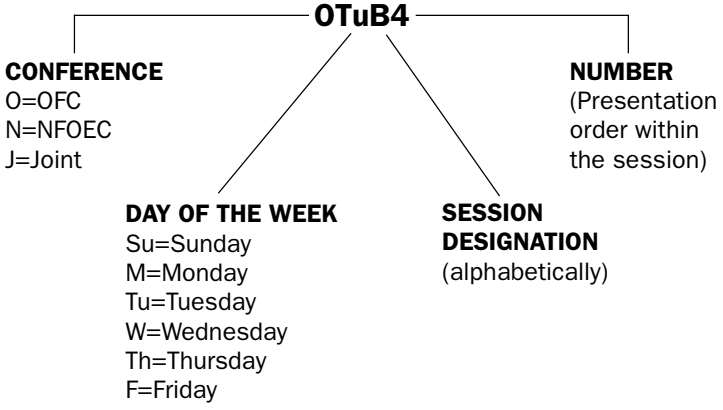
2006 OFC/NFOEC TECHNICAL SESSION ABSTRACTS

EXPLANATION OF SESSION CODES

The first letter of the code designates the Conference (O=OFC, N=NFOEC, J=Joint). The second character denotes the day of the week (Sunday=Su, Monday=M, Tuesday=Tu, Wednesday=W, Thursday=Th, Friday=F). The third character indicates the session within the particular day the talk is being given. Each day begins with the letter A and continues alphabetically. The number on the end of the code signals the position of the talk within the session (first, second, third, etc.). For example, a session numbered OTuB4 indicates that this paper is part of OFC (O) and is being presented on Tuesday (Tu) during the second session (B), and is the fourth paper (4) presented in that session.



Anaheim Mariott Hotel, Marquis Ballroom

8:30 a.m.–11:00 a.m.	**JTuA, OFC/NFOEC Plenary Session**
10:00 a.m.–5:00 p.m.	**Exhibit Hall Open**
12:00 p.m.	**Poster Preview (Exhibit Hall)**

Anaheim Convention Center, Exhibit Hall D

Market Watch

12:00 p.m.–2:00 p.m.
Business and Management Insights
Moderator: *Milton Chang; Incubic, LLC, USA*
Speakers:
Innovation: The Engine of Global Broadband Networks, *Rod Alferness; Bell Labs, Lucent Technologies, USA*
Global Communication Services, *Henry Kressel; Warburg Pincus LLC, USA*
Building the Broadband Connected Community, *Karl May; OpVista, USA*
(See pages 14-15 for details.)

Market Watch

3:00 p.m.–5:00 p.m.
Drivers for an Optical Re-Emergence
Moderator: *Serge Mille; Infinera, USA*
Speakers:
Network Evolution in North America: The Expanding Role of Optics, *Ronald J. Kline; Ovum, USA*
Wireline Resurrection: The New Optical Networking Agenda, *Stéphane Téral; 10th Street Advisors, USA*
Beyond the Internet: Emerging Bandwidth Drivers, *Stuart Elby; Verizon Network Services Group, USA*
(See page 15 for details.)

Ballroom A

2:00 p.m.–4:00 p.m.
OTuA • SBS and Slow Light in Fibers
Ekaterina Golovchenko; Tyco Telecommunications, USA, Presider

OTuA1 • 2:00 p.m. Tutorial
Slow Light in Bulk Materials and Optical Fibers, *Robert Boyd; Inst. of Optics, Univ. of Rochester, USA.* We describe recent progress in the development of techniques for controlling the velocity of light and for using these techniques to develop devices such as buffers for use in telecommunications.

Robert W. Boyd received a B.S. in physics from MIT and a Ph.D. in physics in 1977 from the University of California at Berkeley. His Ph.D. thesis was supervised by Charles Townes and involves the use of nonlinear optical techniques in infrared detection for astronomy. Professor Boyd joined the faculty of the University of Rochester in 1977 and is presently the M. Parker Givens Professor of Optics and Professor of Physics. His research interests include quantum imaging and fundamental studies of nonlinear optical interactions. He is a fellow of the Optical Society of America and the American Physical Society and a past chair of the Division of Laser Science of the American Physical Society.

Ballroom B

2:00 p.m.–3:30 p.m.
OTuB • High Bit Rate Systems
Reinhold Ludwig; Heinrich-Hertz-Inst., Germany, Presider

OTuB1 • 2:00 p.m.
Optical Demultiplexing of up to 200 Gb/s Data Employing Asymmetric Switching Pulses, *Jie Li, Anders Berntson, Gunnar Jacobsen; Acreo AB, Sweden.* A detailed study on all-optical switching based on one switching pulse edge through cross-phase modulation was carried out. Optical demultiplexing of up to 200 Gb/s data has been demonstrated by merely using 11.7 ps asymmetric switching pulses.

OTuB2 • 2:15 p.m.
The Impact of Gating Timing Jitter on a 160 Gb/s Demultiplexer, *Darko Zibar, Leif Katsuo Oxenløwe, Hans Christian Hansen Mulvad, Jesper Mørk, Michael Galili, Anders Thomas Clausen, Palle Jeppesen; Res. Ctr. COM, Technical Univ. of Denmark, Denmark.* The impact of gating timing jitter on a 160Gb/s demultiplexer is investigated by using two pulse sources with different timing jitter properties. It is found that jitter in the range 20kHz-10MHz is essential to minimize.

Ballroom C

2:00 p.m.–4:00 p.m.
OTuC • WDM PON Advances
Cedric Lam; Metro Optical Systems, Opvista Inc., USA, Presider

OTuC1 • 2:00 p.m.
RSOA Based Optical Network Units for WDM-PON, *Cristina Arellano[1], Carlos Bock[1], Josep Prat[1], Klaus-Dieter Langer[2]; [1]Univ. Politècnica de Catalunya, Spain, [2]Fraunhofer Inst. for Telecommunications, Heinrich-Hertz-Inst., Germany.* Designs of low cost ONU for WDM-PON are presented and evaluated. Reflective-SOAs are proposed to be used as core of the ONU in a bidirectional single-fiber single-wavelength topology. FEC is employed to mitigate crosstalk effects.

OTuC2 • 2:15 p.m.
Reducing the Backreflection Impact by Using Gain-Saturated SOA in WDM Single-Fiber Loopback Access Networks, *Masamichi Fujiwara, Hiro Suzuki, Katsumi Iwatsuki; NTT Access Network Service Systems Labs, Japan.* This paper reduces the impact of backreflection in WDM single-fiber loopback access networks by using a gain-saturated SOA. We presented the concept and experimentally confirmed that the gain-saturated SOA significantly improves the SNR of upstream signal.

Ballroom D

2:00 p.m.–4:00 p.m.
OTuD • Novel Optical Waveguide Amplifiers and Applications
Atul Srivastava; Bookham Technology, USA, Presider

OTuD1 • 2:00 p.m. Invited
Waveguide Amplifier Design and Integration, *Sergey V. Frolov; Inplane Photonics, USA.* A new level of waveguide integration is demonstrated. We discuss the performance of a waveguide amplifier, a crucial building block in our library of elements. New circuits, such as an amplified reconfigurable add-drop, are shown as examples of optical integration.

Ballroom E

2:00 p.m.–3:45 p.m.
OTuE • Electronic Impairment Compensation
Misha Boroditsky; AT&T Labs - Res., USA, Presider

OTuE1 • 2:00 p.m. Invited
Advances in SiGe ICs for 40G Signal Equalization, *Hong Jiang, Ross Saunders; StrataLight Communications, USA.* IC technologies and major equalizer structures were discussed for designing a 40Gb/s equalizer chip. Insights, suggestions or comments were given on designing all building blocks for an equalizer circuit, design methodology, and packaging the die.

Room 304 A/B

2:00 p.m.–3:45 p.m.
OTuF • WSSs and ROADMs
Paul Colbourne; JDS Uniphase, Canada, Presider

OTuF1 • 2:00 p.m.
Silicon-Based Monolithic 4x4 Wavelength-Selective Cross Connect with On-Chip Micromirrors, *Chao-Hsi Chi[1,2], Jui-Che Tsai[3], Dooyoung Hah[4], Sagi Mathai[2], Ming-Chang M. Lee[5], Ming C. Wu[2]; [1]Univ. of California at Los Angeles, USA, [2]Univ. of California at Berkeley, USA, [3]Natl. Taiwan Univ., Taiwan Republic of China, [4]Louisiana State Univ., USA, [5]Natl. Tsing Hua Univ., Taiwan Republic of China.* A monolithic 4x4 wavelength-selective cross-connect (chip area = 3.2x4.6 cm^2) is realized by integrating four 4x1 MEMS wavelength-selective switches and four 1x4 passive splitters, together with a 4x4 waveguide shuffle network on a silicon-on-insulator. Wavelength-selective routing has been successfully demonstrated.

OTuF2 • 2:15 p.m.
Highly Programmable Wavelength Selective Switch Based on Liquid Crystal on Silicon Switching Elements, *Glenn Baxter, Steven Frisken, Dmitri Abakoumov, Hao Zhou, Ian Clarke, Andrew Bartos, Simon Poole; Engana Pty Ltd, Australia.* We present a novel Wavelength Selective Switch (WSS) based on a Liquid Crystal on Silicon (LCOS) switching element. The unit operates simultaneously at both 50 and 100 GHz channel spacing and is compatible with 40 G transmission requirements.

Room 303 A

2:00 p.m.–4:00 p.m.
OTuG • Optical Network Architectures I
Ori A. Gerstel; Cisco Systems, USA, Presider

OTuG1 • 2:00 p.m. Invited
Design of Multi-Tier Networks to Support Data-Intensive Applications, *Scott Davidow, Donald G. Duff, Brice T. Womack, Glenn J. Higgins, William C. Daus, Shujia Zhou, Elizabeth F. Martin; Northrop Grunman, USA.* There is an increasing interest in transferring large terabyte and petabyte sized files to support scientific and government applications. Such applications require dynamic acquisition of dedicated and deterministic data services. GMPLS networks under development can address this demand.

Room 303 B

2:00 p.m.–4:00 p.m.
NTuA • FTTX Infrastructure
Al Brunsting; Panduit Corp., USA, Presider

NTuA1 • 2:00 p.m.
Flexible FTTX Deployment Using Segmented Ribbon and Bend Insensitive Fiber, *Patrick Van Vickle, Steve Stokes, George Mackie; Sumitomo Electric Lightwave, USA.* A new type of fiber optic ribbon allowing breakouts in 4 or 8 fiber denominations and a new bend insensitive singlemode fiber for tight FTTX deployments have been developed.

NTuA2 • 2:20 p.m.
The Use of Multi-Fiber Ferrules in FTTP Applications, *Dennis Knecht, James P. Luther; Corning Cable Systems, USA.* The fiber-to-the-premises initiative (FTTP) has required a focused effort to devise the most effective solutions for construction of outside plant infrastructure. The outcome is a preconnectorized solution for the distribution network based on the MT ferrule.

Room 303 C

2:00 p.m.–4:00 p.m.
NTuB • Ethernet's Real Deal: A Discussion of Service Providers' Real-World Experiences Developing, Managing and Delivering Ethernet Services
Panel discussion organized by Umesh Kukreja; Atrica, Inc., USA

Service providers of all types are developing creative Ethernet service strategies, and they are having to address a host of issues from the business strategy, technical, competitive, and financial perspectives. Issues such as service definition, competitive positioning, target marketing, infrastructure choices, and service management must be considered, as well as customizing offerings to best fit their customers. This panel will deliver 'Real World' case studies from service providers that have rolled out Ethernet service offerings, highlighting the issues, challenges, and rewards they have experienced. Attendees will leave with a clearer understanding of their options for pursuing and deploying successful Ethernet services offerings.

Room 303 D

2:00 p.m.–4:00 p.m.
NTuC • 40Gbps Technology/ PMD
Thomas Wood; Lucent, USA, Presider

NTuC1 • 2:00 p.m. Invited
Transmission of 40 Gbps Signals Through Metropolitan Networks Engineered for 10 Gbps Signals, *Mark Boduch[1], Ken Fisher[1], Oleg Leonov[1], Jim Grzyb[1], Ted Schmidt[2], Ross Saunders[2], Luc Ceuppens[2]; [1]Tellabs, Inc., USA, [2]StrataLight Communications, Inc., USA.* A key design driver for 40 Gbps technology is it should seamlessly integrate with existing 10 Gbps systems. Parameters that must be analyzed to assure seamless integration include chromatic dispersion, PMD, and filtering effects.

Ballroom A

OTuA • SBS and Slow Light in Fibers—Continued

Ballroom B

OTuB • High Bit Rate Systems—Continued

OTuB3 • 2:30 p.m. Invited
80+ Gbit/s ETDM Systems Implementation: An Overview of Current Technology, *Thomas Lee; SHF Communication Technologies AG, Germany.* This presentation will show recent advances in the fields of ultra-high speed microelectronics and electro-optics technologies has made possible the implementation and successful demonstration of ETDM-based optical transmission systems at bit rates in excess of 80 GBit/s.

Ballroom C

OTuC • WDM PON Advances—Continued

OTuC3 • 2:30 p.m. Invited
Broadband Access Technology and Asia Market for FTTH and IP-DSLAM, *James Mao; UTStarcom, USA.* No abstract available.

Ballroom D

OTuD • Novel Optical Waveguide Amplifiers and Applications—Continued

OTuD2 • 2:30 p.m.
Waveguide Amplifier for All-Optical WDM Network, *T. Rogowski[1], S. Taccheo[2], J. Shmulovich[3], K. Ennser[4]; [1]Scuola Superiore Sant'Anna, Italy, [2]INFM - Dept. di Fisica - Politecnico di Milano - IFN-CNR, Italy, [3]Inplane Photonics, USA, [4]CNIT Natl. Lab of Photonic Networks, Italy.* We demonstrate a gain clamped waveguide amplifier design suitable for all-optical WDM network. We show negligible extra noise figure penalty and strong immunity from channel reconfiguration or network failure. This configuration can be fully integrated yielding compact low-cost mass production.

OTuD3 • 2:45 p.m.
Design and Characterization of Ultra-Compact Er-Doped Waveguide Amplifier Based on Bisumuthate Glass, *Motoshi Ono, Yuki Kondo, Junich Kageyama, Hideaki Hayashi, Naoki Sugimoto; Asahi Glass Co.,Ltd, Japan.* We have designed and evaluated two types of spiral lightwave circuits for 1-cm2-size high performance waveguide amplifier. Circle-spiral layout is found to show higher performance compared to square-spiral layout because of low bending loss.

Ballroom E

OTuE • Electronic Impairment Compensation—Continued

OTuE2 • 2:30 p.m.
10Gb/s Transmission over 300m OM3 Fiber From 990-1080nm with Electronic Dispersion Compensation, *Yi Sun[1], Mohammed E. Ali[2], Kasyapa Balemarthy[3], Robert L. Lingle Jr[1], Stephen E. Ralph[3], Brian E. Lemoff[2]; [1]OFS, USA, [2]Agilent Labs, USA, [3]Georgia Tech., USA.* We demonstrate numerically and experimentally the transmission of 10Gb/s over OM3 fibers up to 300m, under low-cost VCSEL launch conditions from 990-1080nm with electronic dispersion compensation (EDC), showing a path to low cost 40Gbps links.

OTuE3 • 2:45 p.m.
Experimental Results of EDC Based Receivers for 2400 ps/nm at 10.7 Gb/s for Emerging Telecom Standard, *Ali Ghiasi[1], Frank Chang[2], Badri Gomatam[2], Edem Ibragimov[3], Shanbhag Abhijit[3], Oswin Schreiber[4], Ram Jambunathan[5], Jerry Wood[6], Eric Su[4], Adil Dastur[1], George Noh[2], Keith Conroy[4], Afshin Momtaz[1]; [1]Broadcom, USA, [2]Vitesse, USA, [3]Scintera Networks, USA, [4]Applied Microcircuit Corp., USA, [5]Apogee Photonics, USA, [6]Essex Corp., USA.* Extensive experimental work with Electronic Dispersion Compensation, a critical new technology for Metro 10.7 Gb/s networks, was carried out by multiple companies. The results supporting 2400 ps/nm link are presented and form the bases for emerging Telecom application codes.

3:00 p.m.–5:00 p.m. ***Market Watch:*** **Drivers for an Optical Re-Emergence, Exhibit Hall D (see pg. 15)**

Room 304 A/B

OTuF • WSSs and ROADMs—Continued

OTuF3 • 2:30 p.m. Invited
Four-Degree Hub Switch Module Using Multi-Chip Planar Lightwave Circuit Integration Technology for Transparent ROADM Ring Interconnection, *Takashi Goh, Motohaya Ishii, Takayuki Mizuno, Shin Kamei, Ikuo Ogawa, Hidenobu Hirota, Yasuaki Tamura, Masaru Kobayashi, Masahiro Yanagisawa, Shunichi Sohma, Akimasa Kaneko; NTT Corp., Japan.* We have developed a PLC-based 32-wavelength 4-degree hub switch module, which consists of a broadcast coupler with a demultiplexer for local-drop, and a WSS with wavelength specific ports for local-add. The module size is 220x135x14 mm.

Room 303 A

OTuG • Optical Network Architectures I—Continued

OTuG2 • 2:30 p.m.
Multi-Dimensional Optical Code Processing in MPLS Photonic Routers, *Gabriella Cincotti[1], Michela Svaluto Moreolo[1], Gianluca Manzacca[1], Xu Wang[2], Naoya Wada[2], Ken-ichi Kitayama[3]; [1]Univ. of Roma TRE, Italy, [2]Natl. Inst. of Information and Communications Technology of Japan, Japan, [3]Osaka Univ., Japan.* A multi-dimensional passive encoder/decoder has been characterized that can generate/process about 13000 different labels, with a label processing speed of 13.3 Glabel/s and a packet loss probability of 10^{-9} for a SNR of 23 dB.

OTuG3 • 2:45 p.m.
Waveband Switching Efficiency in WDM Networks: Analysis and Case Study, *Payam Torab, Virginia Hutcheon, David Walters, Abdella Battou; Lambda OpticalSystems Corp., USA.* We study the optical port saving under uniform waveband switching, and derive the network and traffic conditions that make waveband switching efficient. We show that waveband switching reduces optical ports by up to 25% for a sample backbone netrwork.

Room 303 B

NTuA • FTTX Infrastructure—Continued

NTuA3 • 2:40 p.m.
The Comparison and Evaluation of Textile Innerduct vs. Rigid Innerduct Installations and Applications, *John Hepfinger; MaxCell, USA.* Textile innerducts claim easier cable installation compared to High Density Polyethylene conduits. Controlled testing of configurations was conducted to test performance. Results revealed textile innerducts can reduce cable pulling tension up to 60 percent vs. rigid innerduct.

Room 303 C

Room 303 D

NTuC • 40Gbps Technology/PMD—Continued

NTuC2 • 2:40 p.m.
Spectral Efficient Transmission of 40Gbps per Channel over 50GHz Spaced DWDM Systems Using Optical Carrier Suppression, Separation and Optical Duobinary Modulation, *Lei Xu[1], Ting Wang[1], Arshad M. Chowdhury[2], Jianjun Yu[2], Gee-Kung Chang[2], Kiyoshi Fukuchi[3], Toshiharu Ito[3]; [1]NEC Labs America, USA, [2]Georgia Tech, USA, [3]NEC Corp., Japan.* A novel scheme of transmitting 40-Gb/s/channel over 50-GHz spaced DWDM systems is realized by optical carrier suppression and separation technique and optical duobinary modulation. Through simulation, we evaluate the performance of the proposed scheme.

3:00 p.m.–5:00 p.m. ***Market Watch:*** **Drivers for an Optical Re-Emergence, Exhibit Hall D (see pg. 15)**

Ballroom A

OTuA • SBS and Slow Light in Fibers—Continued

OTuA2 • 3:00 p.m.
Broad-Bandwidth Brillouin Slow Light in Optical Fibers, *Miguel Gonzalez-Herraez[1,2], Kwang-Yong Song[2,3], Luc Thevenaz[2]; [1]Dept. of Electronics, Univ. of Alcala, Spain, [2]EPFL Lab of Nanophotonics and Metrology, Switzerland, [3]Univ. of Tokyo, Japan.* We experimentally demonstrate that Brillouin slow light with an arbitrary large bandwidth can be readily obtained in conventional optical fibers using a simple and inexpensive pump spectral broadening technique.

OTuA3 • 3:15 p.m.
Nonlinear Optical Fibers with Increased SBS Thresholds, *Scott R. Bickham, Andrey Kobyakov, Shenping Li; Corning, Inc., USA.* Novel profile designs are used to suppress stimulated Brillouin scattering in nonlinear fibers. The measured SBS thresholds of prototype fibers are 3 to 6 dB higher than those of conventional nonlinear fibers.

Ballroom B

OTuB • High Bit Rate Systems—Continued

OTuB4 • 3:00 p.m.
Clock Extraction from 160-Gbit/s Signal Using Optoelectronic Phase-Locked Loop Based on Optical Phase Modulation and Spectral Filtering, *Koji Igarashi, Kazuhiro Katoh, Kazuro Kikuchi; Univ. of Tokyo, Japan.* We propose a novel phase-locked loop (PLL) for clock extraction using an optoelectronic phase comparator based on phase modulation and spectral filtering. With such PLL, a low-noise 10-GHz clock is extracted from a 160-Gbit/s signal.

OTuB5 • 3:15 p.m.
Demultiplexing 160/320 Gb/s to 40 Gb/s Using a Single SOA Assisted by an Optical Filter, *Eduward Tangdiongga, Yong Liu, Huug de Waardt, Djan Khoe, Harm Dorren; Eindhoven Univ. of Technology, The Netherlands.* Error-free demultiplexing of 40-Gb/s base-rate channels out of a 160-Gb/s OTDM signal is achieved using a single SOA and an optical filter. Performance of demultiplexing 320 Gb/s using this technique is also presented.

Ballroom C

OTuC • WDM PON Advances—Continued

OTuC4 • 3:00 p.m.
Demonstration of a RSOA-Based Wavelength Remodulation Scheme in 1.25Gbit/s Bidirectional Hybrid WDM-TDM PON, *Franck Payoux[1], Philippe Chanclou[1], Thomas Soret[1], Naveena Genay[1], Romain Brenot[2]; [1]France Telecom, France, [2]Alcatel-Thales III-V Lab, France.* We propose a WDM-TDM PON architecture with a RSOA-based colorless ONU where the downstream wavelength shared between 8 or 16 users is remodulated to generate upstream signals. 1.25 Gbit/s down- and up-stream transmissions were demonstrated over single-fibre and two-fibre architectures.

OTuC5 • 3:15 p.m.
16 x 1.25 Gbit/s WDM-PON Based on ASE-Injected R-SOAs in 60 °C Temperature Range, *H. S. Shin, D. K. Jung, D. J. Shin, S. B. Park, J. S. Lee, I. K. Yun, S. W. Kim, Y. J. Oh, C. S. Shim; Samsung Electronics, Republic of Korea.* A specially designed R-SOA with high gain and wider modulation bandwidth is introduced. The injection power requirement and the viable temperature range are experimentally analyzed in 16 x 1.25 Gbit/s WDM-PON based on ASE-injected R-SOAs.

Ballroom D

OTuD • Novel Optical Waveguide Amplifiers and Applications—Continued

OTuD4 • 3:00 p.m.
Waveguide Amplifiers in Sputtered Films of Er^{3+}-Doped Chalcogenide Glass, *Jesse A. Frantz[1], L. Brandon Shaw[2], Jasbinder S. Sanghera[2], Ishwar D. Aggarwal[2]; [1]SFA, Inc., USA, [2]NRL, USA.* We demonstrate the first chalcogenide glass waveguide amplifiers operating at a wavelength of 1.5 μm. The amplifiers, patterned in films of Er^{3+}-doped gallium lanthanum sulfide glass, exhibit a total internal gain of 6.7 dB (2.8 dB/cm).

OTuD5 • 3:15 p.m.
Transmission and Interactions of WDM Burst Signals in Cascaded EDFAs, *Andrew Lieu, Cechan Tian, Takao Naito; Fujitsu Labs of America, Inc, USA.* By use of AGC technology based on electrical feedforward and feedback, gain excursions of optical burst amplification in six cascaded EDFAs, with or without interaction of another burst, is suppressed to 1 dB or less.

Ballroom E

OTuE • Electronic Impairment Compensation—Continued

OTuE4 • 3:00 p.m.
Receiver-Side Electronic Dispersion Compensation Using Passive Optical Field Detection for Low Cost 10Gbit/s 600 km-Reach Applications, *Andrew D. Ellis, Mary E. McCarthy; Univ. College Cork, Ireland.* We show, for the first time, a simple receiver-based signal processing technique, which provides access to the full optical field and enables EDC at 10.7Gbit/s over 600 km SMF whilst compatible with low cost transmitters.

OTuE5 • 3:15 p.m. Invited
Application of Digital Equalization in Optical Transmission Systems, *Andreas Färbert; ADVA AG Optical Networking, Germany.* Digital Equalization found its way into optical transmission systems through the implementation of Maximum Likelihood Sequence Estimation (MLSE) in high end signal processing chips. Application results of this equalization technique are shown and discussed.

Room 304 A/B

OTuF • WSSs and ROADMs—Continued

OTuF4 • 3:00 p.m.
Data Transmission through a 1014-Channel Two-Dimensional Array Wavelength Demultiplexer, *Trevor K. Chan, Rui Jiang, Nikola Alic, Stojan Radic, Joseph E. Ford; Univ. of California at San Diego, USA.* Our hybrid AWG/grating demultiplexes 1014 wavelengths into a 26x39 array measured by an InGaAs camera and scanned output fiber. For 700 outputs over 1270-1700nm the loss was <10dB for all channels measured. BER measurement shows 0.1dB penalty at 10Gb/s.

OTuF5 • 3:15 p.m.
A Reconfigurable Optical Add-Drop Multiplexer Architecture Employing Opto-VLSI Processing, *Chung-Kiak Poh, Kamal Alameh, Zhenglin Wang; Ctr. of Excellence for Microphotonic Systems, Electron Science Res. Inst., Australia.* A Reconfigurable Optical Add/Drop Multiplexer (ROADM) architecture using an Opto-VLSI processor is demonstrated. Experimental results for a 6-channel ROADM show interchannel crosstalk of less than -25dB and inter-port isolation better than 20 dB.

Room 303 A

OTuG • Optical Network Architectures I—Continued

OTuG4 • 3:00 p.m.
A Generic Autonomous Clustering-Based Heterogeneous Waveband Switching Architecture in WDM Networks, *Mengke Li, Byrav Ramamurthy; Univ. of Nebraska, USA.* Heterogeneous waveband switching (HeteroWBS) in WDM networks reduces the network operational costs. We propose an autonomous clustering-based HeteroWBS architecture to support the design of efficient HeteroWBS algorithms under dynamic traffic requests in such a network.

OTuG5 • 3:15 p.m.
40 Gbit/s Packet-Wavelength-Selective, Reconfigurable Optical Add/Drop Multiplexing Using Label-Selectivity-Enhanced Optical En/Decoder and Wide-Passband AOTF, *Nobuyuki Kataoka[1], Naoya Wada[2], Kyosuke Sone[3], Yasuhiko Aoki[3], Hiroshi Miyata[4], Susumu Kinoshita[4], Hideyuki Miyata[4], Hiroshi Onaka[4], Kenichi Kitayama[1]; [1]Osaka Univ., Japan, [2]Natl. Inst. of Information and Communications Technology, Japan, [3]Fujitsu Labs Ltd., Japan, [4]Fujitsu Ltd., Japan.* We demonstrate the packet-wavelength-selective reconfigurable OADM network on 16-wavelength x 40-Gbit/s NRZ signal using a label-selectivity-enhanced optical en/decoder and wide-passband AOTF. Error-free operations for all 16-wavelength channels at three nodes with 100-km transmission are realized.

Room 303 B

NTuA • FTTX Infrastructure—Continued

NTuA4 • 3:00 p.m.
Making the Right Fiber Cable Choice Can Improve Overall Performance of Distribution Cables in the PON, *Trevor Smith[1], Gary Bishop[2]; [1]ADC, USA, [2]Sumitomo Electric Lightwave, USA.* In the distribution portion of the PON network for FTTP architectures, your choice of fiber cabling directly impacts ease of installation and future performance. This session focuses on fiber density and hybrid design, detailing the fiber requirements of connectorized distribution.

NTuA5 • 3:20 p.m.
SC/APC Fiber Optic Connectors Connected and Disconnected under High Optical Power, *Dimitrios S. Kokkinos[1], Costas Saravanos[2], Wendy Stanford[2], Wenjia Wang[1], Yan Hua[2]; [1]Verizon, USA, [2]Corning Cable Systems, USA.* No optical damage was found in fiber optics connectors, with clean end faces, for multiple connections and disconnections under high optical power. This finding is useful in optical transport of analog video in Fiber-To-The-Premises applications.

Room 303 C

Room 303 D

NTuC • 40Gbps Technology/PMD—Continued

NTuC3 • 3:00 p.m. Invited
Field Measurement of PMD Using Four Common Measurement Techniques, *Osman Gebizlioglu[1], John W. Peters[1], Mustafa R. Ozgur[1], Douglas Teller[2]; [1]Telcordia Technologies, USA, [2]BellSouth Telecommunications, USA.* First-order PMD (Polarization Mode Dispersion) measurements in North American telecommunications networks were conducted by using test instruments based on four distinct methodologies. These new PMD measurement results are presented and discussed to show general agreement between different approaches.

Ballroom A

OTuA • SBS and Slow Light in Fibers—Continued

OTuA4 • 3:30 p.m. Invited
Fiber Designs for Reducing Stimulated Brillouin Scattering, *Ming-Jun Li, Xin Chen, Ji Wang, A. Boh Ruffin, Donnell T. Walton, Shenping Li, Daniel A. Nolan, Stuart Gray, Luis A. Zenteno; Corning Inc., USA.* This paper discusses stimulated Brillouin scattering (SBS) in optical fibers. Theoretical approach for analyzing the SBS in fiber is described. Different fiber design methods for reducing the SBS effect are presented.

Ballroom B

Ballroom C

OTuC • WDM PON Advances—Continued

OTuC6 • 3:30 p.m.
A Simple High-Speed WDM PON Utilizing a Centralized Supercontinuum Broadband Light Source for Colorless ONUs, *Bo Zhang, Chinlon Lin, Li Huo, Zhaoxin Wang, Chun-Kit Chan; Chinese Univ. of Hong Kong, Hong Kong Special Administrative Region of China.* We propose a simple high-speed WDM-PON, using a centralized supercontinuum broadband light source based on a nonlinear PCF for upstream optical carriers. "Colorless" ONU operation has been demonstrated in a 10Gb/s bidirectional transmission over 40 km distance.

OTuC7 • 3:45 p.m.
BER Performance on Access Network Using Centralized Light Sources and Single Mode + Multi Mode Fiber, *Jaedon Kim[1], Scott S.-H. Yam[2], David Gutierrez[1], Leonid G. Kazovsky[1]; [1]Stanford Univ., USA, [2]Queen's Univ., Canada.* An access network using a centralized light sources (CLS) and multi mode fiber (MMF) is proposed and verified using BER measurements. Results show that we can implement CLS based PON using currently existing MMF infrastructure.

Ballroom D

OTuD • Novel Optical Waveguide Amplifiers and Applications—Continued

OTuD6 • 3:30 p.m. Invited
Recent Progress of Self-Assembled Quantum Dot Optical Devices for Optical Telecommunication: Temperature-Insensitive 10 Gb/s Directly Modulated Lasers and 40 Gb/s Signal-Regenerative Amplifiers, *Misturu Sugawara[1,2], T. Akiyama[1,2], T. Yamamoto[1], Y. Nakata[3], N. Hatori[3], M. Ishida[3], H. Ebe[3], Y. Arakawa[3]; [1]Fujitsu Ltd., Japan, [2]OITDA, Japan, [3]Univ. of Tokyo, Japan.* This paper reviews the recent progress of self-assembled quantum-dot optical devices, especially highlighting temperature-insensitive 10 Gb/s directly modulated lasers at 1.3 μm and 40 Gb/s signal-regenerative amplifiers in the 1.5 μm band.

Ballroom E

4:00 p.m.–4:30 p.m. REFRESHMENT BREAK, Exhibit Hall

Room 304 A/B

OTuF • WSSs and ROADMs—Continued

OTuF6 • 3:30 p.m.
Compatibility of Flat-Passband, 200 GHz-Wide Wavelength-Selective Switch for 160 Gb/s Transmission Rates, *Dan M. Marom[1], Lothar Möller[1], Yikai Su[2], Daniel López[1], Flavio Pardo[1], Fred Klemens[1], Eric Bower[1], Ed Ferry[1]; [1]Lucent Technologies, USA, [2]Shanghai Jiao Tong Univ., China.* We characterize a 200GHz channel grid, wavelength-selective 4x1 switch with wide/flat passbands and low chromatic dispersion (|CD|<10ps/nm) for 160Gb/s transmission rates. Our findings indicate that the penalties associated with ISI and dispersion are very high.

Room 303 A

OTuG • Optical Network Architectures I—Continued

OTuG6 • 3:30 p.m.
Engineering Methodology for the Use of SOAs and CWDM Transmission in the Metro Network Environment, *N. Antoniades[1], K. C. Reichmann[2], P. P. Iannone[2], A. M. Levine[1]; [1]CUNY College of Staten Island, USA, [2]AT&T Labs - Res., USA.* We investigate the OSNR performance of cascaded SOAs in CWDM metropolitan networks. SOA PDG and noise-figure requirements are determined by an engineering methodology based on careful receiver characterization. Performance is compared to conventional EDFA-amplified DWDM.

OTuG7 • 3:45 p.m.
A Broadcast and Multicast-Enabled Switch Architecture Utilizing a Gateless Channel Selection Scheme, *Yong-Kee Yeo, Jianjun Yu, Gee-Kung Chang; Georgia Tech, USA.* We experimentally demonstrate a new switch architecture that supports simultaneous multicasting/broadcasting for all input ports. Unlike existing architectures, it does not require any optical ON-OFF gates, and is transparent to signal modulation format and bit-rate.

Room 303 B

NTuA • FTTX Infrastructure—Continued

NTuA6 • 3:40 p.m.
Laser Cleaving of Optical Connectors, *David Douglass, Duane Dinkel, Joyce Kilmer; Sagitta, Inc., USA.* Laser cleaving of optical connectors is shown to be more effective than the manual scribing, denubbing, and epoxy removal connector terminating steps. The physics, reliability, and practical benefits of laser cleaving are explored in this paper.

Room 303 C

Room 303 D

NTuC • 40Gbps Technology/PMD—Continued

NTuC4 • 3:40 p.m.
PMD Characterization of Installed Fiber Networks: Compromise Between Result Accuracy and Measurement Time, *Anderson Medeiros, Sergio Barcelos, E. Rigon, R. Rando, J. Seminario, M. Santos, R. Oliveira; FiberWork Optical Communications, Brazil.* Based on an extensive database of fiber plant characterization, this paper discusses the compromise between result accuracy and measurement time for PMD field testing. Some useful practical orientations for such services are then discussed.

4:00 p.m.–4:30 p.m. REFRESHMENT BREAK, Exhibit Hall

Ballroom A

4:30 p.m.–6:30 p.m.
OTuH • Nonlinear Fibers
John M. Fini; OFS Labs, USA, Presider

OTuH1 • 4:30 p.m.
Nonlinearity and Dispersion Control in Small Core Lead Silicate Holey Fibers by Structured Element Stacking, *Julie Y. Y. Leong, Symeon Asimakis, Francesco Poletti, Periklis Petropoulos, Xian Feng, Roger C. Moore, Ken E. Frampton, Tanya M. Monro, Heike Ebendorff-Heidepriem, Wei H. Loh, David J. Richardson; Optoelectronics Res. Ctr., UK.* We report a new fabrication approach that combines the benefits of extrusion and stacking, which is capable of realising high-nonlinearity lead-silicate glass holey fibers with tailorable dispersion characteristics. We present optimised fiber designs offering dispersion-shifted and flattened performance at 1.55μm.

OTuH2 • 4:45 p.m.
Theory of Adiabatic Optical Fiber and Microfiber Tapers, *Misha Sumetsky; OFS Labs, USA.* The theory of adiabatic optical fiber tapers is revised with the Landau-Dykhne formula, which provides simple and physically clear expressions for the intermode transmission amplitudes and is used to determine the smallest microfiber diameter enabling light transmission.

Ballroom B

4:30 p.m.–6:15 p.m.
OTuI • Receivers
Herbert F. Haunstein; Univ. Erlangen-Nürnberg, Germany, Presider

OTuI1 • 4:30 p.m. Invited
High-Rate Photon-Efficient Laser Communications with Near Single Photon/Bit Receiver Sensitivities, *David Caplan, B. S. Robinson, M. L. Stevens, D. M. Boroson, S. A. Hamilton; MIT, Lincoln Lab, USA.* Optical communication systems with sensitivities approaching a single photon/bit can be realized by combining near-quantum-limited optically-preamplified receiver performance with energy-efficient modulation and coding. Potential applications include average-power-limited photon-starved links where channel bandwidth is readily available.

Ballroom C

4:30 p.m.–6:30 p.m.
OTuJ • Optical Network Applications
Kathy Tse; AT&T Labs, USA, Presider

OTuJ1 • 4:30 p.m. Invited
10G-Enabled Optical Network Architecture Directions for Video, Voice and Data: An MSO Perspective, *Robert Harris, Bill Trubey; Time Warner Cable, USA.* We discuss the characteristics of a converged, 10G-enabled, DWDM optical network architecture used to provide carrier-grade service availability, resilience, and protection with ability to scale efficiently and offer the most flexibility for current and future multi-service delivery.

Ballroom D

4:30 p.m.–6:30 p.m.
OTuK • Long Haul Transmission
Jin-Xing Cai; Tyco Telecommunications, USA, Presider

OTuK1 • 4:30 p.m.
An Experimental Analysis of Performance Fluctuations in High-Capacity Repeaterless WDM Systems, *Bamdad Bakhshi, Lee Richardson, Ekaterina A. Golovchenko, Georg Mohs, Massimo Manna; Tyco Telecommunications, USA.* We present an investigation of performance fluctuations in high-capacity repeaterless WDM systems. In a 32x12.3Gb/s 410km transmission experiment, nonlinear channel cross-talk causes > 1.5dB Q-factor fluctuation. System design must include sufficient margin for these fluctuations.

OTuK2 • 4:45 p.m.
Mitigation of SPM Effect by Using Manchester Code on Optical BPSK-SSB Transmission, *Katsumi Takano, Takashi Murakami, Kiyoshi Nakagawa; Yamagata Univ., Japan.* Tolerance to SPM is evaluated in a dispersion-compensated transmission using optical BPSK single sideband modulation. Optical Manchester code is more tolerant to fiber nonlinearity and less pattern dependency than the NRZ format on BPSK-SSB transmission.

Ballroom E

4:30 p.m.–6:30 p.m.
OTuL • Optical Sensors
Brian Culshaw; Univ. of Strathclyde, UK, Presider

OTuL1 • 4:30 p.m.
Performance Enhancement of Raman-Based Distributed Temperature Sensors Using Simplex Codes, *Gabriele Bolognini[1], Jonghan Park[2], Philhan Kim[2], Duckey Lee[2], Fabrizio Di Pasquale[1], Namkyoo Park[2]; [1]Scuola Superiore Sant'Anna, Italy, [2]School of EECS, Seoul Natl. Univ., Republic of Korea.* Using 63 bit simplex coding we demonstrate enhanced performance in Raman-based distributed temperature sensors using low-power (80 mW) laser diodes. Achieved 5.8 dB improvement in dynamic range allows for temperature sensing over 17 km with 15m/5K spatial/temperature resolution.

OTuL2 • 4:45 p.m.
A Novel Strain- and Temperature-Sensing Mechanism Based on Dynamic Grating in Polarization-Maintaining Erbium-Doped Fiber, *Xinyu Fan, Zuyuan He, Kazuo Hotate; Univ. of Tokyo, Japan.* The first experimental observation of dynamic grating in polarization-maintaining erbium-doped fiber (PM-EDF) is reported and a novel fiber-optic strain- and temperature-sensing mechanism based on the dynamic grating in PM-EDF is demonstrated experimentally.

Room 304 A/B

4:30 p.m.–6:30 p.m.
OTuM • Tunable Filters
Olav Solgaard; Stanford Univ., USA, Presider

OTuM1 • 4:30 p.m.
Wavelength- and Bandwidth-Tunable Filters Based on MEMS-Actuated Microdisk Resonators, *Jin Yao[1], Ming-Chang M. Lee[2], David Leuenberger[1], Ming C. Wu[1]; [1]Univ. of California at Berkeley, USA, [2]Natl. Tsing Hua Univ., Taiwan Republic of China.* A wavelength- and bandwidth-tunable filter with microelectromechanical-system (MEMS)-actuated waveguides is first demonstrated on a silicon-based microdisk resonator. Integrated microheaters enabled wavelength tuning up to 125GHz. Bandwidth can be tuned from 12.0 to 41.2GHz by coupling control.

OTuM2 • 4:45 p.m.
All Fiber Dynamic Gain Equalizer Based on a Twisted Long Period Grating Written by High Frequency CO_2 Laser Pulses, *Tao Zhu[1], Yunjiang Rao[2]; [1]Dept. of Optoelectronics Engineering., Chongqing Univ., China, [2]School of Communication and Information Engineering, Univ. of Electronic Science & Technology of China, China.* A dynamic gain equalizer for flattening EDFAs based on twisted LPFGs is reported, which has the higher transverse load sensitivity and the weaker orientation-dependence. Such a dynamic gain equalizer provides a much larger adjustable range and makes packaging much easier.

Room 303 A

4:30 p.m.–6:30 p.m.
OTuN • Network Routing and Survivability
Presider TBA

OTuN1 • 4:30 p.m.
A Novel Provisioning Framework for Dual-Node Interconnected SONET/SDH Rings, *Smita Rai[1], Lei Song[1], Biswanath Mukherjee[1], Ching-Fong Su[2], Takeo Hamada[2]; [1]Univ. of California at Davis, USA, [2]Fujitsu Labs of America, USA.* We present a new approach to provision connections in a network of dual-node interconnected rings. Our approach satisfies the unique constraints imposed by SONET/SDH standards and is very useful for reducing link capacity fragmentation.

OTuN2 • 4:45 p.m.
An Efficient Scheduling Scheme for On-Demand Lightpath Reservations in Reconfigurable WDM Optical Networks, *Xi Yang[1], Lu Shen[2], Ajay Todimala[2], Byrav Ramamurthy[2], Tom Lehman[1]; [1]USC/ISI-East, USA, [2]Univ. of Nebraska at Lincoln, USA.* We propose an efficient scheduling scheme that optimizes advance-reserved lightpath services in reconfigurable WDM networks. A re-optimization approach is devised to reallocate network resources for dynamic service demands while keeping determined schedule unchanged.

Room 303 B

4:30 p.m.–6:30 p.m.
NTuD • Exploiting Ethernet
Rudi Schubert; Telcordia Technologies, USA, Presider

NTuD1 • 4:30 p.m.
Exploiting Carrier Ethernet to Deliver Profitable New Services, *Enrique Hernandez-Valencia; Lucent Technologies, USA.* Operators are turning their attention to Ethernet for point-to-point Layer 2 VPN, Layer 3 VPN, and Internet services. When coupled with existing, well-known technologies such as SONET/SDH, RPR, VPLS, and MPLS, carrier grade Ethernet offers tremendous potential for new services.

NTuD2 • 4:50 p.m.
Ethernet in the Other First Mile: North American Case Studies for IEEE 802.3ah in Applications Beyond FTTH, *Guyton P. Swindell; AFL Telecommunications, USA.* An examination of early case studies where IEEE 802.3ah (Ethernet in the First Mile) has been adopted in non-carrier, non-FTTH applications.

Room 303 C

4:30 p.m.–6:30 p.m.
NTuE • Fiber-to-the-X Deployment Issues
Panel discussion organized by Vincent O'Byrne; Verizon, USA

Over the last several years various Telecommunication and Cable Television companies across the world have deployed fiber further and further into the network in order to offer the customer a triple-play solution (POTS, Data and Video). Companies have chosen different technologies to deploy from FTTP, FTTN and others to meet these demands. This Panel will discuss the various options that the companies chose, their rationale, lessons learned and where they see their Network going over the coming years to meet the ever increasing customer need and competition from other broadband companies.

Room 303 D

4:30 p.m.–6:30 p.m.
NTuF • Ultra Long Haul DWDM
E. Bert Basch; Verizon Labs, USA, Presider

NTuF1 • 4:30 p.m. Invited
Progress in DWDM Deployment in MCI's North American Network, *Daniel L. Peterson, Don Pitchforth; MCI, USA.* MCI owns network facilities in more than 140 countries and over 2,800 cities. MCI is in the midst of an ultra-long haul build of the North American network. This paper outlines MCI's plan and progress on this front.

Ballroom A

OTuH • Nonlinear Fibers—Continued

OTuH3 • 5:00 p.m.
Nonlinearity Enhancement of Filled Microstructured Fibers Operating in the Nanowire Regime, *Kris J. Rowland, Shahraam Afshar V., Tanya M. Monro; Univ. of Adelaide, Australia.* We predict significant enhancement of the effective nonlinear coefficient of soft glass nanowires and nanostructured fibers by surrounding the cores with a nonlinear liquid. Using bismuth nanostructured fibers, γ as high as 5800 W^{-1} km^{-1} is possible.

OTuH4 • 5:15 p.m.
Bi-Doped Silica Fibers: A New Active Medium for Tunable Fiber Lasers and Broadband Fiber Amplifiers, *Vladislav V. Dvoyrin[1], Valery M. Mashinsky[1], Evgeny M. Dianov[1], Andrey A. Umnikov[2], Mihail V. Yashkov[2], Aleksey N. Guryanov[2]; [1]Fiber Optics Res. Ctr. at GPI, RAS, Russian Federation, [2]Inst. of Chemistry of High-Purity Substances, RAS, Russian Federation.* Spectroscopic study of MCVD Bi-doped silica-based optical fibers revealed a broadband long-lived luminescence with the maximum in 1050-1200 nm range that makes such fibers promising for fiber lasers and amplifiers for the second telecommunication window.

OTuH5 • 5:30 p.m. Invited
High Nonlinearity Bismuth Fibers and Their Applications, *Tomohara Hasegawa, T. Nagashima, S. Ohara, N. Sugimoto; Asahi Glass, Japan, Japan.* Bi_2O_3-based optical fiber which exhibits an extra-high nonlinear optical coefficient is developed. Linear and nonlinear optical properties of Bi_2O_3-based optical fiber is discussed. Loss management and applications of the fiber are also reported.

Ballroom B

OTuI • Receivers—Continued

OTuI2 • 5:00 p.m.
Digital Implementation of Soft Detection for 3-Chip-DBPSK with Improved Receiver Sensitivity and Dispersion Tolerance, *Xiang Liu; Bell Labs, Lucent Technologies, USA.* We present a digital implementation of soft detection for 3-chip differential binary phase-shift keying with improved receiver sensitivity and tolerance to chromatic dispersion. An optimum weighting factor is found for signals degraded by correlated phase distortions resulting from chromatic dispersion.

OTuI3 • 5:15 p.m.
2-PSK Homodyne Receiver Based on a Decision Driven Architecture and a Sub-Carrier Optical PLL, *Stefano Camatel, Valter Ferrero, Pierluigi Poggiolini; Politecnico di Torino, Italy.* A 2.5 Gbps PSK homodyne coherent receiver based on a modified decision-driven optical phase-locked loop and sub-carrier modulation is presented and experimentally tested. The proposed coherent receiver is realized without circuitry for clock and data recovery.

OTuI4 • 5:30 p.m. Invited
Coherent Detection of Phase-Shift Keying Signals Using Digital Carrier-Phase Estimation, *Kazuro Kikuchi; Univ. of Tokyo, Japan.* We describe a phase-diversity optical homodyne receiver for demodulating M-array phase-shift keying (PSK) signals, which is based on digital carrier-phase estimation. Bit-error rate measurements in 2-, 4- and 8-PSK systems are demonstrated with such receiver.

Ballroom C

OTuJ • Optical Network Applications—Continued

OTuJ2 • 5:00 p.m.
First Experimental Demonstration of Combined Multicast and Unicast Video Streaming over an Optical-Label Switching Network, *Junqiang Hu, Zhong Pan, Zuqing Zhu, Haijun Yang, Venkatesh Akella, S. J. B. Yoo; Univ. of California at Davis, USA.* This paper experimentally demonstrates, for the first time to our knowledge, the combined multicast and unicast video streaming applications over an optical-label switching network, with edge routers connecting the end-to-end multicast server and clients.

OTuJ3 • 5:15 p.m.
Network Design and Cost Analysis of Optical VPNs, *Kostas Oikonomou, Rakesh K. Sinha; AT&T Labs - Res., USA.* We define three different ways of measuring the cost of providing circuit-based (e.g., optical) VPN services. We give algorithms for computing these cost measures, and compare them empirically on a Tier I service provider's network.

OTuJ4 • 5:30 p.m.
Secure Stealth Transmission over an Existing Public Fiber-Optical Network, *Bernard Wu, Evgenii Narimanov; Princeton Univ., USA.* We develop a spread-spectrum based approach to secure communications over existing public fiber-optical networks. The secure channel is hidden under the noise floor of the network thus allowing cryptographic and steganographic security capabilities.

Ballroom D

OTuK • Long Haul Transmission—Continued

OTuK3 • 5:00 p.m. Invited
Phase Conjugation for Increased System Robustness, *Sander L. Jansen[1], Dirk van den Borne[1], Peter M. Krummrich[2], Stefan Spälter[2], H. Suche[3], W. Sohler[3], Giok Djan Khoe[1], Huug de Waardt[1]; [1]TU Eindhoven, The Netherlands, [2]Siemens AG, Germany, [3]Univ. of Paderborn, Germany.* The transmission performance of optical phase conjugation (OPC) is assessed with a special focus on the combination with the RZ-DQPSK modulation format. We show that when OPC is employed, significant performance improvement is obtained compared to conventional DCF based transmission.

OTuK4 • 5:30 p.m.
A Fully Integrated Block Turbo Code FEC for 10 Gb/s Optical Communication Systems, *Kazuhide Ouchi, Kazuo Kubo, Takashi Mizuochi, Yoshikuni Miyata, Hideo Yoshida, Hitoyuki Tagami, Katsuhiro Shimizu, Tatsuya Kobayashi, Kenkichi Shimomura, Kiyoshi Onohara, Kuniaki Motoshima; Mitsubishi Electric Corp., Japan.* A Block Turbo Code FEC compatible with G.709 has been fully integrated on VLSI. Combining this with a 3-bit soft decision ASIC enabled a net coding gain of 10.1-dB at 12.4-Gb/s with 23.6% redundancy.

Ballroom E

OTuL • Optical Sensors—Continued

OTuL3 • 5:00 p.m.
Frequency-Shifted Interferometer and Its Applications, *Bing Qi[1], Li Qian[2], Andrew Tausz[2], Yu Liu[2], Hoi-Kwong Lo[1,2]; [1]Dept. of Physics, Univ. of Toronto, Canada, [2]Dept. of Electrical and Computer Engineering, Univ. of Toronto, Canada.* We propose a frequency-shifted interferometer and demonstrate its various applications, including fiber length and dispersion measurement, multiple weak reflection sites locating along a fiber link. This could be a useful interrogation technique for sensor multiplexing.

OTuL4 • 5:15 p.m.
Fabrication of Micro-Channels in Optical Fibers Using Femtosecond Laser Pulses and Selective Chemical Etching, *Yicheng Lai, K. Zhou, M. Dubov, L. Zhang, I. Bennion; Aston Univ., UK.* The fabrication of micro-channels in single-mode optical fibers is demonstrated using focused femtosecond laser processing and chemical etching. Straight line micro-channels are achieved based on a simple technique which overcomes limitations imposed by the fiber curved surface.

OTuL5 • 5:30 p.m.
Experimental Demonstration of a Simple Time-of-Flight Rangefinder Based on a Semiconductor Optical Amplifier, *Bipin Sankar Gopalakrishnapillai[1], Ka Lun Lee[1], Arthur J. Lowery[2], Malin Premaratne[2], Satoshi Shinada[3], Naoya Wada[3], Tetsuya Miyazaki[3], Ampalavanapillai Nirmalathas[1], Christina Lim[1]; [1]Univ. of Melbourne, Australia, [2]Monash Univ., Australia, [3]Natl. Inst. of Information and Communications Technology, Japan.* We propose a unique design of a time-of-flight laser ranger that detects the distance and reflectivity of a target using cross-gain modulation between counter-propagating pulses in a semiconductor optical amplifier, without using high-speed electronics.

Room 304 A/B

OTuM • Tunable Filters—Continued

OTuM3 • 5:00 p.m. Invited
SOI Technology for Microring Tunable Filters, *Fabrizio Giacometti[1], Massimo Gentili[1], Marco Romagnoli[1], Franco Cerrina[2]; [1]Pirelli Labs, Italy, [2]Corecom, Italy.* Recent results related on optical building blocks structures for nanophotonics tunable structures based on Silicon on Insulator material are presented. Dimensional control of such extreme high index contrast structures for applications in complex devices will be discussed.

OTuM4 • 5:30 p.m.
Hollow Waveguide Distributed Bragg Reflector for Widely Tunable Optical Devices, *Yasuki Sakurai, Hideaki Yamakawa, Yasushi Yokota, Akihiro Matsutani, Takahiro Sakaguchi, Fumio Koyama; Tokyo Inst. of Technology, Japan.* We demonstrate a tunable hollow waveguide Bragg reflector for widely tunable optical devices, exhibiting a narrow-pass-band filter and tunable laser using the tunable reflector. Also, the integration of a MEMS thermal actuator was demonstrated for the first time.

Room 303 A

OTuN • Network Routing and Survivability—Continued

OTuN3 • 5:00 p.m. Invited
Open Optical Networks, *Vik Saxena; Comcast, USA.* No abstract available.

OTuN4 • 5:30 p.m.
Optical Multicasting and Full-Mesh Wavelength-Routing over Asymmetric Star Topology Network, *Osamu Moriwaki, Kazuto Noguchi, Yoshihisa Sakai; NTT Photonics Labs, NTT Corp., Japan.* We propose and demonstrate the implementation of two functions in a CWDM star-shaped wavelength-routing network, namely optical multicasting and optimization for unequal node distances from the wavelength router, and improved applicability to metro area networks.

Room 303 B

NTuD • Exploiting Ethernet—Continued

NTuD3 • 5:10 p.m. Invited
Optical Network Architecture Choice for Ethernet Services: A CLEC's View, *Steve Plote; Looking Glass Networks Inc, USA.* Ethernet is a ubiquitous service interface in the Service Provider realm. Carriers need to deal with the trade-offs between service demand type, service volume, OA&M requirements and customer expectations to determine the best architecture for their Ethernet service offering.

Room 303 C

Room 303 D

NTuF • Ultra Long Haul DWDM—Continued

NTuF2 • 5:10 p.m.
Environmental and Operational Conditions Effects on the Availability of Highly Reliable Ultra Long Haul Optical Transport Networks, *Mohcene Mezhoudi, Chi-Hung Kelvin Chu, Jerome C. Bohannon, Shirish N. Kher; Bell Labs, Lucent Technologies, USA.* This paper focuses on the reliability of different ring architectures, and the analysis and evaluation of the impact of the environment, the networks operation conditions and the maintenance on the availabilities of real highly reliable ring networks.

NTuF3 • 5:30 p.m.
Performance Improvement for Ultra-Long Haul DWDM Systems by Using Slow Polarization Scrambling, *Guodong Zhang, Pedro Meledina, Craig Sknolick, Joseph T. Stango; AT&T, USA.* Using slow polarization scrambling to improve transmission performance simultaneously for mutichannel of deployment ready DWDM system with reconfigurable OADM nodes is presented. It showed that the power fluctuation and maximum PreFEC BER can be reduced by using slow polarization scrambling.

Ballroom A

OTuH • Nonlinear Fibers—Continued

OTuH6 • 6:00 p.m.
Linear and Nonlinear Optical Properties of Single-Mode As_2Se_3Chalcogenide Fiber, *Kazi S. Abedin; Natl. Inst. of Information and Communications Technology, Japan.* Optical properties of single-mode As_2Se_3 chalcogenide fibers are investigated for applications in the 1.55 μm wavelength range. The fiber exhibits large Kerr nonlinearity of γ=954$W^{-1}km^{-1}$ and large Brillouin gain coefficient of 6.2x10^{-9} m/W, 134 times larger than fused silica fiber.

OTuH7 • 6:15 p.m.
Silica-Based Highly Nonlinear Fiber with γ=30/W/km and Its FWM-Based Conversion Efficiency, *Tetsuya Nakanishi, Masaaki Hirano, Toshiaki Okuno, Masashi Onishi; Sumitomo Electric Industries, Ltd., Japan.* Silica-based highly nonlinear fiber with a record-breaking γ of 30/W/km has been fabricated. FWM-based conversion efficiency was evaluated and we have confirmed that the new fiber shows the highest efficiency among fibers composed of various materials.

Ballroom B

OTuI • Receivers—Continued

OTuI5 • 6:00 p.m.
Phase Stabilisation of Coherent WDM Modulator Array, *Tadhg Healy, Fatima C. Garcia Gunning, Andrew D. Ellis; Tyndall Natl. Inst., Ireland.* This paper reports for the first time a simple stabilisation circuitry technique to monitor and control the relative phase between adjacent channels in a Coherent WDM transmitter, achieving optimum performance.

Ballroom C

OTuJ • Optical Network Applications—Continued

OTuJ5 • 5:45 p.m.
Optical VPN in PON Using TDM-FDM Signal Format, *Yikai Su[1], Xiangqing Tian[1], Indra Widjaja[2], Weisheng Hu[1], Lilin Yi[1], Peigang Hu[1], Yi Dong[1], Hao He[1]; [1]Shanghai Jiao Tong Univ., Dept. of Electronic Engineering, China, [2]Bell Labs, Lucent Technologies, USA.* We demonstrate a simple and low-cost PON with optical VPN functionality using a directly modulated laser diode to generate TDM-FDM format. This format enables one tributary of the transmitted signal to be reflected to ONUs in the same optical VPN.

OTuJ6 • 6:00 p.m.
Novel Optical Packet Switched Access Network Architecture, *Takumi Nomura[1], Hiromi Ueda[2], Toshinori Tsuboi[2], Hiroaki Kurokawa[2], Hiroyuki Kasai[2]; [1]NEC Communication Systems, Ltd., Japan, [2]Tokyo Univ. of Technology, Japan.* This paper describes Gigabit Ethernet Optical Switched Access Network (GE-OSAN) architecture with non-buffered 1xn optical packet switches. It clarifies the role of the key network element, 1xn Optical Switching Module, in realizing the proposed architecture.

OTuJ7 • 6:15 p.m.
In-Band Quantum Key Distribution (QKD) on Fiber Populated by High-Speed Classical Data Channels, *Tiejun J. Xia[1], David Z. Chen[1], Glenn Wellbrock[1], Anton Zavriyev[2], A. Craig Beal[2], Keun M. Lee[2]; [1]MCI Communications, USA, [2]MagiQ Technologies, USA.* We used a commercial QKD system to conduct key exchange over 50-km fiber span that supported classical 10 Gbit/sec traffic. Both quantum and classical channels were carried by the standard ITU grid C-band wavelengths.

Ballroom D

OTuK • Long Haul Transmission—Continued

OTuK5 • 5:45 p.m.
Suppression of Intrachannel Nonlinearities Using BCJR Algorithm and Iterative Decoding, *Ivan B. Djordjevic, Bane Vasic, Varsha Rao; Univ. of Arizona, USA.* MAP symbol-decoding supplemented with iterative decoding is used to mitigate the intrachannel-nonlinearities. MAP detector operates on channel trellis to correct the corrupted data and to provide soft outputs processed further in an iterative decoder. A dramatic performance improvement is demonstrated.

OTuK6 • 6:00 p.m.
Transient Gain Dynamics of Cascaded Erbium Doped Fiber Amplifiers with Re-Configured Channel Loading, *Daniel Kilper, Chandra Chandrasekhar, Chris A. White; Bell Labs, Lucent Technologies, USA.* Wavelength-division-multiplexed channel power transients are examined in cascaded EDFAs with variable pre-transient channel loading through the chain. We identify different orders of transient events and characterize their uncontrolled time response and steady-state power excursions.

OTuK7 • 6:15 p.m.
Gain Reshaping Caused by Spectral Hole Burning in Long EDFA-Based Transmission Links, *Dmitriy Kovsh, Stuart Abbott, Ekaterina Golovchenko, Alexei Pilipetskii; Tyco Telecommunications, USA.* We show that the effect of SHB on power evolution in long-haul EDFA-based links is largest in the first few spans, saturating with distance, and that its strength on end-to-end gain depends on number of amplifiers and not EDFA gain.

Ballroom E

OTuL • Optical Sensors—Continued

OTuL6 • 5:45 p.m.
Sensing an Optical Fiber Surface by a Microfiber with Angstrom Accuracy, *Misha Sumetsky, Yury Dulashko; OFS Labs, USA.* By monitoring the whispering gallery mode resonances, which are excited in an optical fiber by a moving microfiber, we determine the optical fiber effective diameter variation with angstrom accuracy and sensor the residuals and defects on the fiber surface.

OTuL7 • 6:00 p.m. Invited
Distributed Strain Sensors Based on Brillouin Scattering for Structural Health Monitoring, *Xiaoyi Bao, Fabien Ravet, Lufan Zou; Physics Dept, Univ. of Ottawa, Canada.* We developed the distributed Brillouin sensor to monitor structural changes in steel pipeline and composite column subjected to heavy loads. The spatial resolution of 15cm has been achieved for the strain monitoring of both structures.

6:30 p.m.–8:00 p.m. Conference Reception, Anaheim Hilton Hotel, California Pavilion

Room 304 A/B

OTuM • Tunable Filters—Continued

OTuM5 • 5:45 p.m.
Tunable Optical Add-Drop Multiplexer Based on Evanescent Field Coupling with Long-Period Fiber Gratings, *Young-Geun Han[1], Sang Bae Lee[1], Chang-Seok Kim[2]; [1]Korea Inst. of Science & Technology, Republic of Korea, [2]Pusan Natl. Univ., Republic of Korea.* We investigate the voltage-controllable add-drop multiplexer with a tunable coupler based on long-period fiber gratings. The large tuning range of optical signals (~ 50.54 nm) from 1502.32 nm to 1552.86, which covers both the S and C-band, is achieved.

OTuM6 • 6:00 p.m.
Tunable Add/Drop Filter for CWDM System Using Cladding Mode Coupling Assisted by Long-Period Fiber Gratings, *Myoung Jin Kim, Florence Y. M. Chan, Un-Chul Paek, Byeong Ha Lee; Gwangju Inst. of Science and Technology, Republic of Korea.* We proposed a tunable fiber add/drop filter suitable for CWDM. The light coupling was performed through cladding modes assisted by two identical long-period fiber gratings.Experimentally, 75% net coupling efficiency was achieve and the side lobes were suppressed by -24 dB.

OTuM7 • 6:15 p.m.
Optical Tunable Asymmetric Interleaver, *Philip N. Ji[1], Arthur Dogariu[1], Lei Xu[1], Lei Zong[1], Ting Wang[1], Osamu Matsuda[2], Yuji Abe[2]; [1]NEC Labs America, USA, [2]NEC Corp., Japan.* A novel optical tunable asymmetric interleaver is demonstrated. It consists of two symmetric interleavers with wavelength shifting capability in series. It can deliver continuous tunable interleaving ratios for WDM applications, particularly for 10G+40G network upgrade.

Room 303 A

OTuN • Network Routing and Survivability—Continued

OTuN5 • 5:45 p.m.
Utilizing Path Diversity in Optical Packet Switched Interconnection Networks, *Assaf Shacham, Keren Bergman; Columbia Univ., USA.* The concept of path adjustments is introduced as a mean of increasing the utilization of optical packet switched networks. Simulation results show substantial performance improvement under uniform and non-uniform traffic, and an experimental demonstration proves feasibility.

OTuN6 • 6:00 p.m.
Maximum Survivability under Multiple Failures, *Qingya She, Xiaodong Huang, Jason P. Jue; Univ. of Texas at Dallas, USA.* This paper investigates the maximum survivability problem in mesh networks with multiple failures. A heuristic algorithm is proposed to maximize the end-to-end survivability. Simulation results show the algorithm is always better than the bounds of two link-disjoint paths protection scheme.

OTuN7 • 6:15 p.m.
On Protecting Dynamic Multicast Sessions in Survivable Mesh WDM Networks, *Hongbin Luo, Hongfang Yu, Lemin Li, Sheng Wang; Univ. of Electronic Science and Tech. of China (UESTC), China.* We propose a novel protection scheme called multicast protection through spanning paths (MPSP) for efficient multicast protection. Simulation results demonstrate the good performance of the proposed protection scheme in reducing the spare capacity for protection.

Room 303 B

NTuD • Exploiting Ethernet—Continued

NTuD4 • 5:50 p.m.
High-Availability in Multipoint to Multipoint Ethernet for the Delivery of Triple Play Services, *Luis Aguirre-Torres, Gady Rosenfeld; Corrigent Systems, USA.* This paper discusses how RPR and VPLS Remote Fault Indication can combine to provide the required levels of availabilty to offer Triple Play services over a single infrastructure.

NTuD5 • 6:10 p.m.
A Comparison of Optical Packet Switching Node Architectures Based on Component Cost, *Ruth Van Caenegem, Didier Colle, Mario Pickavet, Piet Demeester; Ghent Univ. - IBBT - IMEC, Belgium.* In this paper we discuss the node architecture costs of two all-optical packet switching nodes, a node with electronic header processing and the IP over WDM approach. We compare the costs for increasing network traffic.

Room 303 C

Room 303 D

NTuF • Ultra Long Haul DWDM—Continued

NTuF4 • 5:50 p.m. Invited
Engineering and Planning Tool for an Ultra-Long-Haul Optical Mesh Transport System, *Sydney A. Taegar, Daniel A. Fishman, Diego L. Correa; Bell Labs, Lucent Technologies, USA.* We present a software application that optimizes network and traffic design; provides operations, verification, and diagnostic support capabilities; and enhances cost-effectiveness for LambdaXtremeTM Transport - an ultra-long-haul optical mesh transport system developed by Lucent Technologies.

6:30 p.m.–8:00 p.m. Conference Reception, Anaheim Hilton Hotel, California Pavilion