. A genetic algorithm, minimizing the network's link congestion, is combined with tabu search. Optimal solutions are found for nearly all test cases.

JThA81
Towards a Deeper Understanding of Managing Dynamic Optical Networks Under Link Failures, *Sun-il Kim, Xiaolan J. Zhang, Steven S. Lumetta; Univ. of Illinois at Urbana-Champaign, USA.* We quantify the impact of link failures after initial rerouting and show that some nodes continue to drop a significant portion of its traffic. We discuss the practical tradeoffs in rebalancing the network using redimensioning.

JThA82
Efficient, Fault-Tolerant All-Optical Multicast Networks via Network Coding, *Ronald C. Menendez, Joel W. Gannett; Telcordia Technologies, USA.* Network coding, an emerging field of research, provides a means to create efficient all-optical multicast networks that feature hitless reconfiguration. Here a photonic bitwise exclusive-OR hardware element supplies the key enabling functionality.

JThA83
Theoretical and Experiment Study of Resource Co-Allocation Scheme in Optical Grid for Distributed Computing, *Lingbin Kong, Dongmei Liu, Yaojun Qiao, Yuefeng Ji; Beijing Univ. of Posts and Telecommunications, China.* We propose a minimum cost scheme to solve the co-allocation of application resource and network resource in optical grid. This scheme is deployed on a test-bed and its impact on performance is analyzed by experiment.

JThA84
Minimizing Reconfiguration Times of OXCs in Distributed Wavelength Reservation for Wavelength-Routed Optical Networks, *Lihua Lu, Qingji Zeng; Shanghai Jiao Tong Univ., China.* We propose a novel distributed reservation scheme in which signaling packets collect OXCs configuration status of each available wavelength. It will minimize the number of switch fabrics reconfigured and significantly shorten the connection setup time.

JThA85
Optimal Location Analysis of Two Interconnections for the Consolidation of Two Networks, *Zhenchang Xie, Raymond Hai Ming Leung, Lian-Kuan Chen, Chun-Kit Chan; Chinese Univ. of Hong Kong, China.* In the merging of two identical optimized optical networks with two minimal interconnection links, we analyze the optimal locations of the two interconnection links to achieve maximum saving in fiber links.

JThA86
Automatic Lightpath Provisioning via Wavelength Access Control in WDM Ring Networks, *Jie Zhang, Wanyi Gu, Dahai Han, Yongli Zhao, Yuefeng Ji; Beijing Univ. of Posts and Telecommunications, China.* We address the problem of automatic lightpath provisioning in WDM rings without wavelength conversion and present a state transition model for wavelength access control based on the WOI overhead defined in this paper.

JThA87
Novel Outage Probability Based RWA Algorithm, *Jonathan C. Li[1], Kerry Hinton[2], Sarah D. Dods[1], Peter M. Farrell[1]; [1]Natl. ICT Australia, Victorian Res. Lab, Univ. of Melbourne, Australia, [2]ARC Special Ctr. for Ultra-Broadband Information Networks, Univ. of Melbourne, Australia.* We propose a new algorithm for path selection and wavelength assignment in all-optical networks based on physical layer impairments and outage probability also including optional wavelength conversion.

JThA88
Experimental Demonstration of Optical Multicast Using WSS Based Multi-Degree ROADM, *Hwan Seok Chung, Sun Hyok Chang, Sang Soo Lee, Kwangjoon Kim; Electronics and Telecommunications Res. Inst., Republic of Korea.* The feasibility of multicast capable ROADM supporting optical multicast of any wavelength in any fiber is experimentally demonstrated. We implement fully-reconfigurable MC-ROADM, and evaluate multicasting performances by fully loading 40 x 10 Gb/s WDM signals.

JThA89
Impact of 3R Wavelength Converter Tunability on WDM Networks with Finite Signal Impairment Threshold, *Sun Hyok Chang, Hwan Seok Chung, Sang Soo Lee, Yun Hee Cho, Kwangjoon Kim; Broadband Convergence Network Res. Div., Electronics and Telecommunications Res. Inst., Republic of Korea.* The effects of 3R wavelength converters (3R-WC) tunability on WDM networks with finite signal impairment threshold are presented. We find that 3R-WCs with limited tuning range can give the same network performance with full tunability.

10:00 a.m.–12:00 p.m.
JThA • Joint Poster Session II—Continued

JThA90
Scalable Optical Multi-Service Home Network, *Hary Ramanitra, Philippe Guignard, Anna Pizzinat, Benoit Charbonnier, Laurent Guillo; France Telecom R&D, France.* We present a multi-service and scalable home network based on CWDM and broadcast and select technologies using single mode fiber. Network dimensioning is reported and the link budget is investigated in a multi-application configuration.

JThA91
Concept and Evaluation of the Terminal Pair Available Bitrate (TPAB) for Disjoint Path Pairs, *Velislava Marcheva, Claus Gruber, Dominic Schupke; Nokia Siemens Networks, Germany.* Transport network services can be offered by multiple paths that each accumulate to the desired service bitrate, falling back to lower bitrates upon failures. The paper evaluates this TPAB concept in a case study.

JThA92
Nanophotonic Optical Interconnection Network Architecture for On-Chip and Off-Chip Communications, *Howard Wang, Michele Petracca, Aleksandr Biberman, Benjamin G. Lee, Luca P. Carloni, Keren Bergman; Columbia Univ., USA.* An architecture for an integrated low-power, high-bandwidth optical interconnection network based on microring resonator technology is presented. The layout of the non-blocking network is described and a simulation-based performance evaluation is conducted.

JThA93
Secure Optical Bit- and Block-Cipher Transmission Using a Single Multiport Encoder/Decoder, *Gabriella Cincotti[1], Naoya Wada[2], Ken-ichi Kitayama[3]; [1]Univ. of Roma Tre, Italy, [2]Natl. Inst. of Information and Communications Technology, Japan, [3]Osaka Univ., Japan.* The physical-layer confidentiality of point-to-point (P2P) transmission is analyzed with respect to bit and block-ciphering systems, within an accurate cryptanalysis framework. Different encoding/decoding schemes are presented, based on a single multiport encoder/decoder.

10. Access Solutions, Demonstrations and Non-Telecom Applications

JThA94
Performance Comparison between Manchester and Inverse-RZ Coding in a Wavelength Re-Modulated WDM-PON, *Hwan Seok Chung, Bong Kyu Kim, Kwangjoon Kim; Electronics and Telecommunications Res. Inst., Republic of Korea.* We compare the performance of wavelength re-modulated WDM-PON implemented by Manchester or IRZ coded downstream and NRZ re-modulated upstream, and investigate effects of bit-rate difference between downstream and upstream on the two coding schemes.

JThA95
A Self-Survivable WDM-PON Architecture with Centralized Wavelength Monitoring, Protection and Restoration for both Upstream and Downstream Links, *Arshad M. Chowdhury[1], Ming-Fang Huang[1], Hung-Chang Chien[1], Georgios Ellinas[2], Gee-Kung Chang[1]; [1]Georgia Tech, USA, [2]Univ. of Cyprus, Cyprus.* A centrally-controlled, bi-directional WDM-PON architecture has been demonstrated. The self-survivable scheme can protect all types of failures in distribution and feeder fibers, remote nodes, and transmitters in CO and ONUs.

JThA96
Hybrid WDM-TDM Passive Optical Network in Burst Mode Configuration with RSOA, *Zineb Belfqih, Philippe Chanclou, Fabienne Saliou; France Telecom, Res. and Development Div., France.* A hybrid PON based on TDM and WDM is demonstrated using RSOA in the optical network unit. The burst mode configuration operates at 1.25 Gbit/s over 50 km fibre link for 1024 customers.

JThA97
Bidirectional 1.25Gb/s Colorless RSOA Based WDM-PON Using Suppressed Optical Carrier and Polarization Beam Splitter, *Dong-Hyeon Kim[1], Piao Yin Xing[1], Yong-Yuk Won[1], Soo-Jin Park[2], Sang-Kook Han[1]; [1]Dept. of Electrical and Electronic Engineering, Yonsei Univ., Republic of Korea, [2]Korea Telecom, Republic of Korea.* This is a bidirectional colorless 1.25Gb/s WDM-PON composed of both RSOA for downlink signal and LN-MZM for uplink signal. In this system, PBS actes as OBI noise reducer, OBI noise comes from its interferometer structure.

JThA98
Reduction of Rayleigh Back-Scattering Noise Using RF Tone in RSOA Based Bidirectional Optical Link, *Jae-Min Lee[1], Dae-Won Lee[1], Yong-Yuk Won[1], Soo-Jin Park[2], Sang-Kook Han[1]; [1]Broadband Transmission Network Lab, Yonsei Univ., Republic of Korea, [2]Korea Telecom, Telecommunication Network Lab, Republic of Korea.* The performance of bidirectional optical-link using the same-wavelength can be degraded by Rayleigh-backscattering-noise. The baseband-noise can be reduced by frequency-chirp induced by RF-tone combination in RSOA. We can get 1.5dB power-budget through 1.25Gbps/20Km bidirectional transmission.

JThA99
Impact of Linewidth on System Impairment Caused by Backreflection in WDM PONs, *ShiYu Gao[1], HanWu Hu[1], Ahmad Atieh[2], Hanan Anis[1]; [1]Univ. of Ottawa, Canada, [2]BTI Photonics, Canada.* This paper experimentally investigates the impact of linewidth on system impairment in WDM-PONs for various wavelength-independent ONU configurations. We show that the power penalty decreases and the optimal ONU gain changes as the linewidth increases.

JThA100
Modulation of Injection Locked Lasers for WDM-PON Applications, *Tauhid R. Zaman, Rajeev J. Ram; MIT, USA.* The modulation properties of incoherently injection locked Fabry-Perot laser diodes are studied. It is found that the incoherent injection increases the damping rate and suppresses relaxation oscillations.

JThA101
A Full-duplex Access Network Based on CWDM-Routed PONs, *Yuval Shachaf, Pandelis Kourtessis, John M. Senior; Univ. of Hertfoedshire, UK.* The application of polarisation-division-multiplexing in presented, demonstrating full-duplex transmission in an access network architecture employing RSOA-based ONUs. Modelling of a single coarse-AWG OLT to transmit orthogonally-multiplexed burst-data and continuous-waves demonstrated crosstalk-free transmission up to 20km.

JThA102
A Novel Transmitter Based on Orthogonal Modulation Schemes for Future Passive Optical Networks, *Pantelis Velanas, Pantelis Velanas[1,2], Yannis Androulakakis[1], Adonis Bogris[1], Dimitris Syvridis[1]; [1]Dept. of Informatics and Telecommunications, Univ. of Athens, Greece, [2]Broadband Systems Dept., R&D Div., INTRACOM S.A. Telecom Solutions, Greece.* A low-cost technique for the upgrade of access passive optical networks based on multitone frequency shift keying (FSK) modulation format combined with conventional intensity modulation is proposed and numerically evaluated.

JThA103
Versatile-PON Service for Next Generation Optical Access Networks, *Swook Hann, Joo Boem Eom, Dong-Hwan Kim; Korea Photonics Technology Inst., Republic of Korea.* A novel optical access networks with a function of versatile adaptable architecture is proposed and demonstrated. The versatile-PON service is successfully demonstrated by both E-PON and WDM-PON with a simple uni-architecture of remote node.

JThA104
An Efficient Evolution Method from a TDM-PON with a Video Overlay to NGA, *Ki-Man Choi, Jung-Hyung Moon, Jong Hoon Lee, Chang-Hee Lee; Korea Advanced Inst. of Science and Technology, Republic of Korea.* An evolution method from a TDM-PON with a video overlay to NGA is demonstrated. A single type of 3-/4-port WC enables a simple evolution of TDM-PON with a video overlay maintaining OSP and wavelength plan.

10:00 a.m.–12:00 p.m.
JThA • Joint Poster Session II—Continued

NFOEC B. Network Technologies

JThA105
Prevention of Quality Degradation in Optical Fiber Interconnects for Last 1 Mile, *Takahisa Kida; SEIKOH GIKEN Co., Ltd., Japan.* Study focuses on prevention of quality degradation in optical interconnects in the last mile. This report looks at ways for quality improvements during connection, how to understand and apply procedures for the fiberconstruction field.

JThA106
Deployment Challenges at 40 Gbit/s and Beyond in Optical Transport Networks, *Odile Liboiron-Ladouceur, David V. Plant; McGill Univ., Canada.* We investigate the tradeoffs that service providers face in deploying 40 Gbit/s networks due to the convergence of layers. Two predominant modulation formats used in transponders are compared with respect to the level of convergence.

JThA107
Development of Reference MT Ferrule Using Insert-Molded Metal Plate, *Takahiko Sabano[1], Akito Nishimura[1], Toshiyuki Tanaka[1], Darrell Childers[2], Dirk Schoellner[2]; [1]FUJIKURA Ltd., Japan, [2]US Conec Ltd., USA.* This paper presents the development of a Metal Plate insert-molded 12 fiber MT ferrule, for use as a reference connector and confirms its low loss and high durability.

JThA108
ASE Noise Instability Mitigation in WSS ROADM Based Closed Amplified Ring Networks, *David Dahan, Avi Levy, David Jacobian, Eli Yohi, Uri Mahlab; ECI Telecom, Israel.* We address the ASE noise instability issues in closed ring networks consisted by MEMs based WSS ROADMs. Instabilities in 5 node based optical ring network are experimentally demonstrated and mitigated using noise filtering.

JThA109
Development of an Automated Cleaning System for Multi-Ferrule Fiber-Optic Connectors, *John W. Duffy[1], Dieter Hashimoto[1], Jeff Sloan[2], Gene Bellegarde[2]; [1]Cisco Systems Inc., USA, [2]Va-Tran Systems, Inc., USA.* A novel four stage automated process (a steam blast, CO_2 snow blast, vacuum, and heated ionized drying air) has been developed to efficiently clean fiber optic endfaces in high density multi-ferrule connectors.

12:00 p.m.–1:00 p.m. Lunch Break

Notes

Room 4

1:00 p.m.–3:00 p.m.
OThI • Transparent WDM Networks
Christopher A. White; Bell Labs, Alcatel-Lucent, USA, Presider

OThI1 • 1:00 p.m. Invited
Power Stability and Control in Optically Transparent Mesh Networks, *Christopher A. White, Daniel C. Kilper; Bell Labs, Alcatel-Lucent, USA.* We explore the impact of topology, traffic and amplifier physics on node-to-node channel-power coupling effects in an optically transparent mesh network and describe a simple control strategy for scheduling the adjustment of control elements.

Room 5

1:00 p.m.–3:00 p.m.
OThJ • Nonlinear Fibers and Regeneration
Carsten Schmidt-Langhorst; HHI, Germany, Presider

OThJ1 • 1:00 p.m. Tutorial
Recent Progress in Design and Fabrication of High-Nonlinear Fibers, *Tanya M. Monro; Univ. of Adelaide, Australia.* This tutorial focuses on the fundamentals of nonlinear fibers. Silica and non-silica tapers and fibers will be reviewed, including microstructured fibers. Progress in design and fabrication and considerations relevant for nonlinear devices will be presented.

Since 2005, Tanya Monro has been the Director of the Centre of Expertise in Photonics within the School of Chemistry and Physics at the University of Adelaide, Australia. From 1998 to 2004, Tanya worked at the ORC, UK, on silica and soft glass microstructured optical fibres, where she was a Royal Society University Research Fellow. Prior to this she completed a PhD at the University of Sydney on self-written waveguides, for which she received the Bragg Gold Medal for the best physics PhD in Australia. Her current research focuses on soft glass microstructured fibres. Professor Monro has published over 250 papers.

Room 6B

1:00 p.m.–3:00 p.m.
OThK • Waveguide-Based Laser Diodes
Charles Joyner; Infinera, USA, Presider

OThK1 • 1:00 p.m.
Low Confinement Factor Quantum Dash (QD) Mode-Locked Fabry-Perot (FP) Laser Diode for Tunable Pulse Generation, *Alexandre Shen[1], Jean-Guy Provost[1], Akram Akrout[1,2], Benjamin Rousseau[1], François Lelarge[1], Odile Legouezigou[1], Frédéric Pommereau[1], Francis Poingt[1], Lionel Legouezigou[1], Guang-Hua Duan[1], Abderrahim Ramdane[2]; [1]Alcatel-Thales III-V Lab, France, [2]CNRS-LPN, France.* Electrical spectrum line-width is reduced in mode-locked FP 1.55μm-QD laser diode through optical confinement factor optimization. From optimized structures, we obtained nearly Fourier-transform limited pulses at 10GHz, with an averaged width of 8ps over 10nm.

OThK2 • 1:15 p.m.
Low Drive-Current and Wide Temperature Operation of 1.3-μm AlGaInAs-MQW BH-DFB Lasers by Laterally Enhanced Cladding Layer Growth, *Ryuji Kobayashi, Akihiro Ito, Suguru Kato, Yoshiharu Muroya, Tomoaki Koui, Yasutaka Sakata, Jun-ichi Shimizu, Shin Ishikawa; NEC Electronics Corp. Ltd., Japan.* Low drive-current and extremely wide temperature (from -45 to 105°C) operation were demonstrated in 10-Gb/s directly-modulated 1.3-μm AlGaInAs-MQW BH-DFB lasers with a new DH structure having a p-InP cladding layer grown by a lateral-growth technique.

Room 6C

1:00 p.m.–3:00 p.m.
OThL • Extended Reach PON I
Glenn Wellbrock; Verizon, USA, Presider

OThL1 • 1:00 p.m. Tutorial
Next Generation Extended Reach PON, *Russell Davey; BT, UK.* The tutorial will review state-of-the-art optical access systems (GPON, GE-PON) from an operator perspective and then discuss evolution to next generation systems, especially extended reach systems, which enable benefits such as node consolidation.

Russell Davey graduated in physics from Oxford University in 1989. He holds an MSc in telecommunications engineering from University College London and obtained a PhD from Strathclyde University for research into mode-locked Erbium fibre lasers. He joined BT in 1994 and was heavily involved in the first application of WDM in the BT network. Since 2001 he has managed BT's research activities in optical access systems and is a regular speaker on this topic at international conferences. He is co-chair of the next generation access activity within the FSAN (full service access network) initiative.

Room 6D

1:00 p.m.–3:00 p.m.
OThM • Photonic Crystal Devices
Rance Fortenberry; Sirrus Technology Inc., USA, Presider

OThM1 • 1:00 p.m. Tutorial
Manipulation of Photons by 2-D and 3-D Photonic Crystals, *Susumu Noda; Kyoto Univ., Japan.* Photonic crystals provide exciting tools for the manipulation of photons and have received keen interest from a variety of fields. In this talk, I will review the recent progresses of photonic crystals and their applications.

Susumu Noda received B.S., M.S., and Ph.D. degrees from Kyoto University, Japan, in 1982, 1984, and 1991, respectively, all in electronics. In 2006, he received an honorary degree from Gent University, Belgium. From 1984 to 1988, he was with the Mitsubishi Electric Corporation, and was engaged in research on optoelectronics. In 1988, he joined Kyoto University and is currently a Professor. His research interest covers physics and engineering of photonic and quantum nanostructures. He received various awards including the IBM Science Award (2000), the JSAP Achievement Award on Quantum Electronics (2005), and OSA Joseph Fraunhofer Award/Robert M. Burley Prize.

Room 6E

1:00 p.m.–3:00 p.m.
OThN • Fiber Lasers II
Paul Wysocki; Luna Technologies, Inc., USA, Presider

OThN1 • 1:00 p.m.
New Results on the Efficiency of Bismuth Fiber Lasers, *Valery M. Mashinsky, Vladislav V. Dvoyrin, Evgeny M. Dianov; Fiber Optics Res. Ctr., Russian Acad. of Sciences, Russian Federation.* CW Bi fiber laser slope efficiency of 32% at 1160 nm is obtained at room temperature; at 77K it reaches 52%. The model is proposed explaining the dependence of efficiency on temperature and pump power.

OThN2 • 1:15 p.m.
Yb-ASE-Free Er Amplification in Short-Wavelength Filtered Er:Yb Photonic-Crystal Fiber, *Akira Shirakawa, Hiroyuki Suzuki, Motoyuki Tanisho, Ken-ichi Ueda; Inst. for Laser Science, Univ. of Electro-Communications, Japan.* The short-wavelength cutoff property of photonic-crystal fiber was applied to Er:Yb fiber amplification. Appropriate bending gives >10dB/m distributed filtering in the Yb band and suppression of ASE and parasitic lasing has been successfully demonstrated.

Room 6F

1:00 p.m.–3:00 p.m.
OThO • Electronic Equalization
Yun Chung; Korea Advanced Inst. of Science and Technology, Republic of Korea, Presider

OThO1 • 1:00 p.m. Invited
Iterative Equalization and FEC Decoding in Optical Communication Systems: Concepts and Performance, *Wolfgang Sauer-Greff, Ralph Urbansky; Univ. of Kaiserslautern, Germany.* MLSE and turbo equalization with convolutional and LDPC codes in presence of PMD channels and outer RS codes are compared. Optimized LDPC codes reduce the gap to information theoretic bounds to the order of 1dB.

Room 7

1:00 p.m.–3:00 p.m.
OThP • Radio over Fiber
Gregory Abbas; Eospace, USA, Presider

OThP1 • 1:00 p.m.
Pure QAM Signal Generation with Photonic Vector Modulator, *Juan Luis Corral[1], Rakesh Sambaraju[1], Miguel Ángel Piqueras[2], Valentín Polo[1]; [1]Valencia Nanophotonics Technology Ctr., Spain, [2]Das Photonics S.L., Spain.* Novel photonic vector modulator architecture for generating pure-QAM signals is presented. No electrical devices apart from the local oscillator are needed in the generation process. Pure 1 Gbit/s 4QAM 41 GHz carrier is experimentally demonstrated.

OThP2 • 1:15 p.m.
Transmission of Microwave-Photonics Generated 16Gbit/s Super Broadband OFDM Signals in Radio-over-Fiber System, *Jianjun Yu[1], Junqiang Hu[1], Dayou Qian[1], Zhensheng Jia[2], Gee Kung Chang[2], Ting Wang[1]; [1]NEC Labs America, USA, [2]Georgia Tech, USA.* We have experimentally demonstrated a super broadband OFDM-radio-over-fiber system with a record bandwidth of 16Gbit/s to transmit over 20km SMF-28 and 6m wireless distance.

Room 8

1:00 p.m.–2:40 p.m.
NThC • Optical Fiber Interconnects
John Spencer; Optelian Access Networks, USA, Presider

NThC1 • 1:00 p.m.
Development of Cleanliness Specifications for Single-Mode, Angled Physical Contact MT Connectors, *Tatiana Berdinskikh[1], Aron Lau[1], David Fisher[2], Sun-Yuan Huang[3], Mike Hughes[4], Steve Lytle[5], Tom Mitcheltree[6], Brian Roche[6], Heather Tkalec[7], Douglas H. Wilson[8]; [1]Celestica Intl. Inc., Canada, [2]Tyco Electronics Corp., USA, [3]Intel Corp., USA, [4]US Conec Ltd., USA, [5]Westover Scientific Inc., USA, [6]Cisco Systems Inc., USA, [7]Alcatel-Lucent Canada Inc., Canada, [8]PVI Systems Inc., Canada.* This paper summarizes the latest research of iNEMI (International Electronics Manufacturing Initiative) on development of cleanliness specification for Single-Mode Angle Physical Contact MT fiber optics connectors. The acceptance criteria matrix for MT connectors is proposed.

NThC2 • 1:20 p.m.
Novel Field Installable Sagged Fiber Connector Realizing Physical Contact Connector without Polishing Fiber Endface, *Yoshiteru Abe, Mitsuru Kihara, Masaru Kobayashi, Shinsuke Matsui, Ryo Nagase, Shigeru Tomita; Nippon Telegraph and Telephone Corp., Japan.* We propose and demonstrate a new type of field installable optical fiber connector that enables us to realize physical contact connection by using a sharpened fiber endface and the compression force of sagged fiber.

Room 9

1:00 p.m.–3:00 p.m.
NThD • FTTX Tomorrow
Frank J. Effenberger; Huawei USA, USA, Presider

NThD1 • 1:00 p.m.
Cost Minimization Planning for Passive Optical Networks, *Ji Li, Gangxiang Shen; Dept. of Electrical and Electronic Engineering, Univ. of Melbourne, Australia.* We plan PON network deployment to minimize its total cost. An efficient heuristic is proposed, which can reduce 50%~70% PON network deployment costs compared to a benchmark sectoring approach.

NThD2 • 1:20 p.m.
Characterizing the CapEx and OpEx Tradeoffs in Next Generation Fiber-to-the-Home Networks, *Thomas F. Rand-Nash, Richard Roth, Rajeev Ram, Randolph Kirchain; MIT, USA.* Network cost analyses based on a new modeling methodology are used to evaluate advanced GPON architectures. The relative merits of reach extension and higher splitter port count are examined from both CapEx and OpEx perspectives.

Room 4

OThI • Transparent WDM Networks—Continued

OThI2 • 1:30 p.m. Invited
Quartzite: An Experimental Campus Testbed Involving Wavelength and Wavelength Interleaved Services, *Philip Papadopoulos; Univ. of California at San Diego, USA.* Quartize is a hybrid switching structure connecting about a dozen laboratories on the UCSD campus. It allows us to physically "rewire" connects at the fiber, wavelengthm and packet level. All connections are 10 gigabit.

Room 5

OThJ • Nonlinear Fibers and Regeneration—Continued

Room 6B

OThK • Waveguide-Based Laser Diodes—Continued

OThK3 • 1:30 p.m. Invited
High-Speed Modulation of Optical Injection-Locked Semiconductor Lasers, *Ming Wu, Connie Chang-Hasnain, Erwin K. Lau, Xiaoxue Zhao; Univ. of California at Berkeley, USA.* We review the recent high-speed advances in optical injection-locked lasers, focusing on high resonance frequencies (> 70GHz) and maximum bandwidth (> 40GHz). Experimental and theoretical direct modulation and master amplitude and phase modulation are presented.

Room 6C

OThL • Extended Reach PON I—Continued

Room 6D

OThM • Photonic Crystal Devices—Continued

Room 6E

OThN • Fiber Lasers II—Continued

OThN3 • 1:30 p.m. Invited
Ultra-Small Photonic Crystal Lasers Near Communication Wavelength, *Yong-Hee Lee, Myung-Ki Kim, In-Kag Hwang, Min-Kyo Seo, Se-Heon Kim; KAIST, Republic of Korea.* Recent progresses on wavelength-scale photonic crystal lasers are reported. Electrically driven nondegenerate photonic crystal lasers and reconfigurable microfiber-coupled photonic crystal waveguide lasers are studied. Schemes enabling optical coupling in excess of 80% are also proposed.

Room 6F

OThO • Electronic Equalization—Continued

OThO2 • 1:30 p.m.
Combination of InP MZM Transmitter and Monolithic CMOS 8-State MLSE Receiver for Dispersion Tolerant 10 Gb/s Transmission, *Robert A. Griffin[1], Norman Swenson[2], Diego Crivelli[2], Hugo Carrer[2], Mario Hueda[2], Paul Voois[2], Oscar Ogazzi[2], Fabricio Donadio[2]; [1]Bookham, Inc., UK, [2]ClariPhy Communications, Inc, USA.* We demonstrate that InP modulators together with 1 sample/bit MLSE gives equivalent performance to linear electro-optic Mach-Zehnder modulators combined with oversampled MLSE, potentially providing significant reduction in power dissipation and footprint.

OThO3 • 1:45 p.m.
Dispersion Tolerant 21.4-Gb/s DQPSK Using Simplified Gaussian Joint-Symbol MLSE, *Mohammad S. Alfiad[1], Dirk van den Borne[1], Fabian Hauske[2], Antonio Napoli[3], B. Lankl[2], Ton Koonen[1], Hugo de Waardt[1]; [1]Eindhoven Univ. of Technology, Netherlands, [2]Univ. der Bundeswehr München, Germany, [3]Nokia Siemens Networks, Germany.* We experimentally apply different MLSE schemes to 21.4-Gb/s NRZ-DQPSK. Joint-Symbol MLSE (JS-MLSE) of the in-phase and quadrature components after balanced detection gives best performance, even with a simplified Gaussian model for the MLSE channel estimation.

Room 7

OThP • Radio over Fiber—Continued

OThP3 • 1:30 p.m. Invited
Perspectives of Radio-over-Fiber Technologies, *A. M. J. Koonen[1], M. García Larrodé[1], A. Ng'oma[1,2], K. Wang[1], H. Yang[1], Y. Zheng[1], E. Tangdiongga[1]; [1]COBRA Inst., Eindhoven Univ. of Technology, Netherlands, [2]Corning Inc., USA.* Radio-over-Fiber technologies enable efficient provisioning of broadband wireless services both in access and in in-building networks, in particular when combined with flexible optical routing and dispersion-robust RoF transport techniques, such as optical frequency multiplying.

Room 8

NThC • Optical Fiber Interconnects—Continued

NThC3 • 1:40 p.m.
Investigation of Self-Written Waveguide Technique Toward Easy Splicing Method for SMF in Optical Networks, *Masaki Waki, Kyozo Tsujikawa, Toshio Kurashima; NTT Access Network Service Systems Labs, NTT Corp., Japan.* We investigated a self-written waveguide technique to realize easy fiber splicing for FTTH. We utilized the solution substitution method to splice SMFs with fractured endfaces, and obtained a splice loss of 0.9 dB.

Room 9

NThD • FTTX Tomorrow—Continued

NThD3 • 1:40 p.m.
A Comprehensive Methodology for Comparing Different FTTP Solutions, *Chen-Yu Lee, Gerd Keiser, San-Liang Lee; Natl. Taiwan Univ. of Science and Technology, Taiwan.* We present a method for comparing different FTTP solutions using factors such as information capacity, subscriber number, network flexibility and growth potential in order to select an optimum network design.

Room 4

OThI • Transparent WDM Networks—Continued

OThI3 • 2:00 p.m.
Transparent Path Length Optimized Optical Monitor Placement in Transparent Mesh Networks, *Alex Ferguson[1], Barry O'Sullivan[1], Daniel C. Kilper[2]; [1]Univ. College Cork, Ireland, [2]Bell Labs, Alcatel-Lucent, USA.* Linear programming techniques are applied to the optimization of optical monitor placement by minimizing the worst case transparent path length in optical networks, which we study over different network topologies and traffic patterns.

OThI4 • 2:15 p.m.
Cost Comparisons for Hierarchical and Single-Layer Optical Path Networks Considering Waveband and Wavelength Path Protection, *Yoshiyuki Yamada, Hiroshi Hasegawa, Ken-ichi Sato; Nagoya Univ., Japan.* This paper, for the first time, investigates and clarifies the effectiveness of the waveband networks that adopt waveband level protection in a comparison with single layer optical path networks with optical path level protection.

Room 5

OThJ • Nonlinear Fibers and Regeneration—Continued

OThJ2 • 2:00 p.m.
Enhanced Nonlinearity Tapered Chalcogenide Fiber for All-Optical Wavelength Conversion of 40 Gb/s Signals, *Libin Fu, Mark D. Pelusi, Eric C. Magi, Vahid G. Ta'eed, Benjamin J. Eggleton; CUDOS, School of Physics, Univ. of Sydney, Australia.* Tapering As_2Se_3 fiber for enhancing its nonlinearity to $2500W^{-1}km^{-1}$, enables near penalty-free, wavelength conversion of a 40Gb/s optical signal via cross-phase modulation in a shorter device length that reduces dispersion impact for more broadband operation.

OThJ3 • 2:15 p.m.
Experimental Investigation of a Dispersion-Managed Multi-Channel 2R Optical Regenerator, *Lionel Provost[1], Christos Kouloumentas[2], Francesca Parmigiani[1], Stamatios Tsolakidis[2], Ioannis Tomkos[2], Periklis Petropoulos[1], David J. Richardson[1]; [1]Univ. of Southampton, UK, [2]Athens Information Technology Ctr., Greece.* We experimentally report simultaneous 2R all-optical regeneration of four WDM channels using a dispersion-managed Mamyshev scheme. Inter-channel crosstalk effects are minimized resulting in almost no additional degradation arising from the presence of the multiple channels.

Room 6B

OThK • Waveguide-Based Laser Diodes—Continued

OThK4 • 2:00 p.m.
10Gbps-80km Transmission by 100GHz-Spacing, 8-Channel Wavelength-Tunable 1.55-μm InGaAlAs Electro-Absorption Modulator Integrated DFB Laser, *Shigeki Makino[1], Kazunori Shinoda[1], Takashi Shiota[1], Takeshi Kitatani[1], Shigehisa Tanaka[1], Masahiro Aoki[1], Noriko Sasada[2], Kazuhiko Naoe[2], Seiji Sumi[2], Hiroaki Inoue[2]; [1]Hitachi, Ltd., Japan, [2]Opnext Japan, Inc., Japan.* 10-Gbps, 80-km transmission was achieved by a wavelength-tunable EA/DFB laser with 8-channels and 100-GHz spacing. A dynamic extinction ratio over 10-dB and a power penalty below 2-dB were achieved over 5.6-nm continuous wavelength tuning range.

OThK5 • 2:15 p.m.
Discrete Mode Laser Diodes with Ultra Narrow Linewidth Emission < 3kHz, *Richard Phelan[1], Brian Kelly[1], Dewi Jones[1], Chris Herbert[1], John O'Carroll[1], Marc Rensing[1], Bo Cai[1], Aleksandrda Kaszubowska-Anandarajah[2], Philip Perry[2], Jennifer Stopford[2], Prince Anandarajah[2], Liam P. Barry[2], James O'Gorman[1]; [1]Eblana Photonics Ltd., Ireland, [2]Res. Inst. for Networks and Communications Engineering, Ireland.* Ex-facet, free-running ultra-low linewidth (< 3 kHz), single mode laser emission is demonstrated using low cost, regrowth-free ridge waveguide Discrete Mode Fabry Pérot laser diode chips.

Room 6C

OThL • Extended Reach PON I—Continued

OThL2 • 2:00 p.m. Invited
Scalable Extended Reach PON, *Jose A. Lázaro[1], Josep Prat[1], Philippe Chanclou[2], Giorgio M. Tosi Beleffi[3], Antonio Teixeira[4], Ioannis Tomkos[5], Risto Soila[6], Vassilis Koratzinos[7]; [1]Univ. Politècnica de Catalunya (UPC), Spain, [2]France Telecom R&D, Réseaux d'Accès (RESA), France, [3]ISCOM, Italian Communication Ministry, Optical Communications and Devices, Italy, [4]Inst. de Telecomunicações (IT), Univ. de Aveiro, Portugal, [5]Res. and Education Lab in Information Technologies, Greece, [6]Tellabs Oy, Finland, [7]Intracom S.A. Telecom Solutions, Greece.* Extended reach highly-scalable, fully passive WDM/TDM-PON allows reaching >1000 users along protected 100km by colorless ONUs, centralized light-generation and control, single-fiber access and remote amplification. ONUs are based on 1.25/2.5/5Gbps-capable RSOA and downstream at 10Gbps.

Room 6D

OThM • Photonic Crystal Devices—Continued

OThM2 • 2:00 p.m.
Optical Flip-Flop Based on Coupled Ultra-Small Mach-Zehnder All-Optical Switches, *Shigeru Nakamura[1], Akira Watanabe[2], X. Wang[3], Naoki Ikeda[4], Yoshimasa Sugimoto[4], Nobuhiko Ozaki[5], Yoshinori Watanabe[5], Kiyoshi Asakawa[5]; [1]NEC, Japan, [2]Meijyo Univ., Japan, [3]AIST, Japan, [4]NIMS, Japan, [5]Univ. of Tsukuba, Japan.* The configuration of coupled ultra-small Mach-Zehnder all-optical switches is attractive for high-speed optical flip-flops. Its bistability is experimentally demonstrated with an emulated setup. High-speed capability corresponding to 10 and 40 Gb/s is confirmed with simulation.

OThM3 • 2:15 p.m.
All-Fiber Spectral Filtering with Solid Core Photonic Band Gap Bragg Fibers, *Alexandre Dupuis, Ning Guo, Bertrand Gauvreau, Alireza Hassani, Elio Pone, Francis Boismenu, Maksim Skorobogatiy; Ecole Polytechnique de Montréal, Canada.* We report on intensely colored solid core all-polymer Bragg fibers, with a large diameter PMMA core surrounded by alternating PMMA/PS layers. Modifying reflector layer thickness illustrates that bandgap position can be adjusted in the visible.

Room 6E

OThN • Fiber Lasers II—Continued

OThN4 • 2:00 p.m.
Optimization of the Power Spectral Density of Raman-MOPAs Using Fiber Bragg Gratings with Tunable Chirp, *Johannes Hagen[1], Rainer Engelbrecht[1], Bastian Lins[2], Bernhard Schmauss[2], Lars Grüner-Nielsen[3]; [1]Lehrstuhl fuer Hochfrequenztechnik, Germany, [2]Erlangen Graduate School in Advanced Optical Technologies, SAOT, Germany, [3]OFS Fitel Denmark ApS, Denmark.* Fiber Bragg Gratings with a temperature induced chirp are used to control and optimize the power spectral density of a Raman-MOPA by influencing the FWM-based power dependent spectral broadening.

OThN5 • 2:15 p.m.
OFDM Signal Transmission by Direct Modulation of a Doped Fiber External Cavity Semiconductor Laser, *Runnan Liu[1,2], Mohammad Ebrahim Mousa Pasandi[3], Sophie LaRochelle[3], Jianping Yao[4], Ke Wu[2], Raman Kashyap[1,2]; [1]Advanced Photonics Concepts Lab, École Polytechnique de Montréal, Canada, [2]PolyGrames Res. Ctr., École Polytechnique de Montréal, Canada, [3]Ctr. d'Optique, Photonique et Laser, Dept. de Génie Electrique et de Génie Informatique,Univ. Laval, Canada, [4]Microwave Photonics Res. Lab, Univ. of Ottawa, Canada.* A doped fiber external cavity laser (DFECL) exhibits high power, narrow linewidth and stable wavelength which may be tuned. We demonstrate IEEE 802.11 signal transmission by direct modulating the ultra long DFECL at ~2.5GHz.

Room 6F

OThO • Electronic Equalization—Continued

OThO4 • 2:00 p.m. Invited
FEC Operation in Combination with Electronic Dispersion Compensation, *Julien Poirrier; Orange Labs, France.* The interworking of MLSE and enhanced FEC codes is experimentally investigated. We demonstrate that in the presence of large distortion, the MLSE delivers error bursts with which some FEC codes cannot cope.

Room 7

OThP • Radio over Fiber—Continued

OThP4 • 2:00 p.m.
Demonstration of an SOA Efficient 32x32 Optical Switch for Radio over Fiber Distribution Systems, *Michael J. Crisp, Eng T. Aw, Adrian Wonfor, Richard V. Penty, Ian H. White; Cambridge Univ., UK.* A 32x32 optical RoF switch is demonstrated. A 13dB input dynamic range with acceptable EVM and, using open loop control, an input dynamic range of 10dB with 1dB variation in output RF power is achieved.

OThP5 • 2:15 p.m.
Time-Slotted Full-Duplex Access Network for Baseband and 60-GHz Millimeter-Wave-Band Radio-over-Fiber, *J. J. Vegas Olmos[1], T. Kuri[2], K.-I. Kitayama[1]; [1]Osaka Univ., Japan, [2]Natl. Inst. of Information and Communications Technology, Japan.* We demonstrate a time-slotted full-duplex access network for 1.5-Gbps baseband signals and 155Mbps 60-GHz-band radio-over-fiber. A reflective semiconductor optical amplifier at the access point is used to erasure the downlink signal for uplink reutilization purposes.

Room 8

NThC • Optical Fiber Interconnects—Continued

NThC4 • 2:00 p.m.
Analysis of Mechanical Splicing Faults in FTTH Trial, *Seiichi Yoshino, Masaaki Takaya, Hideyuki Sonoda, Morikazu Uchino, Yoichi Yuki, Ryuichirou Nagano, Hisashi Izumida, Nobuo Kuwaki; Nippon Telegraph and Telephone East Corp., Japan.* We are the first to investigate mechanical splicing faults in FTTH trials. Analyzed field trial data indicates that optical characteristics become unstable when using fault mechanical splicing.

NThC5 • 2:20 p.m.
Field Installable LC Connector for Cables, *Tan Khee Yen Serin, Daigo Saito, Kazuhiro Takizawa, Kazuya Ogata; Fujikura Japan, Japan.* This paper describes the development of the field installable LC connector for Kevlar reinforced cables, with a novel and easy way of terminating Kevlar to maintain good mechanical strength performance.

Room 9

NThD • FTTX Tomorrow—Continued

NThD4 • 2:00 p.m.
Wireless Intermediate Frequency Signal over Passive Optical Networks: Architecture and Experimental Performance Evaluation, *Junqiang Hu[1], Dayou Qian[1], Ting Wang[1], Milorad Cvijetic[2]; [1]NEC Labs America, Inc., USA, [2]NEC America, USA.* We propose wireless intermediate frequency (IF) signal over wavelength division multiplexing (WDM) passive optical networks (WDM-PON), and experimentally evaluate its feasibility and performance with eight channels of OFDM signals, for both downstream and upstream scenarios.

NThD5 • 2:20 p.m.
Extended-Reach Wavelength-Shared Hybrid PON, *Martin Bouda, Paparao Palacharla, Youichi Akasaka, Alexander Umnov, Takao Naito; Fujitsu Labs of America, USA.* Experiments using commercial GPON equipment and optical modules demonstrate feasibility of extending reach of a GPON system using colorless ONTs to 60km, providing 128 subscribers with 40Gbps shared downstream capacity over a single backhaul fiber.

Room 4

OThI • Transparent WDM Networks—Continued

OThI5 • 2:30 p.m.
Interface Optical Buffer and Packet-Switched Network Cross-Layer Signaling Demonstration, *Caroline P. Lai, Howard Wang, Keren Bergman; Columbia Univ., USA.* Queue management in an interface optical buffer is demonstrated via interoperability with an optical packet switched network. Cross-layer signaling is employed between the input buffer and network to dynamically and error-free reroute dropped wavelength-striped packets.

OThI6 • 2:45 p.m.
Time-Shift Circuit Switching, *Ankitkumar Patel, Marco Tacca, Jason P. Jue; Univ. of Texas at Dallas, USA.* This paper introduces a new switching paradigm that can be implemented in (virtual) circuit switched networks for delay-tolerant applications. This paper numerically demonstrates the potential benefits of the proposed approach.

Room 5

OThJ • Nonlinear Fibers and Regeneration—Continued

OThJ4 • 2:30 p.m.
Investigation of Timing Jitter Reduction in a Bidirectional 2R All-Optical Mamyshev Regenerator, *Lionel A. Provost, Francesca Parmigiani, Periklis Petropoulos, David J. Richardson; Optoelectronics Res. Ctr., UK.* We experimentally demonstrate the compensation of the timing jitter introduced in a Mamyshev regenerator as well as amplitude equalization. This was achieved in a double stage configuration using a single HNLF, under suitable operating conditions.

OThJ5 • 2:45 p.m.
Highly Nonlinear Bismuth-Oxide Fiber Based Dispersion Imbalanced Loop Mirror for Interferometric Noise Suppression, *Mable P. Fok, Chester Shu; Chinese Univ. of Hong Kong, Hong Kong.* We demonstrate a dispersion imbalanced loop mirror for interferometric noise suppression using a 32-cm highly nonlinear bismuth-oxide fiber. Improvement in the receiver sensitivity has been determined at different noise levels in a 10-Gb/s BER measurement.

Room 6B

OThK • Waveguide-Based Laser Diodes—Continued

OThK6 • 2:30 p.m. Invited
Uncooled Electroabsorption Modulator Integrated DFB Laser, *Shigeki Makino[1], Kazunori Shinoda[1], Takeshi Kitatani[1], Takashi Shiota[1], Masahiro Aoki[1], Noriko Sasada[2], Kazuhiko Naoe[2]; [1]Hitachi Ltd., Japan, [2]Opnext Japan Inc., Japan.* Uncooled 10-Gbps, 1.55-μm InGaAlAs EA/DFB laser has been realized. Error free 80-km transmission was demonstrated up to 95°C. A power penalty below 2-dB with over 9.8-dB dynamic extinction ratio was achieved over wide temperature range.

Room 6C

OThL • Extended Reach PON I—Continued

OThL3 • 2:30 p.m.
Burst-Mode Optical Amplifier for Long-Reach 10 Gbit/s PON Application, *Ken-Ichi Suzuki, Youichi Fukada, Takashi Nakanishi, Naoto Yoshimoto, Makoto Tsubokawa; NTT Access Network Service Systems Labs, NTT Corp., Japan.* We demonstrate 10 Gbit/s burst signal amplification to confirm the feasibility of burst-mode optical amplifiers for 10 Gbit/s PON application. We achieve 15.0 dB loss budget improvement and a loss budget of over 42.8 dB.

OThL4 • 2:45 p.m.
Purely Passive Long Reach 10 GE-PON Architecture Based on Duobinary Signals and Ultra-Low Loss Optical Fiber, *A. Boh Ruffin, John D. Downie, Jason E. Hurley; Corning Inc., USA.* We experimentally explore long reach PON architectures of 100 km with no in-field amplification using 10.3125 Gb/s duobinary downstream signals and ultra-low loss optical fiber. We demonstrate error-free transmission with split ratios up to 1x128.

Room 6D

OThM • Photonic Crystal Devices—Continued

OThM4 • 2:30 p.m.
Band Edge Effects in Photonic Crystal Waveguides: Polarisation Conversion, *John Canning[1,2], Martin Kristensen[2], Nina Skivesen[2], Lars Frandsen[3], Andrei Lavrinenko[3], Amelie Tetu[2], Jacques Chevallier[2], Cicero Martelli[1,2]; [1]Univ. of Sydney, Australia, [2]Arhus Univ., Denmark, [3]COM DTU, Denmark.* Narrowband polarisation conversion from TE to TM and back is observed at the quasi- TE transmission band edge of a linear photonic SOI photonic crystal waveguide.

OThM5 • 2:45 p.m.
Multifunctional Photonic Crystal Compact Demux-Detector on InP, *Frederik Van Laere[1], Dries Van Thourhout[1], Roel Baets[1], Tiziana Stomeo[2], Thomas F. Krauss[2], Melanie Ayre[3], Cyril Cambournac[3], Henri Benisty[3]; [1]Ghent Univ.-IMEC, Belgium, [2]Univ. of St. Andrews, UK, [3]Lab Charles Fabry de l'Inst. d'Optique, France.* We demonstrate a very compact multifunctional photonic crystal device on InP-membrane. Grating-coupled fibers feed a multimode photonic crystal wedged waveguide accomplishing individually selectable coarse WDM demux within 20 μm per channel toward membrane integrated detectors.

3:00 p.m.–3:30 p.m. Coffee Break, *Exhibit Halls B–G*

Room 6E

OThN • Fiber Lasers II—Continued

OThN6 • 2:30 p.m. Invited
Stabilized Optical Frequency Combs from Diode Lasers—Applications in Optical Communications, Signal Processing and Instrumentation, *Peter J. Delfyett, F. Quinlan, S. Ozharar, W. Lee; School of Optics/CREOL, Univ. of Central Florida, USA.* The development of compact sources of stabilized optical frequency combs from semiconductor diode lasers will be reviewed. Applications in coherent communications and signal processing will be suggested and highlighted.

Room 6F

OThO • Electronic Equalization—Continued

OThO5 • 2:30 p.m.
On the Use of MLSE with Non-Optimal Demodulation Filtering for Optical Duobinary Transmission, *John D. Downie, Jason Hurley, Yihong Mauro, Sergey Lobanov; Corning Inc., USA.* We experimentally study the use of MLSE electronic equalization with optical duobinary signals demodulated with non-optimal narrowband optical filters. Significant improvement can be obtained for overly wide filters and sub-optimal filter shapes.

OThO6 • 2:45 p.m.
Optical Channel Bandwidth Reduction Enabled by Electronic Equalization in 43 Gb/s Systems, *Bernd Franz, Axel Klekamp, Detlef Roesener, Fred Buchali, Wolfgang Kuebart, Henning Buelow; Alcatel-Lucent, Germany.* The performance improvement of 43Gb/s transmission by electronic equalization under optical bandwidth limitation have been validated in simulations and confirmed experimentally. For PSBT modulation format the required optical channel bandwidth can be reduced to 26GHz.

Room 7

OThP • Radio over Fiber—Continued

OThP6 • 2:30 p.m. Invited
Fiber Distribution of Local Oscillator for Atacama Large Millimeter Array, *William Shillue; Natl. Radio Astronomy Observatory, USA.* The ALMA photonic reference is a tunable, phase-stable local oscillator (LO) reference for a radio astronomy array. The LO is 27-122 GHz, actively phase corrected, and distributed on 15 km of fiber.

Room 8

NThC • Optical Fiber Interconnects—Continued

Room 9

NThD • FTTX Tomorrow—Continued

NThD6 • 2:40 p.m.
PON Evolution from TDMA to WDM-PON, *Klaus Grobe, Jörg-Peter Elbers; ADVA AG Optical Networking, Germany.* WDM-PONs are the next step from today's EPONs/GPONs to accommodate further traffic growth and facilitate new applications. WDM-PON variants are analyzed and proposed as solution for a unified optical access and backhauling network.

3:00 p.m.–3:30 p.m. Coffee Break, *Exhibit Halls B–G*

Room 4

3:30 p.m.–5:30 p.m.
OThQ • WDM Networks
Vincent Chan; MIT, Lab for Info. and Decision Systems, USA, Presider

OThQ1 • 3:30 p.m. Invited
Core Network Design and Planning: Challenges and Technology Trend, *Shinya Nakamura[1], Osamu Matsuda[1], Yoshihiko Suemura[1], Koichiro Fujimoto[1], Milorad Cvijetic[1], Ting Wang[2]; [1]NEC Corp. of America, USA, [2]NEC Labs America, USA.* The next generation network architectures are inherently related to packet transport and Ethernet technology. In this presentation authors will discuss various technologies and review existing issues in packet aware networks based on optical technology.

Room 5

3:30 p.m.–5:30 p.m.
OThR • Microstructured Fibers
Ming-Jun Li; Corning Inc., USA, Presider

OThR1 • 3:30 p.m.
Comparisons of Merits on Wide-Band Transmission Systems between Using Extreamly Improved Solid SMFs with Aeff of 160um^2 and Loss of 0.175dB/km and Using Large-Aeff Holey Fibers Enabling Transmission over 600nm Bandwidth, *Kazunori Mukasa, Katsunori Imamura, Ryuichi Sugizaki, Takeshi Yagi; Furukawa Electric Co., Ltd., Japan.* Low-loss and large-Aeff SMFs as well as DCFs for S, C, L-band compensation were numerically optimized and fabricated. Merits of using holey fibers in case of ultra wide-band transmission over 600nm will be also demonstrated.

OThR2 • 3:45 p.m.
Single-Mode Tellurite Glass Holey Fiber with Extremely Large Mode Area for Infrared Applications, *Xian Feng, Joanne C. Flanagan, Ken E. Frampton, Periklis Petropoulos, Nicholas M. White, Wei H. Loh, Harvey N. Rutt, David J. Richardson; Univ. of Southampton, UK.* We report the fabrication of a very large mode area tellurite holey fiber from an extruded preform. Robust single-mode guidance with 3000μm^2 effective mode area was achieved and 2.9dB/m loss was measured at 1.55μm.

Room 6B

3:30 p.m.–5:15 p.m.
OThS • VCSELs
Hiroshi Yasaka; NTT Photonics Labs, Japan, Presider

OThS1 • 3:30 p.m.
1.1μm Single Mode VCSEL-Based 4-Channel x 10-Gbit/s Parallel-Optical Module, *Katsutoshi Takahashi, Hideyuki Nasu, Yoshinobu Nekado, Masayuki Iwase, Yoshikazu Ikegami; Fitel Photonics Lab, Japan.* For the first time, we fabricated a 1.1μm InGaAs/GaAs single mode VCSEL-array-based 4-channel x 10-Gbit/s parallel-optical module integrated with a driver IC. The module achieved error free 10Gbit/s transmission for the distance of >1km.

OThS2 • 3:45 p.m.
10 Gbps VCSELs with High Single Mode Output in 1310 nm and 1550 nm Bands, *Alexei Syrbu[1], V. Iakovlev[1,2], A. Caliman[1,2], P. Royo[1,2], E. Kapon[1,2]; [1]Swiss Federal Inst. of Technology, Switzerland, [2]BeamExpress, Switzerland.* 10 Gb/s wafer fused VCSELs produce 2 mW and 1.5 mW at 80°C in 1310 nm and 1550 nm bands respectively. Transmission over 10 km was performed with less than 1 dB penalty.

Room 6C

3:30 p.m.–5:30 p.m.
OThT • Extended Reach PON II
Niall Robinson; Mintera Corp., USA, Presider

OThT1 • 3:30 p.m. Invited
DOCSIS over PON, *Victor Blake; Unaffiliated, USA.* Data-over-Cable Service Interface Specification PON implements the DOCSIS service layer interfaces on Ethernet PON standards. DPON's purpose is to provide a seamless integration of the new EPON access technology with an MSO's existing OSS software.

Room 6D

3:30 p.m.–5:30 p.m.
OThU • Polarization Effects
Peter Andrekson; Chalmers Univ. of Technology, Sweden, Presider

OThU1 • 3:30 p.m.
A Novel Multi-Stage Automatic PMD Compensator for Polarization-Multiplexed Signals, *Hemonth Rao; MIT Lincoln Lab, USA.* A novel polarization controller and polarization mode dispersion compensator for polarization-multiplexed 42.656 Gb/s channels is presented. Tolerance for chromatic dispersion up to +/-30 ps/nm and differential group delay up to 14 ps are measured.

OThU2 • 3:45 p.m.
Duration of PMD-Induced System Outages, *Cristian Antonelli[1], Antonio Mecozzi[1], Misha Brodsky[2]; [1]Univ. of L'Aquila, Italy, [2]AT&T Labs , Res., USA.* We characterize the statistics of the system outage duration caused by polarization-mode dispersion. The numerical results are validated with experimental data obtained in an installed fiber system.

Room 6E

3:30 p.m.–5:15 p.m.
OThV • Beam Shaping, Microscopy and Device Fabrication

Benjamin J. Eggleton; Univ. of Sydney, Australia, Presider

OThV1 • 3:30 p.m. Invited

Interferometric Synthetic Aperture Microscopy, *Stephen A. Boppart, Tyler S. Ralston, Daniel L. Marks, P. Scott Carney; Beckman Inst. for Advanced Science and Technology, Univ. of Illinois at Urbana-Champaign, USA.* Interferometric synthetic aperture microscopy (ISAM) provides high-resolution three-dimensional optical images of highly-scattering samples with large depth-of-field without scanning the focal plane. ISAM can function in real-time to provide volumes of microscopic data from biological specimens.

Room 6F

3:30 p.m.–5:30 p.m.
OThW • Optical Performance Monitoring

Sarah D. Dods; Monitoring Division, Australia, Presider

OThW1 • 3:30 p.m.

Simultaneous Monitoring Technique for OSNR and PMD Based on Four-Wave Mixing in SOA, *Joon Young Huh, Yun C. Chung; KAIST, Republic of Korea.* We report a simultaneous monitoring technique for OSNR and PMD based on the FWM in a semiconductor amplifier. This technique can monitor the OSNR and PMD with accuracy of ±0.3 dB and ±10 ps, respectively.

OThW2 • 3:45 p.m.

Optical Performance Monitoring from FIR Filter Coefficients in Coherent Receivers, *Fabian N. Hauske[1], Jonas C. Geyer[2], Maxim Kuschnerov[1], Kittipong Piyawanno[1], Thomas Duthel[3], Chris R. S. Fludger[3], Dirk van den Borne[4], Ernst-Dieter Schmidt[5], Bernhard Spinnler[5], Huug de Waardt[4], Berthold Lankl[1]; [1]Federal Armed Forces Univ., Germany, [2]Univ. of Erlangen-Nuremberg, Germany, [3]CoreOptics, Germany, [4]Technische Univ. Eindhoven, Netherlands, [5]Nokia Siemens Networks GmbH & Co. KG, Germany.* We present a robust and precise optical performance monitoring technique from FIR filter coefficients in coherent receivers with digital equalization. Residual chromatic dispersion, DGD and OSNR are simultaneously estimated from measured 111 Gbit/s data.

Room 7

Room 8

3:30 p.m.–5:10 p.m.
NThE • PMD Measurements and Compensation

Danny Peterson; Verizon Business, USA, Presider

NThE1 • 3:30 p.m. Invited

Practical Solutions for PMD Compensation in Next Generation ROADM Based 40G Metropolitan Networks, *Christian J. Rasmussen; Mintera Corp., USA.* We discuss the challenges associated with first- and second-order PMD in next-generation 40G metropolitan networks. A pragmatic approach for PMD compensation is presented. Performance is evaluated through verification tests in lab and field trial settings.

Room 9

Room 4

OThQ • WDM Networks—Continued

OThQ2 • 4:00 p.m.
Online Clustering for Hierarchical WDM Networks, *Mohammad M. Hasan, Jason P. Jue; Univ. of Texas at Dallas, USA.* This paper presents an easy-to-implement, distributed, and scalable clustering technique that determines clusters adaptively based on the current conditions (i.e., bandwidth availability) in large WDM optical networks. Simulation results verify the feasibility of the approach.

OThQ3 • 4:15 p.m.
Method to Estimate the Break-Even Point between SLA Penalty Expenses and Protection Costs, *Clara Meusburger[1,2], Dominic A. Schupke[1]; [1]Nokia Siemens Networks GmbH & Co. KG, Germany, [2]Inst. of Communication Networks, Munich Univ. of Technology, Germany.* Operators invest in network protection to ensure high availability levels for service level agreements (SLAs), which also involve non-fulfillment penalties. Risking penalties, postponing protection is an option to delay investments with an estimatable break-even point.

OThQ4 • 4:30 p.m.
Transponder Wavelength Assignment in WDM Networks, *Onur Turkcu, Suresh Subramaniam; George Washington Univ., USA.* We propose a heuristic algorithm for the assignment of wavelengths to the transponders at a reconfigurable node in a WDM Network. We show that network performance is improved with our algorithm compared to random assignment.

Room 5

OThR • Microstructured Fibers—Continued

OThR3 • 4:00 p.m. Invited
Photonic Bandgap Fiber for New Wavelength Range, *Satoki Kawanishi[1], Masatoshi Tanaka[2], Masato Ohmori[3], Hiroyuki Sakaki[3]; [1]NTT Basic Res. Labs, Japan, [2]Mitsubishi Cable Industry Ltd., Japan, [3]Toyota Technological Inst., Japan.* Recent progress on silica-based photonic bandgap fiber technologies are reviewed, aiming at a new wavelength region that includes the visible, ultraviolet and infrared regions. Possible optical active devices at heretofore unused wavelengths are discussed.

OThR4 • 4:30 p.m.
Robustly Single Mode Hollow Core Photonic Bandgap Fiber, *Marco N. Petrovich, Francesco Poletti, Adriaan van Brakel, David J. Richardson; Univ. of Southampton, UK.* We model, fabricate and characterize a photonic bandgap fiber with a small core formed by 3 omitted capillaries. The fiber provides robust single mode guidance and is of particular interest for various short-length device applications.

Room 6B

OThS • VCSELs—Continued

OThS3 • 4:00 p.m.
1.5mW/Gbps Low Power Optical Interconnect Transmitter Exploiting High-Efficiency VCSEL and CMOS Driver, *Shigeru Nakagawa[1], Daniel Kuchta[2], Clint Schow[2], Richard John[2], Larry A. Coldren[3], Yu-Chia Chang[3]; [1]IBM Tokyo Res. Lab, Japan, [2]IBM T.J.Watson Res. Ctr., USA, [3]Univ. of California at Santa Barbara, USA.* We demonstrate a low power optical interconnect transmitter which employs a 990nm VCSEL with high efficiency and low threshold current, and a 130nm CMOS driver. The power dissipated by the transmitter is 15.1mW at 10Gbps.

OThS4 • 4:15 p.m. Invited
Chip-to-Chip Board-Level Optical Data Buses, *Fuad E. Doany[1], Clint L. Schow[1], Russell Budd[1], Christian Baks[1], Daniel M. Kuchta[1], Petar Pepeljugoski[1], Jeffrey A. Kash[1], Frank Libsch[1], Roger Dangel[2], Folkert Horst[2], Bert J. Offrein[2]; [1]IBM T. J. Watson Res. Ctr., USA, [2]IBM Res. GmbH, Switzerland.* We have demonstrated 160-Gb/s bidirectional optical data buses using parallel optical transceivers with 16-transmitter plus 16-receiver 10-Gb/s channels on optical printed circuit boards with 32 polymer waveguides, providing requisite technologies for chip-to-chip board-level optical interconnects.

Room 6C

OThT • Extended Reach PON II—Continued

OThT2 • 4:00 p.m.
Signal Remodulation with High Extinction Ratio 10-Gb/s DPSK Signal for DWDM-PONs, *C. W. Chow[1], Y. Liu[2], C. H. Kwok[3]; [1]Dept. of Photonics, Natl. Chiao Tung Univ., Taiwan, [2]Dept. of Electronic Engineering, The Chinese Univ. of Hong Kong, Hong Kong, [3]Ctr. for Advanced Photonics and Electronics, Dept. of Engineering, Univ. of Cambridge, UK.* We propose and demonstrate a novel wavelength remodulation scheme using DPSK in both downstream/upstream signals with high extinction-ratio. Error-free operation was achieved in a 20-km-reach 10-Gb/s DWDM-PON without dispersion compensation.

OThT3 • 4:15 p.m.
Mitigation of Reflection-Induced Crosstalk in a WDM Access Network, *P. J. Urban, A. M. J. Koonen, G. D. Khoe, H. de Waardt; Technical Univ. of Eindhoven, Netherlands.* Reduction of reflection-induced crosstalk in a link employing Reflective Semiconductor Optical Amplifier achieved by applying Bias Dithering at RSOA and Phase Modulation at the source gives 6dB and 7dB improvement in power penalty, respectively.

OThT4 • 4:30 p.m.
A Full-Duplex Symmetric WDM-PON Featuring OSSB Downlink Modulation with Optical Down-Conversion, *Marco Presi[1], Roberto Proietti[1], Antonio D'Errico[1], Giampiero Contestabile[1], Ernesto Ciaramella[1], Fabio Cavaliere[2]; [1]Scuola Superiore Sant'Anna, Italy, [2]Ericsson, Italy.* We demonstrate a full-duplex, bandwidth symmetric WDM PON based on periodic filtering and reflective ONUs. It features an all-optical down-converted downlink ptical Single Side Band modulation and reuses the carrier for upstream colourless remodulation.

Room 6D

OThU • Polarization Effects—Continued

OThU3 • 4:00 p.m.
Dynamic Performance Evaluation of Optical Polarization Mode Dispersion Compensators and Electronic Equalizers Including Forward Error Correction, *Chongjin Xie[1], Dieter Werner[2], Herbert Haunstein[3], Sethumadhavan Chandrasekhar[1]; [1]Bell Labs, Alcatel-Lucent, USA, [2]Alcatel-Lucent, Germany, [3]Univ. of Erlangen-Nürnberg, Germany.* A method to test the dynamic performance of polarization mode dispersion (PMD) compensators (PMDCs) is presented. The dynamic performance of an optical PMDC combined with electronic equalizers is measured before and after forward error correction.

OThU4 • 4:15 p.m.
Automatic PMD Compensation over Transoceanic Distance with Time Varying SOP, PSP and PMD, *Jin-Xing Cai, Morten Nissov, Alexei N. Pilipetskii, Neal S. Bergano; Tyco Telecommunications, USA.* Automatic receiver PMD compensation was successfully demonstrated with 40Gb/s RZ-DPSK signals using a circulating loop transmission line. The long-term Q-factor histogram was significantly improved. PMD compensation was not as effective for the APol RZ-DPSK format.

OThU5 • 4:30 p.m.
Impact of Polarisation Dependent Loss on Coherent POLMUX-NRZ-DQPSK, *Thomas Duthel[1], Chris R. S. Fludger[1], Jonas Geyer[2], Christoph Schulien[1]; [1]CoreOptics GmbH, Germany, [2]Univ. of Erlangen, Germany.* We present simulations and measurements on the effect of PDL on a POLMUX-NRZ-DQPSK signal. We show that the orientation between the POLMUX signal and PDL element has a major impact on the OSNR performance.

Room 6E

OThV • Beam Shaping, Microscopy and Device Fabrication—Continued

OThV2 • 4:00 p.m.
Generation of Radially Polarised Beams from Optical Fibers, *Siddharth Ramachandran, Man F. Yan; OFS Labs, USA.* We generate radially-polarised beams, for the first time with a novel, phase-engineered fiber that posseses these spatial patterns as stable eigenmodes. With conversion-efficiencies >99.7%, this is an attractive alternative to complex free-space techniques used currently.

OThV3 • 4:15 p.m.
Conversion and Focusing of Optical Fiber Modes with Superimposed Long Period Gratings, *Misha Sumetsky, Siddharth Ramachandran; OFS Labs, USA.* The paper shows how to convert several arbitrary fiber modes into a single mode and vice versa using superimposed long period gratings and proposes an efficient all-fiber mode focuser and beam shaper.

OThV4 • 4:30 p.m. Invited
Direct Femtosecond Laser Writing of 3-D Waveguides and Gratings for Optical Communications, *Peter Herman; Univ. of Toronto, Canada.* No abstract available.

Room 6F

OThW • Optical Performance Monitoring—Continued

OThW3 • 4:00 p.m.
Experimental Demonstration of Optical Performance Monitoring in Coherent Optical OFDM Systems, *Xingwen Yi[1], William Shieh[2], Yiran Ma[1], Yan Tang[1], Graeme J. Pendock[2]; [1]Dept. of Electrical and Electronic Engineering, Victoria Res. Lab, Univ. of Melbourne, Australia, [2]ARC Special Res. Ctr. for Ultra-Broadband Information Networks, Univ. of Melbourne, Australia.* We experimentally demonstrate optical performance monitoring through optical channel estimation in coherent optical OFDM systems without the need for separate monitoring devices. The monitoring results of OSNR, Q-factor, fiber chromatic dispersion, and PMD are presented.

OThW4 • 4:15 p.m.
Plug-and-Play Phasor Monitor for DxPSK Signals Based on Single Delay-Interferometer Using a 3x3 Optical Coupler, *Yuichi Takushima, Hyeonyeong Choi, Yun C. Chung; Korea Advanced Inst. of Sceince and Technology, Republic of Korea.* We report an adjustment-free DxPSK demodulator using a single delay-interferometer composed of a 3x3 optical coupler. We experimentally demonstrate wavelength- and polarization-independent monitoring of the differential phasor trajectory of DxPSK signals.

OThW5 • 4:30 p.m. Invited
Monitoring and Diagnostics of Power Anomalies in Transparent Optical Networks, *Tin Kam Ho, Thomas Bengtsson, Todd Salamon, Christopher White; Bell Labs, Alcatel-Lucent, USA.* Challenges in monitoring optically-transparent networks are highlighted for dynamically controlled Raman amplification systems. We use models of amplifier physics together with statistical estimation to automatically discriminate between measurement errors, anomalous losses and pump failures.

Room 7

Room 8

NThE • PMD Measurements and Compensation—Continued

NThE2 • 4:10 p.m.
Measuring the Link Distribution of PMD: Field Trial Using an RS-POTDR, *Daniel Fritzsche[1], Manuel Paul[1], Lars Schuerer[1], Armin Ehrhardt[1], D. Breuer[1], Werner Weiershausen[1], Normand Cyr[2], Hongxin Chen[2], Greg W. Schinn[2]; [1]T-Systems Enterprise Services GmbH, Germany, [2]EXFO Electro-Optical Engineering Inc., Canada.* A new POTDR measurement technique is used to investigate the spatial distribution of PMD in deployed fibers. Results help to identify high-PMD fiber sections that need to be replaced to enable 40Gbit/s transmission and beyond.

NThE3 • 4:30 p.m.
PMD Measurement of 160-km Buried Fiber with Low DGD, *Youichi Akasaka[1], Xi Wang[1], Andrew Lee[2], Matthew Davy[2], Takao Naito[1]; [1]Fujitsu Labs of America, Inc., USA, [2]Indiana Univ., USA.* We have been measuring PMD characteristics including DGD, SOPMD, PDL, etc. over buried low DGD (0.04ps/√km) fibers to gather information for higher (40Gbps, 100Gbps) bit rate transmission systems. Temporal and wavelength-wise properties are reported.

Room 9

Room 4

OThQ • WDM Networks—Continued

OThQ5 • 4:45 p.m.
Waveband Assignment in Bi-Directional Ring Networks, *Majid Al-Naimi, Suresh Subramaniam; George Washington Univ., USA.* In this paper, we give an integer linear programming formulation and present a heuristic algorithm to minimize the worst-case tuning ROADM range in a bi-directional ring network to support all-to-all traffic.

OThQ6 • 5:00 p.m.
A Comparison of Flat and Hierarchical Fault-Localization in Transparent Optical Networks, *Sava Stanic, Suresh Subramaniam; George Washington Univ., USA.* This paper provides quantitative performance analysis for flat and hierarchically distributed monitoring and fault-localization in all-optical networks. We present an efficient heuristic and compare achievable improvements in monitor activation and fault-localization complexity for both schemes.

OThQ7 • 5:15 p.m.
Resource Buffering Schemes for Dynamic Traffic Grooming in Wavelength-Routed WDM Mesh Networks, *Nan Hua[1], Xiaoping Zheng[1], Michael Schlosser[2], Bingkun Zhou[1]; [1]Tsinghua Univ., Beijing, China, China, [2]Fraunhofer-Inst. for Telecommunications, Heinrich-Hertz-Inst., Berlin, Germany, Germany.* We propose novel resource buffering (RB) schemes at two granularity levels for dynamic traffic grooming. Continuous-time system (CTS) simulation shows that the RB schemes achieve better network utilization and significantly reduce the blocking probability.

Room 5

OThR • Microstructured Fibers—Continued

OThR5 • 4:45 p.m.
Accurate Modal Analysis of Microstructured Optical Fibers with the Boundary Integral Method, *Elio Pone, Alireza Hassani, Suzanne Lacroix, Maksim Skorobogatiy; Ecole Polytechnique de Montreal, Canada.* A boundary integral method for calculating leaky and guided modes of microstructured optical fibers is presented. The method is rapidly converging and can handle a large number of inclusions with arbitrary geometries.

OThR6 • 5:00 p.m.
Acousto-Optic Mode Coupling in Photonic Crystal Fiber with Structural Imperfections, *Sun Do Lim[1], Hyun Chul Park[1], Byoung Yoon Kim[1], In Kag Hwang[2]; [1]Korea Advanced Inst. of Science and Technology, Republic of Korea, [2]Chonnam Natl. Univ., Republic of Korea.* We describe and theoretically analyze the origin of multiple resonance peaks experimentally observed in an all-fiber acousto-optic tunable filter built with a photonic crystal fiber having slightly deformed air-hole structure and non-circular outer cladding.

OThR7 • 5:15 p.m.
Ultra-Broadband Acousto-Optic Coupling in Hole-Assisted Fiber, *Takashi Matsui, Kazuhide Nakajima, Kazuyuki Shiraki, Toshio Kurashima; NTT Corp., Japan.* Ultra-broadband acousto-optic coupling is realized by using hole-assisted fiber with flattened beat length characteristics. The coupling bandwidth reaches 120 nm, and can be controlled by designing the air hole structure.

Room 6B

OThS • VCSELs—Continued

OThS5 • 4:45 p.m. Invited
High-Speed 1.1-μm-Range InGaAs VCSELs, *Takayoshi Anan, Naofumi Suzuki, Kenichiro Yashiki, Kimiyoshi Fukatsu, Hiroshi Hatakeyama, Takeshi Akagawa, Keiichi Tokutome, Masayoshi Tsuji; Nanoelectronics Res. Labs, NEC Corp., Japan.* We developed high-speed InGaAs VCSELs. 3-dB bandwidth up to 20 GHz and error-free 30-Gbps operations were demonstrated with Ox-VCSELs. BTJ-VCSELs were developed with 3-dB bandwidth up to 24 GHz and demonstrated a 40-Gbps error-free operations.

Room 6C

OThT • Extended Reach PON II—Continued

OThT5 • 4:45 p.m.
Gain-Clamp Light Auto Level Control (GCL-ALC) Technique for Gain-Controllable Burst-Mode PON Amplifying Repeater, *Youichi Fukada, Takashi Nakanishi, Ken-Ichi Suzuki, Naoto Yoshimoto, Makoto Tsubokawa; NTT Access Network Service Systems Labs, NTT Corp., Japan.* A novel gain-clamping technique that controls the amplifier output power of the gain-clamp light by the ALC mechanism is proposed and experimentally confirmed. It yields signal-light gain controllability and stability in burst-mode PON signal amplification.

OThT6 • 5:00 p.m.
Energy Consumption in Access Networks, *Jayant Baliga, Robert Ayre, Wayne V. Sorin, Kerry Hinton, Rodney S. Tucker; Univ. of Melbourne, Australia.* We present a comparison of energy consumption of access networks. We consider passive optical networks, fiber to the node, point-to-point optical systems and WiMAX. Optical access technologies provide the most energy-efficient solutions.

OThT7 • 5:15 p.m.
Field Trial of 160-Gbit/s, Polarization-Division Multiplexed RZ-DQPSK Transmission System Using Automatic Polarization Control, *Mikio Yagi, Shuichi Satomi, Shiro Ryu; Lab, SoftBank Telecom Corp., Japan.* We have successfully demonstrated a field trial of 160-Gbit/s, RZ-DQPSK polarization-division multiplexed transmission system over 214 km using automatic polarization control. Q-factors of the signals have been kept stable for more than five days.

Room 6D

OThU • Polarization Effects—Continued

OThU6 • 4:45 p.m.
Impact of Polarization Dependent Loss and Cross-Phase Modulation on Polarization Multiplexed DQPSK Signals, *Olga Vassilieva[1], Takeshi Hoshida[2], Xi Wang[1], Jens Rasmussen[2], Hideyuki Miyata[2], Takao Naito[1]; [1]Fujitsu Labs of America Inc., USA, [2]Fujitsu Labs Ltd., Japan.* We investigated PolMux-RZ-DQPSK signal degradation modes due to PDL and XPM in WDM transmission with co-propagating NRZ signals. SNR degradation due to PDL and XPM-induced polarization dependent phase noise greatly impact transmission system.

OThU7 • 5:00 p.m.
Experimental Investigation of System Impairments in Polarization Multiplexed 107-Gb/s RZ-DQPSK, *Sethumadhavan Chandrasekhar, Xiang Liu; Bell Labs, Alcate-Lucent, USA.* Several types of impairments manifested in polarization-multiplexed 107-Gb/s RZ-DQPSK are experimentally investigated. Comparisons are made between symbol-interleaved and symbol-aligned generation for impairments under tight optical filtering, PDL/PDG, PMD and fiber nonlinearities.

OThU8 • 5:15 p.m.
Performance Comparison of Singly-Polarized and Polarization-Multiplexed at 10Gbaud under Nonlinear Impairments, *Gabriel Charlet, Jérémie Renaudier, Oriol Bertran Pardo, Patrice Tran, Haik Mardoyan, Sebastien Bigo; Alcatel Lucent Res. and Innovation, France.* PDM-QPSK combined with coherent detection is seen as a promising modulation scheme for high bit-rate transmission (40Gb/s and above). The impact of Polarization-Division Multiplexing on the tolerance to nonlinearities is investigated here with 10Gbaud signals.

5:30 p.m.–6:00 p.m. Coffee Break, *Ballroom 6 Lobby*

6:00 p.m.–8:00 p.m. Postdeadline Papers Sessions, *see posted schedules for locations*

Room 6E

OThV • Beam Shaping, Microscopy and Device Fabrication—Continued

OThV5 • 5:00 p.m.
Self-Enclosed All-Fiber In-Line Etalon, *Yunjiang Rao, Zengling Ran, Hongyou Deng; Univ. of Electronics Science & Technology of China, China.* An in-line fiber etalon, formed by a self-enclosed Fabry-Perot (F-P) cavity inside an optical fiber fabricated by using 157nm laser micromachining, is first demonstrated. This etalon has almost perfect characteristics.

Room 6F

OThW • Optical Performance Monitoring—Continued

OThW6 • 5:00 p.m.
OSNR Monitoring Technique for DPSK/DQPSK Signals Based on Self-Heterodyne Detection, *Hyeon Y. Choi, Yuichi Takushima, Yun C. Chung; Korean Advanced Inst. of Science and Technology, Republic of Korea.* We report a new OSNR monitoring method of DPSK/DQPSK signals, which analyzes the RF spectrum obtained by the self-heterodyne detection. The performance of this technique is not affected by the polarization scrambling or fiber dispersion.

OThW7 • 5:15 p.m.
Waveform Distortion Monitor for 160 Gbit/s Signal by Prescaled-Clock Measurement Using EA Modulator, *Masatoshi Kagawa, Hitoshi Murai, Hiromi Tsuji, Kozo Fujii; Oki Electric Industry Co., Ltd., Japan.* Waveform monitor for 160 Gbit/s signal using an asynchronous EAM prescaler is proposed. This monitor detect waveform distortion by dispersion, PMD and OSNR. The feasibility of the monitor was examined by experiments and numerical estimations.

Room 7

Room 8

NThE • PMD Measurements and Compensation—Continued

NThE4 • 4:50 p.m.
High-Resolution Photon-Counting OTDR for PON Testing and Monitoring, *Jürgen Brendel; Sunrise Telecom, Switzerland.* A novel OTDR based on photon-counting technique is presented. The high sensitivity, resolution, and dynamic range of this instrument make it possible to characterize optical fiber links beyond the limitations of conventional OTDRs.

Room 9

5:30 p.m.–6:00 p.m. Coffee Break, *Ballroom 6 Lobby*

6:00 p.m.–8:00 p.m. Postdeadline Papers Sessions, *see posted schedules for locations*