Notes

8:00 a.m.–11:00 a.m. Plenary Session and Awards Ceremony, *Ballroom 20*

10:00 a.m.–5:00 p.m. Exhibit Hall Open

11:00 a.m.–2:00 p.m. Exhibit Only Time/Poster Preview

● Market Watch ●

12:00 p.m.–2:00 p.m.
Panel I: Business and Management Insights
Moderator: Milton Chang, Incubic Venture Fund, USA
Speakers:
Will Wall Street Ever Love Telecom's Optical Stocks Again? *George Kelly, Communications Equipment Industry, USA*
Fiber-Optic Components—Is This Any Way to Earn a Living? *Peter Bordui, Bookham Inc., USA*
The Role of Technology in Business Transformation, *Stuart Elby, Verizon, USA*

3:00 p.m.–5:00 p.m.
Panel II: Packet-Optical Migration Strategies
Moderator: Ron Kline, Ovum RHK, USA
Speakers:
From Optical Transport Platform (OTP) to Packet Optical Platform (P-OTP): Challenges and Strategies, *Roman Egorov, Verizon Labs, USA*
Packet Optical Networking: Evolving the Metro Infrastructure, *Sam Lisle, Fujitsu Network Communications, USA*
IP over DWDM: Near Term and Long Term Goals and Opportunities, *Loukas Paraschis, Cisco Systems, USA*
The Benefits of Packet-Optical Integration, *Tom Rarick, Tellabs, USA*

2:00 p.m.–6:30 p.m. Future Internet Symposium, *Room 6A*

Room 4

2:00 p.m.–4:00 p.m.
OTuA • WDM Network Control
Ioannis Tomkos; Athens Information Technology, Greece, Presider

OTuA1 • 2:00 p.m. Invited
Advance Reservation-Based Network Resource Manger for Optical Networks, *Michiaki Hayashi, Hideaki Tanaka, Masatoshi Suzuki; KDDI R&D Labs Inc., Japan.* An SOA-based network resource management architecture for orchestrated end-to-end network service is described. The design and operation of a network resource manager for optical networks are introduced, including virtualization, scheduling, path discovery and resource allocation.

Room 5

2:00 p.m.–4:00 p.m.
OTuB • High-Power Propagation and Continuum Generation
Georg Mohs; Tyco Telecommunications, USA, Presider

OTuB1 • 2:00 p.m. Invited
High-Power Pulse Propagation in Optical Fibers, *G. Ronald Hadley; Sandia Natl. Labs, USA.* The operation of fiber lasers and amplifiers in new higher-power regimes for machining applications is limited by several nonlinear effects that must be understood and mitigated against for further development of these sources.

Room 6B

2:00 p.m.–4:00 p.m.
OTuC • Quantum Dot Amplifiers and Other Novel Devices
Clint L. Schow; IBM T. J. Watson Res. Lab, USA, Presider

OTuC1 • 2:00 p.m.
Quantum Dots Semiconductor Optical Amplifier with a -3dB Bandwidth of up to 120 nm in Semi-Cooled Operation, *Romain Brenot, François Lelarge, O. Legouezigou, F. Pommereau, F. Poingt, L. Legouezigou, E. Derouin, O. Drisse, B. Rousseau, F. Martin, G. H. Duan; Alcatel-Lucent Thales III-V Lab, France.* More than 120 nm of -3dB optical bandwidth, together with 10dB of internal gain at 50°C, are demonstrated and explained with specially designed quantum dot semiconductor optical amplifiers.

OTuC2 • 2:15 p.m.
Temperature Independent Optical Amplification in Uncooled Quantum Dot Optical Amplifiers, *Haibo Wang, Eng Tin Aw, Mo Xia, Mark G. Thompson, Richard V. Penty, Ian H. White; Univ. of Cambridge, UK.* 1.3μm QD SOAs are shown to provide 19dB optical gain at temperatures up to 70°C, allowing <0.1dB system penalty at 10Gb/s. The gain is constant to within ±3.5dB dB from 20°C-70°C for 10nm spectral bandwidth.

Room 6C

2:00 p.m.–4:00 p.m.
OTuD • Optical Conversion and Switching
Alexandre Shen; Alcatel-Lucent, France, Presider

OTuD1 • 2:00 p.m.
Tunable 105-ns Optical Delay for 80-Gbit/s RZ-DQPSK, 40-Gbit/s RZ-DPSK, and 40-Gbit/s RZ-OOK Signals Using Wavelength Conversion and Chromatic Dispersion, *Louis C. Christen[1], Irfan Fazal[1], Omer Yilmaz[1], Xiaoxia Wu[1], Scott R. Nuccio[1], Alan E. Willner[1], Carsten Langrock[2], Martin Fejer[2]; [1]Univ. of Southern California, USA, [2]Stanford Univ., USA.* We demonstrate a continuously-tunable, optical-delay-element using selective-wavelength-conversion in a PPLN waveguide, dispersion-compensating-fiber, and intra-channel dispersion-compensation. A continuous delay of 105-ns, >4000 bit-slots at 40-Gb/s, is demonstrated for 80-Gb/s RZ-DQPSK, 40-Gb/s RZ-DPSK, and 40-Gb/s RZ-OOK.

OTuD2 • 2:15 p.m.
Novel Chirp-Enhanced Tunable Fast Light of Ultra-Short Pulses in Semiconductor Optical Amplifiers, *Bala Pesala[1], Forrest G. Sedgwick[1], Alexander V. Uskov[2], Connie J. Chang-Hasnain[1]; [1]Univ. of California at Berkeley, USA, [2]Lebedev Physical Inst., Russian Federation.* Large tunable advance and delay are demonstrated by varying the sign and magnitude of the linear chirp of 440fs pulses using ultrafast nonlinearities in semiconductor optical amplifiers, for the first time.

Room 6D

2:00 p.m.–4:00 p.m.
OTuE • FEC and Capacity
Shiva Kumar; McMaster Univ., Canada, Presider

OTuE1 • 2:00 p.m.
The Capacity of Fiber-Optic Communication Systems, *René-Jean Essiambre, Gerard J. Foschini, Peter J. Winzer, Gerhard Kramer, Ellsworth C. Burrows; Bell Labs, Alcatel-Lucent, USA.* We present a capacity estimate of fiber-optic communication systems limited by fiber nonlinearity. The analysis reveals that a 5 bits/s/Hz capacity in a single polarization for transmission over 2000 km is possible using advanced technologies.

OTuE2 • 2:15 p.m.
Light-Capacity Loading Studies over an Installed 28-nm Standard Dispersion-Map Transpacific WDM System, *Bamdad Bakhshi, William Patterson, Dmitriy Kovsh, Georg Mohs, Ekaterina Golovchenko; Tyco Telecommunications, USA.* We present the first detailed study of lightly loaded long-haul WDM systems. We examine how channel performance depends on wavelength and power allocation of idlers in a lightly loaded 28-nm installed transpacific system.

Room 6E

2:00 p.m.–4:00 p.m.
OTuF • High-Confinement Waveguides and Devices
Yurii Vlasov; IBM T.J. Watson Res. Ctr., USA, Presider

OTuF1 • 2:00 p.m. Invited
Concepts and Constraints of Plasmonic Waveguides Operating from the Visible to the THz Regime, *Stefan A. Maier; Imperial College London, UK.* Different geometries of waveguides for electromagnetic energy providing mode confinement below the diffraction limit based on surface plasmon polaritons will be reviewed, operating from the visible to the THz regime of the spectrum.

Room 6F

2:00 p.m.–4:00 p.m.
OTuG • High-Speed Systems
Dave Atkinson; JDSU, Canada, Presider

OTuG1 • 2:00 p.m. Tutorial
100 Gb/s Challenges and Solutions, *Gregory Raybon, Peter Winzer; Alcatel-Lucent, USA.* We review the current technologies that have been demonstrated to generate and detect 100 Gb/s optical signals and we will discuss the application of these techniques to achieve long-haul WDM transmission in today's networks.

Gregory Raybon received the B. S. degree in Electrical Engineering from Penn State University in 1984 and the M. S. degree in Material Science from Stevens Institute of Technology in 1989. Greg joined Bell Laboratories, Holmdel, NJ, in 1985 and today he is Member of Technical Staff in Lightwave Systems Research Department.

Room 7

2:00 p.m.–4:00 p.m.
OTuH • WDM PON
Shoichi Hanatani; Hitachi, Ltd., Japan, Presider

OTuH1 • 2:00 p.m.
Demonstration of Plug-and-Play Function by Automatically Controlling Tunable DWDM-SFP Transceiver for Coexistence-Type Colorless WDM-PONs, *Hiro Suzuki, Masamichi Fujiwara, Tetsuya Suzuki, Hideaki Kimura, Makoto Tsubokawa; NTT Access Network Service Systems Labs, Japan.* The plug-and-play function for coexistence-type colorless WDM-PONs, which remotely and automatically assigns dedicated wavelengths, is demonstrated using tunable DWDM-SFP transceivers. Prototypes of the tunable ONU controller are developed and its dynamic performance is evaluated.

OTuH2 • 2:15 p.m.
Cost-Effective WDM-PON Delivering Up/Downstream Data and Broadcast Services on a Single Wavelength Using Mutually Injected FPLDs, *H. C. Ji[1], Ikuo Yamashita[2], Ken-Ichi Kitayama[1]; [1]Osaka Univ., Japan, [2]Kansai Electric Power Co. Inc., Japan.* We propose and demonstrate a cost-effective wavelength-division-multiplexed passive optical network which can provide 155-Mb/s up/downstream data and broadcast signals on a single wavelength using bidirectional transmission and mutually injected Fabry-Perot laser diodes.

Room 8

2:00 p.m.–4:00 p.m.
NTuA • FTTX towards Gb/s per Subscriber
(Panel Discussion)

NTuA • 2:00 p.m.
FTTX towards Gb/s per Subscriber, *William C. Uliasz; Verizon, USA.* The deployment of FTTX based fiber access is growing rapidly and users are starting to request more bandwidth, richer applications and more control over the network they subscribe to. Broadcast video, interactive gaming, streaming video, and an ever increasing number of HDTV channels are accelerating the bandwidth requirements a distribution system must deliver. The recently ratified G984.5 contains options for adding wavelengths that would coexist with the current GPON architecture. In addition, other technologies are being developed or optimized to improve network performance, simplify equipment installation, and reduce costs. This panel will examine industry trends and technology advancements relating to G-PON, 10G-PON and WDM-PON systems. Many real world issues faced in building a carrier access network will be discussed.

Room 9

2:00 p.m.–3:40 p.m.
NTuB • High-Speed Transmission Technologies
Michel W. Chbat; Nokia Siemens Networks, USA, Presider

NTuB1 • 2:00 p.m. Invited
Technologies for 40Gb/s and 100 Gb/s Transmission, *Hideo Kuwahara; Fujitsu Labs Ltd., Japan.* Technology trends of high capacity transmission system together with emerging device technologies are summarized that make it possible to support exploding traffic demand in next generation broadband networks combining telecom and broadcast arena.

Room 4

OTuA • WDM Network Control—Continued

OTuA2 • 2:30 p.m.
Reconfigurable Optical Networks: Is It Worth? *Reza Roshani, Paolo Monti, Marco Tacca, Andrea Fumagalli; Univ. of Texas at Dallas, USA.* A fundamental question to address is what levels of traffic fluctuations may justify the deployment of reconfigurable optical networks. Based on a flow model, this study provides a preliminary answer for IP/MPLS over WDM networks.

OTuA3 • 2:45 p.m.
Field Trial of GMPLS-Controlled All-Optical Networking Assisted with Optical Performance Monitors, *Jun Haeng Lee, Takehiro Tsuritani, Hongxiang Guo, Shuichi Okamoto, Noboru Yoshikane, Tomohiro Otani; KDDI R&D Labs Inc., Japan.* A field trial of GMPLS-controlled all-optical networking was successfully demonstrated with assistance of OPMs capable of monitoring in-band OSNR. The reliable and stable network operation was achieved thanks to the GMPLS control plane and OPMs.

Room 5

OTuB • High-Power Propagation and Continuum Generation—Continued

OTuB2 • 2:30 p.m.
Multiple Four-Wave Mixing in Ultra-Flattened Dispersion Photonic Crystal Fibers, *Arismar Cerqueira S. Jr.[1], Jorge Diego Marconi[1], Andrés A. Rieznik[1], H. E. Hernandez-Figueroa[1], Hugo L. Fragnito[1], Jonathan C. Knight[2]; [1]Unicamp-IFGW, Brazil, [2]Univ. of Bath, UK.* The generation of multiple four-wave mixing products in ultra-flattened dispersion photonic crystal fibers is presented. We obtained more than 200 products spanning over 170nm by launching 3 lasers at ITU-T grid specification.

OTuB3 • 2:45 p.m.
Selective Generation of Individual Raman Stokes Wavelengths Using Shaped Optical Pulses, *Andrew Malinowski, Khu T. Vu, Kang K. Chen, Peter Horak, David J. Richardson; Univ. of Southampton, UK.* We demonstrate efficient frequency translation of high-energy pulsed fiber laser output to individual Raman Stokes orders in a single mode fiber using active pulse shaping.

Room 6B

OTuC • Quantum Dot Amplifiers and Other Novel Devices—Continued

OTuC3 • 2:30 p.m.
Enhancing Small-Signal Cross-Gain Modulation of Quantum-Dot Optical Amplifiers by Injecting Carriers to Excited States, *Jungho Kim[1], Matthias Laemmlin[1], Christian Meuer[1], Sven Liebich[1], Dieter Bimberg[1], Gadi Eisenstein[1,2]; [1]Technical Univ. of Berlin, Germany, [2]Technion Inst. of Technology, Israel.* We numerically and experimentally demonstrate that high-speed small-signal cross-gain modulation of quantum-dot optical amplifiers can be improved by injecting carriers to excited states, which increases the amplifier's gain recovery time due to spectral hole burning.

OTuC4 • 2:45 p.m.
Time-Resolved Linewidth Measurements of a Wavelength Switched SG-DBR Laser for Optical Packet Switched Networks, *Arvind K. Mishra[1], Andrew D. Ellis[1], Liam P. Barry[2], Tom Farrell[3]; [1]Univ. College Cork, Ireland, [2]Dublin City Univ., Ireland, [3]Intune Networks, Ireland.* We report time-resolved linewidth measurements of different sizes of optical packets under wavelength-switching for the first time and show that laser linewidth is significantly broadened during switching transition requiring ~3μs to attain its minimum value.

Room 6C

OTuD • Optical Conversion and Switching—Continued

OTuD3 • 2:30 p.m.
40Gb/s Autonomous Optical Packet Synchronizer, *John P. Mack, Henrik N. Poulsen, Daniel J. Blumenthal; Univ. of California at Santa Barbara, USA.* We demonstrate a 40Gb/s autonomous optical packet synchronizer with a resolution of 853ps and dynamic tuning range of 12.8ns. Layer-1 (BER) and Layer-2 (Packet Recovery) measurements are presented with > 15dB input power dynamic range.

OTuD4 • 2:45 p.m.
640 Gbit/s Wavelength Conversion, *Michael Galili, Hans Christian Hansen Mulvad, Leif Katuso Oxenløwe, Hua Ji, Anders Thomas Clausen, Palle Jeppesen; COM-DTU, Denmark.* We report on the first demonstration of wavelength conversion of a 640 Gbit/s OOK single channel, single polarisation optical data signal. Error free wavelength conversion is achieved by XPM in 200 m HNLF.

Room 6D

OTuE • FEC and Capacity—Continued

OTuE3 • 2:30 p.m.
Advanced Repeater Architectures with Ultra-Long Spans for Submarine Systems, *Alan J. Lucero, Dmitri G. Foursa, Carl R. Davidson, Morten Nissov, Dmitriy Kovsh, Alexei N. Pilipetskii; Tyco Telecommunications, USA.* We present a comparative analysis of two remotely pumped amplifiers schemes used for long-haul transmission. Our numerical and experimental studies show that the remotely pumped EDFA scheme is superior to the Raman assisted EDFA system.

OTuE4 • 2:45 p.m.
Efficient FEC for Optical Communications Using Concatenated Codes to Combat Error-Floor, *Yoshikuni Miyata, Wataru Matsumoto, Hideo Yoshida, Takashi Mizuochi; Mitsubishi Electric Corp., Japan.* We propose concatenated LDPC(9252,7967)+RS(992,956) codes for application to systems beyond 40 Gb/s, taking practical implementation into account. Simulation shows that the Q limit is 7.1 dB, and that the concatenation effectively suppresses unwanted error-floor.

OTuF • High-Confinement Waveguides and Devices—Continued

OTuF2 • 2:30 p.m.
Variable Slowlight Buffers in All-Optical Packet Switching Routers, *Jie Yang[1], Aytug O. Karalar[1], Stevan S. Djordjevic[1], Nicolas K. Fontaine[1], Chunxin Yang[1], Wei Chen[2], Sai Chu[2], Brent E. Little[2], S. J. Ben Yoo[1]; [1]Univ. of California at Davis, USA, [2]Little Optics Div., Infinera, USA.* We investigated variable slowlight buffers consisting of 8 and 32 tunable-coupled-resonator-rings. Experiments showed error-free operations exhibiting variable delays of 0~2 ns at 1.25 Gb/s for 8-ring and 0~350 ps at 10 Gb/s for 32-ring structures.

OTuF3 • 2:45 p.m.
A Tunable Microwave-Photonic Notch Filter Fabricated in CMOS Silicon, *Mahmoud S. Rasras[1], Kun-Yii Tu[1], Sanjay S. Patel[1], Doug M. Gill[1], Young-Kai Chen[1], Alice E. White[1], Daniel N. Carothers[2], Andy T. Pomerene[2], Jim Beattie[2], Mark Beals[3], Jurgen Michel[3], Lionel C. Kimerling[3]; [1]Bell-Labs, Alcatel-Lucent, USA, [2]BAE Systems, USA, [3]MIT, USA.* We present a tunable narrowband (625 MHz) optical notch filter fabricated in a silicon complementary metal oxide semiconductor foundry. Using this device, a method to cancel undesired bands (910 MHz) in microwave-photonic systems is demonstrated.

OTuG • High-Speed Systems—Continued

Peter Winzer received his Ph.D. in Communications Engineering from the Vienna University of Technology, Vienna, Austria, in 1998 and joined Bell Labs, Holmdel, NJ, in 2000. He has been working on advanced optical modulation, equalization, and detection schemes as well as on other topics of optical data network design.

OTuH • WDM PON—Continued

OTuH3 • 2:30 p.m.
Operating Wavelength Range of 1.25-Gb/s WDM PON Implemented by Using Uncooled RSOA's, *Keun Yeong Cho[1], Yuichi Takushima[1], Kwang Ryong Oh[2], Yun C. Chung[1]; [1]Korea Advanced Inst. of Science and Technology, Republic of Korea, [2]ETRI, Republic of Korea.* We demonstrate that, by using a simple bias-control circuit, the operating wavelength range of the 1.25-Gb/s WDM-PON implemented by using uncooled RSOA's can be extended to ~49 nm in the temperature range of -20~+60°C.

OTuH4 • 2:45 p.m.
Demonstration of RSOA-Based WDM PON Operating at Symmetric Rate of 1.25 Gb/s with High Reflection Tolerance, *Keun Yeong Cho[1], Ayako Murakami[2], Yong Jik Lee[1], Akira Agata[2], Yuichi Takushima[1], Yun C. Chung[1]; [1]Korea Advanced Inst. of Science and Technology, Republic of Korea, [2]KDDI R&D Labs Inc., Japan.* We demonstrate an RSOA-based WDM PON operating at the symmetric rate of 1.25 Gb/s by using a low-frequency subcarrier (2.5 GHz). The performance is robust against the remodulation noise as well as the reflection noise.

NTuA • FTTX towards Gb/s per Subscriber *(Panel Discussion)*—Continued

NTuB • High-Speed Transmission Technologies—Continued

NTuB2 • 2:40 p.m.
43Gb/s RZ-DQPSK Field Upgrade Trial in a 10Gb/s DWDM Ultra-Long-Haul Live Traffic System in Australia, *Cornelius Fürst[1], Horst Wernz[1], Marco Camera[2], Philip Nibbs[3], Jules Pribil[3], Robert Iskra[4], Glenn Parsons[4]; [1]Ericsson, Germany, [2]Ericsson, Italy, [3]Ericsson Australia Pty., Australia, [4]Telstra Corp., Australia.* 43Gb/s upgrade possibility of two existing DWDM links of >1100km length between Melbourne and Sydney carrying live 10Gb/s traffic has been demonstrated. The trial showed a smooth 43Gb/s introduction with high margin and performance stability.

Room 4

OTuA • WDM Network Control—Continued

OTuA4 • 3:00 p.m.
Introducing Crosstalk—Awareness into GMPLS-Controlled Transparent Optical Networks, *Nicola Sambo[1], Nicola Andriolli[1], Alessio Giorgetti[1], Filippo Cugini[2], Luca Valcarenghi[1], Piero Castoldi[2]; [1]Scuola Superiore Sant'Anna, Italy, [2]CNIT, Italy.* A solution based on RSVP-TE signaling protocol is proposed to encompass degradation due to crosstalk in all-optical networks. Simulation results show that it achieves low blocking probability and allows to design larger domains of transparency.

OTuA5 • 3:15 p.m.
Enhancing Backward Recursive PCE-Based Computation (BRPC) for Inter-Domain Protected LSP Provisioning, *Francesco Paolucci[1], Filippo Cugini[2], Luca Valcarenghi[1], Piero Castoldi[1]; [1]Scuola Superiore Sant'Anna, Italy, [2]CNIT, Italy.* A PCE-based scheme exploiting BRPC and PCEP extensions is proposed for computing protected LSPs in multi-domain networks. Experimental evaluation shows that the proposed scheme is effective in terms of Traffic Engineering solution and protocol efficiency.

Room 5

OTuB • High-Power Propagation and Continuum Generation—Continued

OTuB4 • 3:00 p.m.
Synthesis of Picosecond Parabolic Pulses Pormed by a Long Period Fiber Grating Structure and Its Application for Flat-Top Supercontinuum Generation, *Radan Slavik[1], Yongwoo Park[2], Tae-Jung Ahn[2], Jose Azana[2]; [1]Inst. of Photonics and Electronics AS CR, v.v.i., Czech Republic, [2]Inst. Natl. de la Recherche Scientifique, Canada.* Stable 2.2-ps parabolic pulses are obtained by filtering of 1.3-ps Gaussian pulses with a LPG-based filter. Their subsequent nonlinear propagation in dispersion-shifted fiber resulted in supercontinuum generation with flat spectral response over 20 nm.

OTuB5 • 3:15 p.m.
Low-Threshold Supercontinuum Generation in Dispersion Engineered Highly Nonlinear Chalcogenide Fiber Nanowires, *Dong-Il Yeom, Eric C. Mägi, Michael R. E. Lamont, Libin Fu, Benjamin J. Eggleton; CUDOS, School of Physics, Univ. of Sydney, Australia.* We report fabrication of chalcogenide nanowires with tailored dispersion enabling low-threshold soliton fission leading to supercontinuum generation. Tapered sub-micron chalcogenide fiber exhibit record ultrahigh nonlinearity (γ~54.1/W/m), over 50,000 times standard silica fiber, and anomalous dispersion.

Room 6B

OTuC • Quantum Dot Amplifiers and Other Novel Devices—Continued

OTuC5 • 3:00 p.m.
Design and Implementation of Ultra-Compact Grating-Based 2x2 Beam Splitter for Miniature Photonic Integrated Circuits, *Chin-Hui Chen, Jonathan Klamkin, Leif A. Johansson, Larry A. Coldren; Univ. of California at Santa Barbara, USA.* We provide detailed experimental study of reflectivity, insertion loss, and interference extinction ratio for our recently proposed and demonstrated grating-based beam splitter. Both low-loss and high-extinction-ratio devices are demonstrated for reflectivities close to 50%.

OTuC6 • 3:15 p.m.
40 GHz Bright and Dark Parabolic Pulse Generation Using a Picosecond Optical Pulse Source and a 64-Channel AWG, *Toshihiko Hirooka[1], Masataka Nakazawa[1], Katsunari Okamoto[2]; [1]Tohoku Univ., Japan, [2]Univ. of California at Davis, USA.* 40 GHz parabolic pulse generation by the spectral manipulation of a picosecond optical pulse is demonstrated. Bright and dark parabolic pulses were generated from a mode-locked fiber laser using a 64-channel AWG pulse shaper.

Room 6C

OTuD • Optical Conversion and Switching—Continued

OTuD5 • 3:00 p.m.
OTDM-to-WDM Conversion Based on Wavelength Conversion and Time Gating in a Single Optical Gate, *Rui Morais[1,2], Rui Meleiro[1,3], Paulo Monteiro[1,3], Paulo Marques[2]; [1]Nokia Siemens Networks, Portugal, [2]INESC Porto, Portugal, [3]Univ. de Aveiro, Portugal.* OTDM-to-WDM conversion from 128.1Gbit/s to 3x42.7Gbit/s is achieved by wavelength conversion using side filtering of SPM broadened spectrum in HNLF, followed by a single electro-absorption modulator based optical gate. A maximum 2dB penalty was achieved.

OTuD6 • 3:15 p.m.
All-Optical Modulation Format Conversion from NRZ-OOK to RZ-M-ary PSK Based on Fiber Nonlinearity, *Satoru Kitagawa, Suresh M. Nissanka, Akihiro Maruta; Graduate School of Engineering, Osaka Univ., Japan.* We propose an all-optical NRZ-OOK to RZ M-ary PSK modulation format conversion based on fiber nonlinearity. The proposed scheme is numerically investigated and experimentally demonstrated with the error-free operation of NRZ-OOK/RZ-QPSK conversion at 10.7 Gsymbol/s.

Room 6D

OTuE • FEC and Capacity—Continued

OTuE5 • 3:00 p.m. **Tutorial**
Next Generation FEC for Optical Communication, *Takashi Mizuochi; Mitsubishi Electric Corp., Japan.* The basics of and recent advances in forward error correction are reviewed. The Shannon limit for the ultimate coding gain and FECs in practical use are discussed. We anticipate possible roles for FEC in future.

Takashi Mizuochi received the B.S., M.S., and Ph.D. degrees in electrical engineering from Osaka University, Japan. At Mitsubishi Electric Corporation, he has been engaged in research on optical frequency-division multiplexing, coherent optical fiber communications, long-haul terrestrial, and WDM undersea systems. His current interests include FEC for 100GbE and electronic dispersion compensation using digital signal processing. He is currently R&D Manager, Optical Communication Technology, at the Information Technology R&D Center. Dr. Mizuochi is a Member of the IEEE ComSoc, LEOS, the OSA, the IEICE of Japan, and the Laser Society of Japan. He received the Ohm Technical Award, 2004, in Japan.

OTuF • High-Confinement Waveguides and Devices—Continued

OTuF4 • 3:00 p.m. Invited
Hitless-Reconfigurable and Bandwidth-Scalable Silicon Photonic Circuits for Telecom and Interconnect Applications, *Miloš A. Popović, Tymon Barwicz, Marcus S. Dahlem, Fuwan Gan, Charles W. Holzwarth, Peter T. Rakich, Michael R. Watts, Henry I. Smith, Franz X. Kärtner, Erich P. Ippen; MIT, USA.* We describe silicon microring-resonator-based microphotonic circuits that support complete (amplitude and phase) disabling of resonant states, enabling novel capabilities: truly-hitless switching/tuning of high-order, telecom-grade channel add-drop filters, dispersionless FSR multiplication, and "hot-swapping" of photonic subsystems.

OTuG • High-Speed Systems—Continued

OTuG2 • 3:00 p.m.
Experimental Synchronization Monitoring of I/Q Data and Pulse-Carving Temporal Misalignment for a Serial-Type 80-Gbit/s RZ-DQPSK Transmitter, *Xiaoxia Wu[1], Louis Christen[1], Scott Nuccio[1], Omer Faruk Yilmaz[1], Loukas Paraschis[2], Yannick Keith Lize[3], Alan E. Willner[1]; [1]Univ. of Southern California, USA, [2]Cisco Systems, USA, [3]ITF Labs, Canada.* We experimentally demonstrate the misalignment monitoring between I/Q data streams and between data and pulse-carving in an 80-Gbit/s serial RZ-DQPSK transmitter. We show an 8-dB monitoring-power-dynamic-range for I/Q data misalignment and 6-dB for carver misalignment.

OTuG3 • 3:15 p.m.
Multiplexing and DQPSK Precoding of 10.7-Gb/s Client Signals to 107 Gb/s Using an FPGA, *Haoyu Song, Andrew Adamiecki, Peter J. Winzer, Clark Woodworth, Steven Corteselli, Greg Raybon; Bell Labs, Alcatel-Lucent, USA.* We implemented a real-time DQPSK precoder for 107-Gb/s data, together with a high-speed channel alignment scheme and the required rate adaptation from 10.7 Gb/s to 13.375 Gb/s, on a Xilinx Virtex II Pro X FPGA.

OTuH • WDM PON—Continued

OTuH5 • 3:00 p.m.
Reflection Tolerance of RSOA-Based WDM PON, *Yong Jik Lee[1], Keun Yeong Cho[1], Ayako Murakami[2], Akira Agata[2], Yuichi Takushima[1], Yun C. Chung[1]; [1]Korea Advanced Inst. of Science and Technology, Republic of Korea, [2]KDDI R&D Laboratiries Inc., Japan.* We investigate the effects of back-reflection in RSOA-based WDM PON utilizing the remodulation technique. The downstream signal is likely to have severe reflection tolerance (-42 ~ -35 dB), which highly depends on the RSOA gain.

OTuH6 • 3:15 p.m.
WDM-PON Systems Using Cross-Remodulation to Double Network Capacity with Reduced Rayleigh Scattering Effects, *Han-Hyuan Lin, Chen-Yu Lee, Shu-Chuan Lin, San-Liang Lee, Gerd Keiser; Natl. Taiwan Univ. of Science and Technology, Taiwan.* A simple WDM-PON architecture operating at two wavelength bands is demonstrated to increase the system capacity and suppress the Rayleigh scattering effect on the remodulated upstream signals. The system adds minimal extra components and loss.

NTuA • FTTX towards Gb/s per Subscriber *(Panel Discussion)*—Continued

NTuB • High-Speed Transmission Technologies—Continued

NTuB3 • 3:00 p.m. Invited
Multi-Rate (100G/40G/10G) Transport over Deployed Optical Networks, *Torsten Wuth[1], Michel W. Chbat[2], Valey F. Kamalov[3]; [1]Siemens, Germany, [2]Nokia Siemens Networks, USA, [3]Google Inc., USA.* In this paper we describe the boundary conditions for upgrading existing 10G optical transport networks with 40G and 100G channels and the operational issues in multi-rate optical networks.

Room 4

OTuA • WDM Network Control—Continued

OTuA6 • 3:30 p.m.
Event-Triggered Reprovisioning with Resource Preemption in WDM Mesh Networks: A Traffic Engineering Approach, *Ming Xia, Lei Song, Marwan Batayneh, Biswanath Mukherjee; Dept. of Computer Science, Univ. of California at Davis, USA.* We propose a novel scheme for dynamic connection reprovisioning with resource preemption. Study cases show that SLA violations are minimized, particularly for connections with high SLA requirements under heavy network load.

OTuA7 • 3:45 p.m.
Provisioning of Deadline-Driven Requests with Flexible Transmission Rates in Different WDM Network Architectures, *Dragos Andrei, Marwan Batayneh, Charles Martel, Biswanath Mukherjee; Univ. of California at Davis, USA.* We investigate the problem of provisioning deadline-driven requests with flexible transmission rates in WDM mesh networks. We analyze the network's performance and cost for different node architectures and for different traffic distributions.

Room 5

OTuB • High-Power Propagation and Continuum Generation—Continued

OTuB6 • 3:30 p.m.
Visible Continuum Generation Using a Femtosecond Erbium-Doped Fiber Laser and a Hybrid HNLF-PCF Nonlinear Fiber, *Jeffrey W. Nicholson[1], Ryan Bise[1], John Alonzo[1], Thomas Stockert[1], Dennis J. Trevor[1], Frank Dimarcello[1], Eric Monberg[1], John M. Fini[1], Paul S. Westbrook[1], Kenneth Feder[1], Lars Gruner-Nielsen[2]; [1]OFS Labs, USA, [2]OFS Fitel Denmark ApS, Denmark.* Visible supercontinuum in the fundamental mode is generated in a silica hybrid nonlinear fiber using a femtosecond, erbium-doped fiber laser. The nonlinear fiber consists of highly-nonlinear, germano-silicate fiber fusion spliced to a photonic crystal fiber.

OTuB7 • 3:45 p.m.
Passive Nonlinear Pulse Shaping in Normally Dispersive Fiber, *Anton I. Latkin[1,2], Sonia Boscolo[2], Sergei K. Turitsyn[2]; [1]Novosibirsk State Univ., Russian Federation, [2]Photonics Res. Group, School of Engineering and Applied Science, Aston Univ., UK.* We propose a simple method for passive nonlinear optical pulse shaping that utilizes pulse prechirping and nonlinear propagation in a normally dispersive fiber to generate various temporal waveforms of practical interest from conventional laser pulses.

Room 6B

OTuC • Quantum Dot Amplifiers and Other Novel Devices—Continued

OTuC7 • 3:30 p.m.
High-Resolution, Loop-Back AWG for Compact, High-Fidelity Optical Arbitrary Waveform Generation, *Nicolas K. Fontaine[1], David J. Geisler[1], Ryan P. Scott[1], Chunxin Yang[2], Francisco M. Soares[1], Aytug Karalar[1], Jie Yang[1], Katsu Okamoto[1], Jonathan P. Heritage[1], S. J. Ben Yoo[1]; [1]Dept. of Electrical and Computer Engineering, Univ. of California at Davis, USA, [2]Dept. of Applied Science, Univ. of California at Davis, USA.* We demonstrate a high-performance waveform shaper based on a 64-channel, 10-GHz silica arrayed-waveguide grating with loop-back channels and integrated amplitude and phase modulators. The design allows wavelength-matched demultiplexing and multiplexing in the compact waveform shaper.

OTuC8 • 3:45 p.m.
Magneto-Optical Isolator with SOI Waveguide, *Yuya Shoji[1], Hideki Yokoi[2], I-Wei Hsieh[3], Richard M. Osgood, Jr.[3], Tetsuya Mizumoto[1]; [1]Tokyo Inst. of Technology, Japan, [2]Shibaura Inst. of Technology, Japan, [3]Columbia Univ., USA.* A magneto-optical isolator with SOI waveguides is demonstrated. The isolator is fabricated by direct-bonding a magneto-optic garnet onto the SOI waveguides. Nonreciprocal phase shift is observed and the isolation ratio of 21 dB is obtained.

Room 6C

OTuD • Optical Conversion and Switching—Continued

OTuD7 • 3:30 p.m. Invited
All-Optical Signal Processing Using Specialty Fibers, *Ju Han Lee; Univ. of Seoul, Republic of Korea.* The ultimate potential of state-of-the-art highly nonlinear optical fiber technologies is reviewed from a perspective of practical implementation of all-optical nonlinear signal processing devices. This review is focused on Bismuth oxide-based ultra-high nonlinear optical fiber.

Room 6D

OTuE • FEC and Capacity—Continued

4:00 p.m.–4:30 p.m. Coffee Break, *Exhibit Halls B–G*

Room 6E

OTuF • High-Confinement Waveguides and Devices—Continued

OTuF5 • 3:30 p.m.
High-Throughput Silicon Nanophotonic Deflection Switch for On-Chip Optical Networks, *Yurii Vlasov, William M. J. Green, Fengnian Xia; IBM T.J. Watson Res. Ctr., USA.* We demonstrate error-free (BER<10^{-12}) deflection switching of multiple 40Gbps channels with an ultra-compact (30x10μm^2), low-latency (<2ns), high throughput (over 360Gbps), and small crosstalk (<-10dB) optical switch based on coupled silicon microring resonators.

OTuF6 • 3:45 p.m.
Demonstration of All-Optical Multi-Wavelength Message Routing for Silicon Photonic Networks, *Aleksandr Biberman[1], Benjamin G. Lee[1], Keren Bergman[1], Po Dong[2], Michal Lipson[2]; [1]Columbia Univ., USA, [2]Cornell Univ., USA.* We demonstrate all-optical switching of 20 wavelength channels simultaneously in a silicon broadband comb switch, and perform single-channel BER measurements through both ports. A statistical characterization of the insertion loss and extinction ratio is included.

Room 6F

OTuG • High-Speed Systems—Continued

OTuG4 • 3:30 p.m.
Direct Detection of 107-Gb/s Polarization-Multiplexed DQPSK with Electronic Polarization Demultiplexing, *Xiang Liu, S. Chandrasekhar; Bell Labs, Alcatel-Lucent, USA.* We demonstrate a direct detection scheme for a 107-Gb/s polarization-multiplexed return-to-zero DQPSK signal, featuring automatic polarization de-multiplexing in the electronic domain without polarization tracking. The required OSNR for BER=10^{-3} was measured to be ~21 dB.

OTuG5 • 3:45 p.m.
Chromatic Dispersion Monitoring of 40-Gb/s RZ-DPSK and 80-Gb/s RZ-DQPSK Data Using Cross-Phase Modulation in Highly Nonlinear Fiber and a Simple Power Monitor, *Jeng-Yuan Yang[1], Lin Zhang[1], Teng Wu[1], Xiaoxia Wu[1], Louis Christen[1], Scott Nuccio[1], Omer F. Yilmaz[1], Wei-Ren Peng[2], Alan E. Willner[1]; [1]Dept. of Electrical Engineering, Univ. of Southern California, USA, [2]Inst. of Electro-Optical Engineering, Natl. Chiao-Tung Univ., Taiwan.* We experimentally demonstrate an all-optical chromatic dispersion monitoring technique utilizing cross-phase modulation in highly-nonlinear fiber for 40-Gb/s RZ-DPSK. Maximum monitored power variation of 16.5-dB is achieved in the presence of up to 120-ps/nm chromatic dispersion.

Room 7

OTuH • WDM PON—Continued

OTuH7 • 3:30 p.m.
High Spectral Efficiency DWDM-PON Using an Optical Homodyne Receiver with Integral Circuits Based on Digital Signal Processing, *Shin Kaneko, Hiro Suzuki, Noriki Miki, Hideaki Kimura, Makoto Tsubokawa; NTT Access Network Service Systems Labs, Japan.* A DWDM-PON is proposed that realizes a spectral efficiency of 1 bit/s/Hz by using homodyne detection based on digital signal processing. The feasibility is confirmed with a transmission experiment, and the application area is discussed.

OTuH8 • 3:45 p.m.
40-Gb/s Wavelength-Division-Multiplexing Passive Optical Network with Centralized Lightwave Source, *Jianjun Yu, Zhensheng Jia, Philip N. Ji, Ting Wang; NEC Labs America, USA.* We propose and experimentally demonstrate a 40-Gb/s wavelength-division-multiplexing passive optical network (WDM-PON) with a centralized directly-modulated laser (DML) source for the first time.

Room 8

NTuA • FTTX towards Gb/s per Subscriber *(Panel Discussion)*—Continued

Room 9

NTuB • High-Speed Transmission Technologies—Continued

4:00 p.m.–4:30 p.m. Coffee Break, *Exhibit Halls B–G*

Room 4

4:30 p.m.–6:30 p.m.
OTuI • Access and Metro Networks
Junqiang Hu; NEC Labs America, Inc., USA, Presider

OTuI1 • 4:30 p.m.
Resource Provisioning for Orthogonal Frequency Division Multiple Access (OFDMA)-Based Virtual Passive Optical Networks (VPON), *Wei Wei[1], Ting Wang[1], Chunming Qiao[2]; [1]NEC Labs America, USA, [2]SUNY Buffalo, USA.* A virtualization mechanism of passive optical networks (PON) based on optical orthogonal frequency division multiple access (OFDMA) technologies is introduced. A comparison between two types of resource provisioning schemes for virtual PON is studied.

OTuI2 • 4:45 p.m.
Long-Reach 10 Gbps Ethernet Passive Optical Network Based on a Protected Ring Architecture, *João Santos[1], João Pedro[1,2], Paulo Monteiro[1,3], João Pires[2]; [1]Nokia Siemens Networks, Portugal, [2]Inst. de Telecomunicações, Inst. Superior Técnico, Portugal, [3]Inst. de Telecomunições, Univ. de Aveiro, Portugal.* We propose a network architecture for self-protected long-reach 10 Gbps EPONs based on a feeder ring, and investigate its physical feasibility and MAC performance using a 100-km ring supporting four EPONs, each with 32 ONUs.

Room 5

4:30 p.m.–6:30 p.m.
OTuJ • High-Power Fibers
Akira Shirakawa; Inst. for Laser Science, Japan, Presider

OTuJ1 • 4:30 p.m. Invited
Erbium Doped AirClad Fibers for High-Power Broad Band Amplifiers and Single Mode Erbium Doped Fibers for High Performance Amplifiers and Lasers, *Bera Pálsdóttir; OFS Fitel, Denmark.* Development of erbium doped fibers for broadband amplifiers will be reviewed and parameters important for volume production identified. AirClad Er-doped fibers and their use in simple design, broadband, high power amplifiers will be presented.

Room 6B

4:30 p.m.–6:15 p.m.
OTuK • Biophotonics and Sensors
David J. Moss; Univ. of Sydney, Australia, Presider

OTuK1 • 4:30 p.m. Tutorial
Optical Technologies for Early GI Cancer Detection: Many Ways to Skin a Cat, *Brian Wilson; Univ. of Toronto, Canada.* The detection of early cancer in the colon and esophagus are critical to successful treatment. Many endoscopic imaging and spectroscopic techniques have been investigated, with varying results. The challenges have driven many biophotonic advances.

Dr. Brian C. Wilson was educated in Scotland and worked at the Institute of Cancer Research, England and Flinders University, Australia before moving to Canada in 1981. Currently, he is Professor of Medical Biophysics at the Ontario Cancer Institute/University of Toronto. At the Laboratory for Applied Biophotonics, he directs a basic-translational-clinical research program in biophotonics that includes clinical therapeutics, clinical diagnostics and micro-imaging. He has published over 250 peer-reviewed papers, and has trained more than 30 graduate students/fellows. He is a consultant to several companies, as well as a Founding Director of 2 biophotonics start-up companies.

Room 6C

4:30 p.m.–6:30 p.m.
OTuL • Optical Burst/Packet Switching
Chester Shu; Chinese Univ. of Hong Kong, Hong Kong, Presider

OTuL1 • 4:30 p.m.
Reconfigurable All-Optical Byte Recognition for 40-Gb/s Phase-Shift-Keyed Transmission Using a Planar-Lightwave-Circuit Passive Correlator, *Inuk Kang[1], M. Rasras[1], M. Dinu[1], M. Cappuzzo[1], L. T. Gomez[1], Y. F. Chen[1], L. Buhl[1], S. Cabot[2], A. Wong-foy[2], S. S. Patel[1], C. R. Giles[1], N. Dutta[2], J. Jaques[2], A. Piccirilli[2]; [1]Bell Labs, Alcatel-Lucent, USA, [2]LGS Innovations, USA.* We demonstrate all-optical recognition of byte patterns embedded in phase-shift-keyed data streaming at 40 Gb/s. We use matched filtering to generate an autocorrelation pulse indicating the pattern matching. We show excellent discrimination against spurious patterns.

OTuL2 • 4:45 p.m.
42Gbit/s All-Optical Pattern Recognition System, *Roderick P. Webb[1], Xuelin Yang[1], Robert J. Manning[1], Graeme D. Maxwell[2], Alistair J. Poustie[2], Sebastien Lardenois[2], David Cotter[1]; [1]Tyndall Natl. Inst., Univ. College Cork, Ireland, [2]Ctr. for Integrated Photonics, UK.* We propose a novel programmable pattern recognition system employing all-optical logic gates and experimentally demonstrate key functions at 42Gbit/s. Gate count is independent of target length and the temporal position of the target is identified.

Room 6D

4:30 p.m.–6:30 p.m.
OTuM • Coherent Transmission
Werner Rosenkranz; Univ. of Kiel, Germany, Presider

OTuM1 • 4:30 p.m. Invited
Coherent Detection in Long-Haul Transmission Systems, *Yi Cai; Tyco Telecommunications, USA.* We review the potentials and challenges of applying coherent detection in long-haul transmission systems. We compare several different coherent detection schemes from the aspects of receiver sensitivity, carrier phase recovery and fiber nonlinearity induced penalty.

Room 6E

4:30 p.m.–6:30 p.m.
OTuN • Optical Amplifiers
Maxim Bolshtyansky; JDSU, USA, Presider

OTuN1 • 4:30 p.m. Invited
SOA in WDM Communication Links, *Steve Grubb, Radha Nagarajan, Masaki Kato, Fred Kish, Dave Welch; Infinera, USA.* Photonic Integrated Circuits (PICs) have had a significant impact on WDM systems and have been shown to be scalable, reliable and economic. Integration of SOAs to the PIC platform extend the benefits of PICs.

Room 6F

4:30 p.m.–6:30 p.m.
OTuO • Digital Signal Processing
Giuseppe Bordogna; Nortel Networks Ltd., Canada, Presider

OTuO1 • 4:30 p.m.
Compact Digital Dispersion Compensation Algorithms, *Michael G. Taylor; Atlantic Sciences LLC, USA.* The standard FIR filter for chromatic dispersion compensation consumes huge digital processing resources. Two new algorithms significantly reduce the computation load, the circular coefficient approximation by a factor of 3.9, and sub-band processing by 1.7.

OTuO2 • 4:45 p.m.
A Real-Tme CMA-Based 10 Gb/s Polarization Demultiplexing Coherent Receiver Implemented in an FPGA, *Andreas Leven, Noriaki Kaneda, Young-Kai Chen; Alcatel-Lucent, USA.* One advantage of signal-processing based coherent receivers is the ability to polarization-demultiplex in the digital domain. In this paper, we report on an FPGA-based real-time implementation of a 10 Gb/s receiver with a CMA-based demultiplexer.

Room 7

4:30 p.m.–5:30 p.m.
OTuP • Optical Layer Security
John Jacob; BBN Technologies, USA, Presider

OTuP1 • 4:30 p.m. Invited
Quantum Key Distribution Integrated into Commercial WDM Systems, *Harald Rohde[1], Sylvia Smolorz[1], Andreas Poppe[2], Hannes Huebel[3]; [1]Nokia Siemens Networks GmbH & Co. KG, Germany, [2]Austrian Res. Ctr. GmbH, Austria, [3]Dept. of Physics, Univ. of Vienna, Austria.* Quantum cryptography circumvents the threat on classical cryptography due to quantum computers. Its integration into WDM transmission systems is a key point in its commercial deployment. The necessary pre-requisites are discussed in this paper.

Room 8

4:30 p.m.–6:30 p.m.
NTuC • Technologies for FTTH
Paparao Palacharla; Fujitsu Labs of America, Inc., USA, Presider

NTuC1 • 4:30 p.m. Invited
Hybrid SOA-Raman Amplifiers for Fiber-to-the-Home and Metro Networks, *Patrick P. Iannone, Kenneth C. Reichmann; AT&T Labs, USA.* SOA-Raman amplifiers have broad gain bandwidth (> 80 nm) and can be designed to operate in any wavelength region compatible with single-mode optical fiber. We review recent progress in SOA-Raman amplified access and metro systems.

Room 9

4:30 p.m.–6:30 p.m.
NTuD • Network Optimization
Mark Allen; Infinera, USA, Presider

NTuD1 • 4:30 p.m.
SD-WAN: A Technology for the Efficient Use of Bandwidth in Multi-Wavelength Networks, *Alain Houle[1], Louis-Patrick Boulianne[2], Louis Dupras[2]; [1]Univ. de Sherbrooke, Canada, [2]dō networks, Canada.* SD-WAN technology offers multiple advantages over other networking technologies like EoS, S-EoS and RPR. We conduct theoretical and experimental validation of this technology and propose an application example in the MSO environment.

NTuD2 • 4:50 p.m.
Dynamic Incremental Design for Telecom Networks, *Dah-Min Hwang, Angela Chiu, Guangzhi Li; AT&T Labs, USA.* A systematic approach is proposed for network design with changing forecast. It optimizes the Net Present Value, emphasizing in supporting the present demands, while considering the future forecast with discounts to avoid excessive future penalty.

Room 4

OTuI • Access and Metro Networks—Continued

OTuI3 • 5:00 p.m.
A Novel Medium Access Control and Processing System for a Packet-Switched WDM Metro Ring Network, *Maria C. Yuang[1], Ya-Shian Wang[1,2], Yu-Min Lin[3]; [1]Natl. Chiao Tung Univ., Taiwan, [2]Telecommunication Labs, Chunghwa Telecom Co., Ltd., Taiwan, [3]Information and Communications Res. Labs, Industrial Technology Res. Inst., Taiwan.* We present the design/experimentation of a medium-access control and processing system (MACOPS) for an optical packet-switched WDM network. MACOPS enables optical parallel headers to be efficiently received/modified via wavelength-time conversion, and achieves exceptional throughput/delay/fairness performance.

OTuI4 • 5:15 p.m.
A Simple WDM-PON Architecture to Simultaneously Provide Triple-Play Services by Using One Single Modulator, *Ming-Fang Huang[1,2], Jianjun Yu[3], Huang-Chang Chien[1], Arshad Chowdhury[1], Jason (Jyehong) Chen[2], Sien Chi[2,4], Gee-Kung Chang[1]; [1]School of Electrical and Computer Engineering, Georgia Tech, USA, [2]Dept. of Photonics, Natl. Chiao-Tung Univ., Taiwan, [3]NEC Labs America, USA, [4]Dept. of Electrical Engineering, Yuan Ze Univ., Taiwan.* Simple WDM-PON testbed with centralized-lightwave using single-arm IM to provide 10Gb/s data and 2.5Gb/s digital video downstream and 2.5Gb/s upstream data has been demonstrated. After 20km SSMF, power-penalty for all channels is less than 0.5dB.

Room 5

OTuJ • High-Power Fibers—Continued

OTuJ2 • 5:00 p.m.
Effective Area Limit for Large Mode Area Laser Fibers, *Ming-Jun Li, Xin Chen, Anping Liu, Stuart Gray, Ji Wang, Donnell T. Walton, Luis A. Zenteno; Corning Inc., USA.* We analyze practical constraints of fibers designs for achieving large mode area and single mode operation for fiber lasers, and provide estimated upper limits for the core diameter and effective area.

OTuJ3 • 5:15 p.m.
Dynamics of Room Temperature DC-Induced Second-Order Nonlinearity in Poled Fiber under an External Field, *Jiawen Zhang, Li Qian; Univ. of Toronto, Canada.* We investigated room-temperature dynamics of an internal field-induced second-order nonlinearity (SON) in a poled fiber subject to an external DC field (±1.1MV/cm) and obtained an internal SON of ~0.01pm/V with a time constant of ~20s.

Room 6B

OTuK • Biophotonics and Sensors—Continued

Room 6C

OTuL • Optical Burst/Packet Switching—Continued

OTuL3 • 5:00 p.m.
All-Optical Swapping of Digital Lightpath Labels, *Mark D. Feuer[1], Christina Hruska[1], Hongsheng Wang[2], Leo H. Spiekman[2], Boris B. Stefanov[2], Vinay A. Vaishampayan[1]; [1]AT&T Labs - Res., USA, [2]Alphion Corp., USA.* We describe a new method of swapping digital lightpath labels, by selective inversion of blocks of bits. All-optical label swapping is demonstrated using an SOA-MZI regenerator, optically switched from inverting to non-inverting operation.

OTuL4 • 5:15 p.m.
Demonstration of Multi-Hop Transparent Optical Code Label Swapping by Self-Seed Pulse Technique Using a Multi-Port En/Decoder, *Gengo Hayashi[1], Yoshinari Awaji[2], Naoya Wada[2], Gabriella Cincotti[3], Tetsuya Miyazaki[2], Ken-ichi Kitayama[1]; [1]Osaka Univ., Japan, [2]Natl. Inst. of Information and Communications Technology (NICT), Japan, [3]Univ. of Roma, Italy.* Fully transparent optical-code label swapping by a novel self-seed pulse technique using a multi-port en/decoder at 10Gbit/s is experimentally demonstrated. Feasibility of the cascaded label swapping for multi-hop routing is verified by SNR evaluation.

Room 6D

OTuM • Coherent Transmission—Continued

OTuM2 • 5:00 p.m.
Laser Linewidth Limitations for Optical Systems with High-Order Modulation Employing Feed Forward Digital Carrier Phase Estimation, *Matthias Seimetz; Fraunhofer Inst. for Telecommunications, Heinrich-Hertz-Inst., Germany.* Laser linewidth requirements for optical systems with homodyne detection and feed forward digital phase estimation are determined by extensive Monte Carlo simulations, and shown to be a stringent limitation for high-order modulation formats.

OTuM3 • 5:15 p.m.
Ultra-Fast Adaptive Digital Polarization Control in a Realtime Coherent Polarization-Multiplexed QPSK Receiver, *Timo Pfau[1], Christian Wördehoff[1], Ralf Peveling[1], Selwan K. Ibrahim[1], Sebastian Hoffmann[1], Olaf Adamczyk[1], Suhas Bhandare[1], Mario Porrmann[1], Reinhold Noé[1], Alexander Koslovsky[2], Yaakov Achiam[2], Daniel Schlieder[2], Nicolas Grossard[3], Jérôme Hauden[3], Henri Porte[3]; [1]Univ. of Paderborn, EIM-E, Germany, [2]CeLight Israel Ltd., Israel, [3]Photline Technologies, France.* A digital polarization controller integrated in a 2.8 Gbit/s realtime polarization-multiplexed coherent QPSK system compensates for endless polarization changes having a maximum gradient of 3.5 krad/s (12 krad/s) with 1 dB (3.9 dB) sensitivity penalty.

OTuN • Optical Amplifiers—Continued

OTuN2 • 5:00 p.m. Invited
Advances in Amplification Technology for the Agile Optical Network, *Gregory J. Cowle, Maxim Bolshtyansky; JDSU, USA.* The evolution of optical amplifier technology and functionality are described, as designs have merged with novel network functionality and requirements of the Agile Optical Network.

OTuO • Digital Signal Processing—Continued

OTuO3 • 5:00 p.m. Invited
Digital Signal Processing Options in Long Haul Transmission, *Seb J. Savory; Univ. College London, UK.* Digital signal processing (DSP) combined with spectrally efficient modulation has redefined the limits for long-haul transmission. We survey the options currently under consideration, including the impact of technology and discuss future directions for DSP research.

OTuP • Optical Layer Security—Continued

OTuP2 • 5:00 p.m.
DPSK Based Eavesdropper Vulnerability in Two-Code Keyed O-CDMA Systems, *Daniel E. Leaird[1], Chen-Bin Huang[1], Zhi Jiang[2], Sang-Gyu Park[3], Andrew M. Weiner[1]; [1]Purdue Univ., USA, [2]Univ. of Illinois, USA, [3]Hanyang Univ., Republic of Korea.* The use of a DPSK de-modulator by an eavesdropper to extract the data stream of a two-code keyed O-CMDA transmitter is experimentally explored. A possible scheme for masking this vulnerability is also presented.

OTuP3 • 5:15 p.m.
OCDM-Based Photonic Encryption with Provable Security, *Giovanni Di Crescenzo, Ronald Menendez, Shahab Etemad; Telcordia Technologies, USA.* We introduce two novel techniques, random noise on unused channels and varying the inter-code phases on realistic framing repetition, to obtain an OCDM-based encryption scheme for which we can prove desirable security guarantees.

NTuC • Technologies for FTTH—Continued

NTuC2 • 5:10 p.m.
Requirements for Bend Insensitive Fibers for Verizon's FiOS and FTTH Applications, *David Z. Chen[1], William R. Belben[1], John B. Gallup[1], Claudio Mazzali[2], Paulo Dainese[2], Todd Rhyne[2]; [1]Verizon, USA, [2]Corning, USA.* Bandwidth requirements for residential customers have justified the fiber penetration into buildings, living units. We present a detailed analysis of the requirements for macro-bend performance, and the results of field trails using revolutionary fiber technology.

NTuD • Network Optimization—Continued

NTuD3 • 5:10 p.m.
An Optimal Investment Strategy of Optical Transceivers for Static WDM Networks, *Mitsumasa Okada, Junichi Kani, Toshio Watanabe, Naoto Yoshimoto; NTT Access Network Service Systems Labs, NTT Corp., Japan.* We present an optimum failure recovery procedure and transmitter choices for static DWDM networks that use fixed wavelength assignment. XFP modules are found as the more cost-effective choice than tunable lasers.

Room 4

OTuI • Access and Metro Networks—Continued

OTuI5 • 5:30 p.m.
Topology Abstraction Algorithms for Light-Mesh: An Alternate Model for PON, *Anuj Agrawal[1], Ashwin A. Gumaste[1], Mohit Chamania[1], Nasir Ghani[2]; [1]Indian Inst.of Technology Bombay, India, [2]Univ. of New Mexico, USA.* Light-mesh: an alternate solution for access networks is presented. Two heuristic topology algorithms are discussed and simulated showing cost and performance benefits.

OTuI6 • 5:45 p.m.
Dynamic Wavelength Allocation in a Converged and Scalable Interface for Metro-Access Ring Integrated Networks, *Shing-Wa Wong[1], Wei-Tao Shaw[1], Ning Cheng[1], Chumming Qiao[2], Leonid G. Kazovsky[1]; [1]Stanford Univ., USA, [2]SUNY at Buffalo, USA.* A flexible metro-access interface employs dynamic wavelength allocation to provide bandwidth sharing between access and metro traffic is proposed. Simulations show the MARIN architecture achieves superior performance and lower cost when compared to other architectures.

OTuI7 • 6:00 p.m. Invited
Development of Broadband Convergence Network and Services in Korea, *Minho Kang; Information and Communications Univ., Republic of Korea.* This paper presents the current developments of Broadband convergence Networks, Next Generation Networks, as well as emerging broadband convergence services in Korea.

Room 5

OTuJ • High-Power Fibers—Continued

OTuJ4 • 5:30 p.m.
Novel NZ-DSF for Submarine Transmission Systems without Discrete Dispersion Compensation, *Katsunori Imamura, Kazunori Mukasa, Masateru Tadakuma, Ryuichi Sugizaki, Takeshi Yagi; Furukawa Electric Co. Ltd., Japan.* NZ-DSF with negative dispersion and negative dispersion slope was realized by restrict mode excitation method. Residual dispersion compensation free submarine cable system is proposed by combination of standard SMF and fabricated fiber.

OTuJ5 • 5:45 p.m.
Cladding-Pumped Yb-Doped Solid Photonic Bandgap Fiber for ASE Suppression in Shorter Wavelength Region, *Ryuichiro Goto, Katsuhiro Takenaga, Kenji Okada, Masahiro Kashiwagi, Tomoharu Kitabayashi, Shoji Tanigawa, Kensuke Shima, Shoichiro Matsuo, Kuniharu Himeno; Fujikura Ltd., Japan.* We demonstrate suppression of amplified spontaneous emission at 1030 nm in a cladding-pumped ytterbium-doped solid photonic bandgap fiber. This fiber should play an important role for a high power fiber laser lasing around 1180 nm.

OTuJ6 • 6:00 p.m. Invited
High-Power Large-Mode Area Optical Fibers for Fiber Lasers and Amplifiers, *Bryce Samson, G. Firth, A. Carter, K. Tankala; Nufern, USA.* Increasing the mode-field area of the core-guiding region beyond standard telecom fiber designs delivers highly efficient kWatt-level fiber lasers and amplifiers operating at 1µm, based on Yb-doping and extension to 2µm using highly-efficient Tm-doped fibers.

Room 6B

OTuK • Biophotonics and Sensors—Continued

OTuK2 • 5:30 p.m. Invited
Photonic Crystal Waveguide-Based Biosensor, *Nina Skivesen[1], John Canning[1,2], Martin Kristensen[1], Cicero Martelli[1,3], Amelie Tetu[1], Lars H. Frandsen[4]; [1]iNANO and Dept. of Physics and Astronomy, Univ. of Aarkus, Denmark, [2]School of Chemistry, Univ. of Sydney, Australia, [3]School of Electrical and Information Engineering, Univ. of Sydney, Australia, [4]Dept. of Communications, Optics and Materials, Nano-DTU, COM-DTU, Denmark.* Protein detection using a photonic crystal waveguide-based biosensor is presented using two different sensing features for the device—the bandgap-edge, a common-known feature, and a novel feature arising due to polarization mixing.

OTuK3 • 6:00 p.m.
Multipoint Chemical Gas Sensing System Based on Frequency-Shifted Interferometry, *Fei Ye, Li Qian, Bing Qi; Univ. of Toronto, Canada.* We present a novel fiber-optic multipoint gas sensing scheme based on frequency-shifted interferometry. A minimum detectable concentration of 77 ppm was achieved for C_2H_2 in a two sensor system.

Room 6C

OTuL • Optical Burst/Packet Switching—Continued

OTuL5 • 5:30 p.m. Invited
Bit Rate Transparent Optical Burst Switching with Contention Resolving Wavelength Conversion, *Abdullah Al Amin[1], Katsuhiro Shimizu[1], Mitsuru Takenaka[1], Takuo Tanemura[1], Kohsuke Nishimura[2], Hiroshi Onaka[3], Tatsuo Hatta[4], Akihiko Kasukawa[5], Shinji Tsuji[6], Yuki Kondo[7], Yutaka Urino[8], Hisato Uetsuka[9], Yoshiaki Nakano[1]; [1]Univ. of Tokyo, Japan, [2]KDDI R&D Labs Inc., Japan, [3]Fujitsu Ltd., Japan, [4]Mitsubishi Electric Corp., Japan, [5]Furukawa Electric Co. Ltd., Japan, [6]Hitachi Ltd., Japan, [7]Asahi Glass Co. Ltd., Japan, [8]NEC, Japan, [9]Hitachi Cable Ltd., Japan.* Optical burst switching using fast, bit-rate transparent switches is reviewed. Random contention is handled without using optical memory by wavelength conversion. We demonstrate error-free 10 and 40Gb/s burst contention resolution in a 5x5 node prototype.

OTuL6 • 6:00 p.m.
Ultrafast FWM Self Routing between 10 Ports of Spectral Amplitude Coded 10 Gb/s Packets Set on a 25 GHz Grid with Unequally Spaced Bins, *Jose B. Rosas-Fernandez, Gefan Huang, Eng Tin Aw, Adrian Wonfor, Richard V. Penty, Ian H. White; Dept. of Electrical Engineering, Univ. of Cambridge, UK.* A novel ultrafast self routing system is demonstrated using four-wave-mixing of 10Gb/s packets spectrally-encoded in 25GHz grid bins which are unequally spaced. Codes with a maximum separation of 1.6nm enable routing to 10 different ports.

Room 6D

OTuM • Coherent Transmission—Continued

OTuM4 • 5:30 p.m.
Nonlinearity Tolerance of Direct Detection and Coherent Receivers for 43 Gb/s RZ-DQPSK Signals with Co-Propagating 11.1 Gb/s NRZ Signals over NZ-DSF, *Takahito Tanimura[1], Shoichiro Oda[1], Masahiro Yuki[1], Huijian Zhang[2], Lei Li[2], Zhenning Tao[2], Hisao Nakashima[1], Takeshi Hoshida[1], Kentaro Nakamura[1], Jens C. Rasmussen[1]; [1]Fujitsu Labs Ltd., Japan, [2]Fujitsu R&D Ctr., China.* We experimentally investigate the nonlinear impairments on 43 Gb/s RZ-DQPSK signals with direct detection and coherent receivers in a hybrid 10G/40G DWDM transmission over NZ-DSF with 50GHz channel spacing.

OTuM5 • 5:45 p.m.
Investigation of Design Options for Overlaying 40Gb/s Coherent PDM-QPSK Channels over a 10Gb/s System Infrastructure, *Oriol Bertran Pardo, Jérémie Renaudier, Haïk Mardoyan, Patrice Tran, Gabriel Charlet, Sébastien Bigo; Alcatel-Lucent Res. and Innovation, France.* To contain limitations from cross nonlinear effects caused by 10Gb/s NRZ channels onto 40Gb/s coherent PDM-QPSK channels, we investigate the benefits of optimizing the carrier phase estimation process and introducing band-gaps in the multiplex.

OTuM6 • 6:00 p.m. Invited
Coherent Based Systems for High Capacity WDM Transmissions, *Jeremie Renaudier; Alcatel-Lucent, France.* Coherent-based systems are very good candidates to upgrade 10Gb/s WDM infrastructures thanks to their high spectral efficiency and unique resistance to linear impairments, but their poor tolerance to nonlinearites at 40Gb/s has to be considered.

OTuN • Optical Amplifiers—Continued

OTuN3 • 5:30 p.m.
S Band EDFA Using Standard Erbium Doped Fiber, 1450 nm Pumping and Single Stage ASE Filtering, *Joao B. Rosolem[1], Antonio A. Juriollo[1], Murilo A. Romero[2]; [1]CPQD Foundation, Brazil, [2]Univ. of Sao Paulo, Brazil.* A double-pass EDFA designed for S band operation using standard EDF is evaluated. It is demonstrated that the proposed amplifier configuration using single amplification and filtering stage can be very efficient, although requiring gain equalization

OTuN4 • 5:45 p.m.
Er^{3+}-Doped Fluorophosphate Glass Fiber with Ultra Low Nonlinearity for Suppressing Four-Wave-Mixing in L-Band EDFA, *Shinichi Aozasa, Atsushi Mori, Kiyoshi Oikawa, Makoto Yamada, Hirotaka Ono, Hirohisa Kanbara, Kazunori Naganuma; NTT Corp., Japan.* We developed Er^{3+}-doped fluorophosphate glass fiber with low nonlinearity. With an L-band EDFA employing the fiber the four-wave-mixing crosstalk was 10 dB less than when employing an Er^{3+}-doped silica fiber with low nonlinearity.

OTuN5 • 6:00 p.m.
Er/Ce Codoped Tellurite Fibre Amplifier for High-Gain and Low-Noise Operation, *Yongqiang Wei[1], Agarwal Harsh[1], Richard V. Penty[1], Ian H. White[1], Shaoxiong Shen[2], Animesh Jha[2]; [1]Univ. of Cambridge, UK, [2]Univ. of Leeds, UK.* A high performance Er/Ce codoped tellurite fibre amplifier is presented. A 980-nm pumped fibre of only 22 cm length exhibits a net peak gain of 22 dB and a noise figure (NF) below 4.4 dB.

OTuO • Digital Signal Processing—Continued

OTuO4 • 5:30 p.m.
Demodulation of 320-Gbit/s Optical Quadrature Phase-Shift Keying Signal with Digital Coherent Receiver Having Time-Division Demultiplexing Function, *Kazuro Kikuchi[1], Koji Igarashi[1], Yojiro Mori[2], Chao Zhang[2]; [1]Dept. of Frontier Informatics, Univ. of Tokyo, Japan, [2]Dept. of Electronic Engineering, Univ. of Tokyo, Japan.* We demodulate a 320-Gbit/s optical quadrature phase-shift keying (QPSK) signal using a novel digital coherent receiver, which features a function of time-division demultiplexing with a local oscillator pulsed at the 10-GHz base-clock frequency.

OTuO5 • 5:45 p.m.
Nonlinear Inter-Channel Crosstalk Compensation Using Electronic Pre-Distortion in Carrier Phase Locked WDM, *Fumikazu Inuzuka, Etsushi Yamazaki, Kazushige Yonenaga, Atsushi Takada; NTT Network Innovation Labs, Japan.* This paper shows electronic pre-compensation of nonlinear inter-channel crosstalk induced by four-wave mixing in 3-channel carrier phase-locked WDM. Experimental results show that carrier phase locking and electric pre-distortion successfully suppress the waveform distortion.

OTuO6 • 6:00 p.m.
Joint Electronic Dispersion Compensation for DQPSK, *Torsten Freckmann, Carlos Valerio González, José M. Ruiz-Cabello Crespo; Univ. of Stuttgart, Germany.* We investigate electronic dispersion compensation for DQPSK based on linear and nonlinear feed-forward and decision feedback equalizers and maximum likelihood sequence estimation. We propose joint processing of the two tributaries to exploit any cross-coupling.

NTuC • Technologies for FTTH—Continued

NTuC3 • 5:30 p.m. Tutorial
Bend Insensitive Fiber Design Strategies, *David Peckham; OFS Labs, USA.* Optical fiber deployment deep into the telecom network has renewed the interest in bending sensitivity. In this presentation we will discuss bending loss of single mode fibers and design techniques to improve bending sensitivity.

David W. Peckham received the BS and ME degrees in Electrical Engineering from the University of Florida. He started his career at the Bell Labs Transmission Media Laboratory in Norcross, GA, in 1982 working on optical fiber measurement techniques. Since 1989 he has focused on the design, process development and commercialization of optical fibers for high capacity transmission systems at Bell Labs, Lucent Technologies and currently OFS. He received the 2002 OSA Engineering Excellence Award recognizing his contributions in the design and commercialization of fibers enabling high speed, wideband WDM networks. He is currently a CMTS/Research Fellow at OFS.

NTuD • Network Optimization—Continued

NTuD4 • 5:30 p.m.
Network Cost Savings from Router Bypass in IP-over-WDM Core Networks, *Serge Melle, Drew Perkins, Curtis Villamizar; Infinera, USA.* Optimization of IP and WDM network architecture using IP router link bypass provides cost savings in both layers. Results indicate that optimal level of router bypass varies with total traffic volume and router interface speed.

NTuD5 • 5:50 p.m. Invited
The Optimized Architecture for Transition to All Packet Transport, *Jin-Yi Pan, Enhui Jing, Lingguang Zhou; Nokia Siemens Networks, China.* We compared three architectures for the performance and cost analysis. We found out in the transaction from TDM to all Packet Transport, the most reliable and cost effective architecture is the Hybrid Switch architecture.

Room 4	Room 5	Room 6B	Room 6C	Room 6D
OTuI • Access and Metro Networks—Continued	**OTuJ • High-Power Fibers—Continued**		**OTuL • Optical Burst/Packet Switching—Continued**	**OTuM • Coherent Transmission—Continued**

OTuL7 • 6:15 p.m.
640 ($2 \times 32\lambda \times 10$) Gbit/s Polarization-Multiplexed, Wide-Colored Optical Packet Switching Achieved by Polarization-Independent High-Speed PLZT Switch, *Hideaki Furukawa[1], Naoya Wada[1], Naganori Takezawa[1], Keiichi Nashimoto[2], Tetsuya Miyazaki[1]; [1]Natl. Inst. of Information and Commnunications Technology, Japan, [2]EpiPhotonics Inc., USA.* We demonstrate 640 ($2 \times 32\lambda \times 10$) Gbit/s polarization-multiplexed, wide-colored optical packet switching by using a polarization-independent and high-speed (<2.5ns) PLZT optical switch to attain error-free (bit-error-rate<10^{-9}) operation for all 64 payload channels.

6:30 p.m.–8:00 p.m. Conference Reception, *Sails Pavilion*

Notes

Room 6E

OTuN • Optical Amplifiers—Continued

OTuN6 • 6:15 p.m.
PMD Assisted Pump to Signal Noise Transfer in Distributed Fiber Raman Amplifiers, *Shifeng Jiang, Philippe Gallion; Ecole Natl. Supérieure des Télécommunications, CNRS, France.* We present a theoretical analysis on the PMD assisted pump to signal noise transfer in distributed fiber Raman amplifiers. New noise mechanisms are pointed out, and their impacts on the system performance are then analyzed.

Room 6F

OTuO • Digital Signal Processing—Continued

OTuO7 • 6:15 p.m.
10 Gb/s and 20 Gb/s Extended-Reach Multimode-Fiber Datacommunication Links Using Multilevel Modulation and Transmitter-Based Equalization, *Jonathan D. Ingham, Richard V. Penty, Ian H. White; Univ. of Cambridge, UK.* Extended-reach operation of 10 Gb/s and 20 Gb/s multimode-fiber links is considered using multilevel modulation formats and equalization. Rigorous simulations indicate the feasibility of 300 m operation at 20 Gb/s using transmitter-based equalization.

Room 7

Room 8

NTuC • Technologies for FTTH—Continued

Room 9

NTuD • Network Optimization—Continued

6:30 p.m.–8:00 p.m. Conference Reception, *Sails Pavilion*

Notes