OSA
Optical Society of America

OAA/COTA

Optical Amplifiers and Their Applications (OAA)
June 25-28, 2006

and

Coherent Optical Technologies and Applications (COTA)
June 28-30, 2006

Collocated Topical Meetings
and Tabletop Exhibit

Collocated with Workshop on High Power Lasers
Sunday, June 25, 2006

Westin Whistler Resort & Spa
Whistler, BC, Canada

Pre-Registration Deadline:	June 12, 2006
Housing Deadline EXTENDED:	May 31, 2006

OAA Organizing Committee

Hitoshi Kawaguchi, *Yamagata Univ., Japan,* **General Chair**
Peter M. Krummrich, *Siemens AG, Germany,* **General Chair**
Morten Nissov, *Tyco Telecommunications, USA,* **General Chair**
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COTA Organizing Committee

Guifang Li, *Univ. of Central Florida, USA,* **Program Chair**
Stojan Radic, *Univ. of California at San Diego, USA,* **Program Chair**

Sponsored by:

Technical Co-Sponsor:

IEEE/Lasers and Electro-Optics Society

COTA Organizing Committee

Guifang Li, *Univ. of Central Florida, USA,* **Program Chair**
Stojan Radic, *Univ. of California at San Diego, USA,* **Program Chair**

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Stojan Radic, *Univ. of California at San Diego, USA,* **Program Chair**
Shinji Yamashita, *Univ. of Tokyo, Japan,* **Program Chair**

1. Fiber and Active Waveguides
Clifford E. Headley, *OFS, USA,* **Subcommittee Chair**
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COTA Topics

Category I: Devices and Subsystems

Sources

- High-Power
- Narrow-Linewidth
- High-Stability
- Tunability
- Phase-Preservation over Temporal/Spectral Domain

Receivers

- Advanced Reception
- EPLL, OPLL
- Direct Locking Techniques
- Phase Estimation Techniques

Novel Devices and Platforms

- Modulators
- Phase-Sensitive Amplifiers
- Polarization Management

Category II: Systems and Applications

Applications 1 - Communication

- Coherent Modulation Formats/Signaling/Protocols
- Phase-Preserving Optical Systems
- Phase-Sensitive Links and Systems
- Free-Space (Spaceborne/Airborne) Optical Communications
- Metro/Terrestrial/Long-Haul Fiber-Optic Communications
- Analog Links
- Coherent and Transparent Optical Networks
- Coherent Techniques for Secure Optical Communications

Applications 2 - Sensing

- Free-Space (Remote Sensing): Airborne, Spaceborne
- Synthetic-Aperture Lidar/Ladar

- Coherent Fiber Sensors
- Coherent Microsensing in Spectroscopic Applications
- Coherent Biosensing: Statistical and Cellular Applications

Applications 3 - Coherent Optical Signal Processing

- Arbitrary Waveform Generation
- A/D Conversion
- Arbitrary Filtering
- Ultrafast All-Optical Correlation

OAA Meeting Topics

The topics of the conference are divided into the following three general areas:

Fiber and Active Waveguides
This topic focuses on amplifying fibers and planar waveguides, their fabrication, materials, modeling, characterizations and devices, and subsystems. The following specific topics are included in this area:

- Planar Waveguide Amplifiers and Sources
- Fiber Amplifiers and Sources (Raman, Brillouin, Parametric, Rare-Earth Doped)
- High-Power Fiber Lasers
- Nonlinear Optical Devices
- Novel Fibers Useful for Optical Amplification
- Sensors
- Modeling and Characterization
- Materials and Structures
- Design and Fabrication
- Amplifier Integration

Semiconductor Devices and Functional Circuits
This area focuses on semiconductor devices, materials and material characteristics and semiconductor photonic integrated circuits. The following specific topics are included:

Semiconductor Devices

- Semiconductor Optical Amplifiers

- Semiconductor Pump Lasers
- Semiconductor Nonlinear Devices
- Semiconductor Sensors

Materials and Material Characteristics

- Novel Semiconductor Materials and Low-Dimensional Material Systems
- Semiconductor Nanostructured Material Systems
- Semicondutor Growth and Fabrication
- Nonlinear Effects in Semiconductor Materials,
- Noise Dynamics
- Ultrafast Processes in Semiconductors

Semiconductor Photonic Integrated Circuits

- Optical Switches and Processing Elements
- Planar Elements and Subsystems
- Devices for All-Optical Signal Processing, (e.g. Wavelength Conversion and Regeneration)

Network and System Circuits

This area focuses on telecom and non-telecom applications of optical amplification. The following specific topics are included:

- Telecommunication Systems including Terrestrial and Undersea Transmission, Transparent Optical Networks, Metro and Access Networks, Video and Analog Transport
- Free Space Optics, Applications of Optical Signal Processing
- Biomedical Uses of Optical Amplifiers
- Optical Metrology and Sensing
- System-Related Analysis
- Optical Pre-Amplification
- Coherent Systems
- Quadrature Manipulation in Optical Links (e.g. Phase-Preserving Amplification)
- Nonlinear Effects
- Field Demonstrations/Deployment Experience

COTA Invited Speakers

Plenary Speaker

JWA1, **Femtosecond Frequency Combs,** *Ronald Holzwarth; Menlo Systems GmbH, Germany.*

Invited Speakers

CWB1, **Coherent Detection with Arrays of Photon-Counting Detectors,** *Jonathan Ashcom, Sumanth Kaushik, Richard Heinrichs; Lincoln Lab, USA.*

CWB4, **Development of the Laser Absorption Spectrometer for Atmospheric CO_2 Measurements,** *Gary Spiers, David Tratt, Sven Geier, Mark Phillips, Robert Menzies; JPL, USA.*

CWC1, **Fieldable Digital Coherent Interferometric Communication and Sensing Application Domains,** *Isaac Shpantzer; CeLight Inc., USA.*

CWD1, **New Techniques for Signal Optimization in Harmonic and Multiphoton Absorption Fluorescence Microscopy,** *Jeffrey Squier; Colorado School of Mines, USA.*

CWD2, **Entangled-Photon Optical Coherence Tomography,** *Malvin C. Teich, Magued B. Nasr, Alexander V. Sergienko, Bahaa E. A. Saleh; Boston Univ., USA.*

CThA1, **Comprehensive Screening for Disease with Optical Frequency-Domain Imaging,** *Brett E. Bouma; Harvard Medical School and Massachusetts General Hospital, USA.*

CThA2, **Quantitative Multiplex CARS Micro-Spectroscopy in Congested Spectral Regions,** *Michiel Muller; Univ. of Amsterdam, The Netherlands.*

CThA3, **Low-Coherence Enhanced Backscattering for Biomedical Applications,** *Vadim Backman; Northwestern Univ., USA.*

CThB1, **Coherent Detection for Fiber Optic Communications Using Digital Signal Processing,** *Michael Taylor; Univ. College London, UK.*

CThB3, **Phase-Diversity Homodyne Receiver for Coherent Optical Communications,** *Kazuro Kikuchi; RCAST, Univ. of Tokyo, Japan.*

CThC1, **Modulation and Detection Techniques for Optical Communication Systems,** *Joseph Kahn; Stanford Univ., USA.*

CThC4, **European "synQPSK" Project: Toward Synchronous Optical Quadrature Phase Shift Keying with DFB Lasers,** *Reinhold Noe[1], Ulrich Rückert[1], Yakoov Achiam[2], Franz Josef Tegude[3], Henri Porte[4]; [1]Univ. Paderborn, Germany, [2]CeLight Israel Ltd., Israel, [3]Univ. Duisburg-Essen, Germany, [4]Photline, France.*

CThD1, **Optical Signal Processing for RADAR & LIDAR Applications,** *Daniel Dolfi, Loïc Morvan, Sylvie Tonda-Goldstein, Jean-Pierre Huignard; Thales Res. & Technology, France.*

CThD3, **Slow Light: Fundamentals & Applications,** *Jacob B. Khurgin; Johns Hopkins Univ., USA.*

CFA1, **Advances in Coherent Optical Spectroscopy,** *Jun Ye; JILA, Univ. of Colorado & NIST, USA.*

CFA4, **Phase-Locking in Semiconductor Lasers & Arrays,** *Amnon Yariv; Caltech, USA.*

CFB1, **Polypulse Coherent Lidar Waveforms for Coherent Lidar Measurements,** *Philip Gatt, Sammy Henderson; Lockheed Martin Coherent Technologies, USA.*

CFB4, **Fundamental Comparison of Direct and Coherent Lidar System Performance,** *Sammy W. Henderson, Philip Gatt; Lockheed Martin Coherent Technologies, USA.*

CFC1, **LIGO - Highly Stabilized Lasers in Search of Gravitational Waves,** *David H. Reitze; Univ. of Florida, USA.*

CFC4, **High-Power, Ultra-Narrow Linewidth Fiber Lasers,** *Shibin Jiang; NP Photonics, Inc., USA.*

CFD1, **Coherent Optical Free-Space Communications,** *Ronald Phillips; Univ. of Central Florida, USA.*

CFD3, **Coherent Techniques for Optical Code-Division-Multiple-Access Systems,** *Ken-ichi Kitayama; Osaka Univ., Japan.*

OAA Plenary and Invited Speakers

Plenary Speakers

OMB1, **Lightwave Capacity Demand in a 20-Years Horizon and Optical Fiber Bandwidth "Finiteness",** *Emmanuel Desurvire, Alcatel Submarine Networks, France.*

OMB2, **Optical Amplifiers: Current and Future Applications and Opportunities,** *Bruce Nyman, Princeton Lightwave, USA.*

Invited Speakers

OSuA1, **Fiber Lasers vs. Solid-State Lasers: Which Is Better?,** *Ken-ichi Ueda; Univ. of Electro-Communications, Japan.*

OSuA2, **High Peak Power Fiber Laser Technologies,** *Almantas Galvanauskas; Univ. of Michigan, USA.*

OSuA3, **High Power, High Reliability ErYb Optical Amplifiers**, *Douglas P. Holcomb; Lucent Technologies - Bell Labs, USA.*

OSuA4, **Pump Sources and Related Devices for High-Power Fiber Laser Systems,** *Christoph Harder; ETH Zurich, Switzerland.*

OSuB1, **High Power, Narrow Linewidth Fiber Amplifiers,** *Stuart Gray; Corning Inc., USA.*

OSuB2, **Continuous-Wave and Pulsed Operation of High-Power Fiber Lasers,** *Michalis Zervas; Univ. of Southampton, UK.*

OSuC1, **GaSb Based High-Power Pump Lasers Emitting around 2um,** *Marc Kelemen; Fraunhofer Inst. for Applied Solid State Physics, Germany.*

OSuC2, **High Power CW Lasers**, *Denis Gapontsev; IPG Photonics, USA.*

OSuC3, **Towards All Fiber High Power Amplifiers**, *Marc D. Mermelstein; OFS Labs, USA.*

OMC1, **High Peak Power Fiber Amplifiers,** *John Minelly; Aculight Corp., USA.*

OMD1, **Silicon Raman Amplifiers,** *Bahram Jalali; Univ. of California at Los Angeles, USA.*

OMD5, **Erbium Doped Fiber and Highly Nonlinear Fiber Based on Bismuth Oxide Glasses,** *Naoki Sugimoto; Asahi Glass Company, Japan.*

OME1, **Uncooled QD Pump Laser,** *Alfred Forchel; Julius Maximilians-Univ., Germany.*

OME2, **Slow Light in QW and QD SOA,** *Shun L. Chuang; Univ. of Illinois, USA.*

OTuA1, **Optical Sources for WDM-PON,** *Chang-Hee Lee; KAIST, Republic of Korea.*

OTuA3, **Optical Label Switching Functionalities Employing Semiconductor Optical Amplifiers,** *Idelfonso Tafur Monroy[1,2], A. M. J. Koonen[1], J. J. Vegas Olmos[1], N. Yan[1], C. Peucheret[2], E. V. Breusegem[3]; [1]Eindhoven Univ. of Technology, The Netherlands, [2]Dept. of Communications Optics and Materials, COM DTU, Denmark, [3]Ghent Univ., The Netherlands.*

OTuB1, **Fibers in High Performance Amplifiers,** *Bera Palsdottir; OSF Fitel Denmark I/S, Denmark.*

OTuB5, **Novel Fibers,** *Peter G. Kazansky; Optoelectronics Res. Ctr., UK.*

OTuC1, **Cancellation of Non-Linear Patterning in Semiconductor Amplifier Based Switches,** *Robert J. Manning; Univ. College Cork, Ireland.*

OTuD1, **Advanced Raman Amplified Transmission Systems in Long-Haul and High-Capacity Photonic Networks,** *Hiroji Masuda; NTT Network Innovation Labs, Japan.*

OTuD2, **Nonlinear Optical Approaches for the Generation of Multi-Wavelength Outputs from Fiber Lasers,** *Chester Shu; Chinese Univ. of Hong Kong, Hong Kong.*

OWA1, **Fiber-Optic Parametric Devices for DWDM,** *Hugo Fragnito, José M. Chavez Boggio, Diego J. Marconi; Univ. Estadual de Campinas, Brazil.*

OWB1, **SOA Based Devices for All Optical Signal Processing,** *Alistair J. Poustie; Corning Res. Ctr., UK.*

OWB2, **SOA Based Optical Packet Switching for High Performance Computing,** *B. Roe Hemenway; Corning, Inc., USA.*

OWC1, **Phase-Sensitive Parametric Amplifiers,** *Prem Kumar; Northwestern Univ., USA.*

CONFERENCE HIGHLIGHTS

The organizers of COTA would like to acknowledge the generous support of the **Air Force Office of Scientific Research.**

Workshop on High Power Lasers ▪ Sunday, June 25 ▪ 10:00 a.m.–4:30 p.m. ▪ Emerald B

Monday, June 26 ▪ 10:30 a.m.–12:15 p.m. ▪ Emerald B

The workshop focuses on high power fiber lasers, amplifiers and related devices. Supported by some of the most regarded scientists in this field, the goal is to provide researchers an overview of the topic while at the same time educating the novice. Areas of discussion include fibers, diode pump sources, system architecture, design challenges and applications.

OAA Conference Reception ▪ Monday, June 26 ▪ 5:30 p.m.–7:00 p.m. ▪ Emerald A

Enjoy local fare and drink while you network with your colleagues. Guest tickets may be purchased for $50 US by 12:00 p.m. on Monday, June 26, 2006.

OAA Rump Session ▪ Tuesday, June 27 ▪ 7:30 p.m.–10:00 p.m. ▪ Emerald B

A List of questions and statements will stimulate discussion at the OAA Rump Session. In order to keep to the tradition of spontaneity during this session, viewgraphs prepared in advance will not be allowed to be presented. Light snacks and beer will be served.

Joint Poster Session ▪ Wednesday, June 28 ▪ 12:00 p.m.–2:30 p.m. ▪ Emerald C

Authors are requested to remain near their poster boards for the duration of the session to facilitate discussion. In lieu of an evening reception, COTA registrants will receive a ticket for a box lunch during the poster session. OAA registrants may purchase a box lunch for $20 US by 12:00 p.m. on Tuesday, June 27, 2006.

OAA Postdeadline Paper Session ▪ Wednesday, June 28 ▪ 5:30 p.m.–6:00 p.m. ▪ Emerald B

The Program Committee reviewed several papers, and those deemed appropriate for postdeadline presentation will be presented during this session. Copies of the accepted postdeadline papers will be distributed onsite at registration.

COTA Rump Session ▪ Thursday, June 29 ▪ 7:30 p.m.–10:00 p.m. ▪ Emerald A

The inaugural COTA Rump Session is intended to enable invigorating discussion on industry topics. Light snacks and beer will be served.

TECHNICAL DIGEST

The *OAA/COTA Technical Digest on CD-ROM* is comprised of the summaries of papers being presented during each conference. Each registrant receives a copy of the technical digest CD-Rom at the meeting. Extra copies may be purchased at the meeting for a special price of $60 US.

SPECIAL WORKSHOP ON HIGH POWER LASERS!

The workshop focuses on high power fiber lasers, amplifiers and related devices. Supported by some of the most regarded scientists in this field, the goal is to provide researchers an overview of the topic while at the same time educating the novice. Areas of discussion include fibers, diode pump sources, system architecture, design challenges and applications.

Workshop Organizers:
Clifford E. Headley, *OFS, USA*
Berthold Schmidt, *Bookham, Switzerland*

High Peak Power Fiber Laser Technologies, *Almantas Galvanauskas, Univ. of Michigan, USA*
High Power CW Lasers, *Denis Gapontsev, IPG Photonics Corp., USA*
High Power, Narrow Linewidth Fiber Amplifiers, *Stuart Gray, Corning, Inc., USA*
Pump Sources and Related Devices for High Power Fiber Laser Systems, *Christoph Harder, Switzerland*
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GaSb Based High-Power Pump Lasers Emitting Around 2 µm, *Márc Tibor Kelemen, IAF, Germany*
Towards All Fiber High Power Amplifiers, Marc Mermelstein, OFS, USA
High Peak Power Fiber Amplifiers, *John Minelly, Aculight Corp., USA*
Continuous-Wave and Pulsed Operation of High-Power Fiber Lasers, *Michalis Zervas, Univ. of Southampton, UK*
Fiber Lasers vs Solid-State Lasers – Which is Better? *Ken-ichi Ueda, Inst. for Laser Science, Univ. of Electro-Communications, Japan*

Exhibitors

Topical Meeting: **June 25 - June 30, 2006**

Tabletop Exhibit: **June 27 – June 29, 2006**

OAA/COTA 2006 Exhibit Space Reservation Contract

OAA/COTA 2006 Exhibit Space Reservation Contract (PDF, 153 KB)

Note: You need Adobe Acrobat to view the PDF files above. If you do not already have this software, you can download Adobe Acrobat for free from Adobe's web site.

Tabletop exhibit space at Optical Amplifiers & Their Applications (OAA) and Coherent Optical Technologies and Their Applications (COTA), will be $940 for Corporate Members and $990 for non-members and will include:

- One complimentary registration list
- One complimentary technical registration and two exhibit personnel registrations
- One copy of the meeting's proceedings

If you have questions about exhibiting at this topical meeting, please contact our exhibit sales staff at 202.416.1957 or exhibitsales@osa.org .

Sponsorship Opportunities at OAA/COTA 2006

Increase your company's visibility among qualified attendees with a sponsorship at the event.

Current OAA/COTA Sponsorship Opportunities include:

- Coffee Break Sponsorships
- Reception Sponsorships
- Attendee Tote Bag Sponsorship
- Registration Material Inserts
- Advertising Signage Placements

Plus other customizable promotional opportunities

To find out more about one of the sponsorship opportunities listed above or to discuss a customized promotional package or sponsorship, please contact Melissa Russell at 202.416.1957 or email exhibitsales@osa.org

Agenda

On This Page:

Sunday, June 25, 2006

9:00 a.m.– 5:00 p.m.	**Registration Open**	Emerald Ballroom Foyer
10:00 a.m.– 12:00 p.m.	**OSuA ● High Power Fiber Lasers and Amplifiers Workshop I**	Emerald Ballroom B
12:00 p.m.–1:00 p.m.	**Lunch (on your own)**	
1:00 p.m.– 2:30 p.m.	**OSuB ● High Power Fiber Lasers and Amplifiers Workshop II**	Emerald Ballroom B
2:30 p.m.–2:55 p.m.	**Coffee Break**	Emerald Ballroom Foyer
2:55 p.m.– 4:25 p.m.	**OSuC ● High Power Fiber Lasers and Amplifiers Workshop III**	Emerald Ballroom B

Monday, June 26, 2006

7:30 a.m.–5:00 p.m.	**Registration Open**	Emerald Ballroom Foyer
8:30 a.m.– 8:45 a.m.	**OMA ● OAA Welcome**	Emerald Ballroom B
8:45 a.m.– 10:00 a.m.	**OMB ● OAA Plenary**	Emerald Ballroom B
10:00 a.m.–10:30 a.m.	**Coffee Break**	Emerald Ballroom Foyer
10:30 a.m.– 12:15 p.m.	**OMC ● High Power Fiber Lasers and Amplifiers**	Emerald Ballroom B
12:15 p.m.–1:30 p.m.	**Lunch Break (on your own)**	
1:30 p.m.– 3:30 p.m.	**OMD ● Novel Materials and Mode Locked Lasers**	Emerald Ballroom B
3:30 p.m.–4:00 p.m.	**Coffee Break**	Emerald Ballroom Foyer
4:00 p.m.– 5:30 p.m.	**OME ● Novel Semiconductor Device and Slow Light in Semiconductor**	Emerald Ballroom B
5:30 p.m.–7:00 p.m.	**Conference Reception**	Emerald Ballroom A

Tuesday, June 27, 2006

8:00 a.m.–5:00	**Registration Open**	Emerald Ballroom

p.m.		Foyer
8:30 a.m.– 10:00 a.m.	**OTuA • New Applications**	Emerald Ballroom B
10:00 a.m.–10:30 a.m.	**Coffee Break**	Emerald Ballroom C
10:30 a.m.– 12:15 p.m.	**OTuB • Fiber Design**	Emerald Ballroom B
12:15 p.m.–1:30 p.m.	**Lunch (on your own)**	
1:30 p.m.– 3:15 p.m.	**OTuC • SOA-Based All Optical Processing**	Emerald Ballroom B
3:15 p.m.–3:45 p.m.	**Coffee Break**	Emerald Ballroom C
3:45 p.m.– 5:30 p.m.	**OTuD • Transmission and Other Systems**	Emerald Ballroom B
7:30 p.m.–10:00 p.m.	**OAA Rump Session**	Emerald Ballroom B

Wednesday, June 28, 2006

8:00 a.m.–5:00 p.m.	**Registration Open**	Emerald Ballroom Foyer
8:45 a.m.– 9:00 a.m.	**CWA • COTA Welcome**	Emerald Ballroom B
9:00 a.m.– 9:45 a.m.	**JWA • Joint OAA/COTA Plenary**	Emerald Ballroom B
9:45 a.m.–4:30 p.m.	**Exhibit Open**	Emerald Ballroom C
9:45 a.m.–10:15 a.m.	**Coffee Break**	Emerald Ballroom C
10:15 a.m.– 12:00 p.m.	**OWA • Optical Parametric Amplifiers**	Emerald Ballroom B
10:15 a.m.– 12:05 p.m.	**CWB • Coherent LIDAR I**	Emerald Ballroom A
12:30 p.m.– 2:30 p.m.	**JWB • OAA/COTA Poster Session (Box Lunches will be served)**	Emerald Ballroom C
2:30 p.m.– 3:45 p.m.	**OWB • Integrated Semiconductor Device and Switching Application of SOA**	Emerald Ballroom B
2:30 p.m.– 3:55 p.m.	**CWC • Coherent Optical Communication I**	Emerald Ballroom A
3:45 p.m.–4:15 p.m.	**Coffee Break**	Emerald Ballroom C
4:10 p.m.– 5:30 p.m.	**CWD • Coherent Biosensing and Imaging I**	Emerald Ballroom A
4:15 p.m.– 5:30 p.m.	**OWC • Raman and Parametric Amplifiers and their Applications**	Emerald Ballroom B
5:30 p.m.– 6:00 p.m.	**OWD • OAA Postdeadline Papers**	To Be Announced

Thursday, June 29, 2006

8:00 a.m.–5:00 p.m.	**Registration Open**	Emerald Ballroom Foyer
8:30 a.m.– 10:15 a.m.	**CThA • Coherent Biosensing and Imaging II**	Emerald Ballroom A
10:00 a.m.–4:00 p.m.	**Exhibit Open**	Emerald Ballroom C
10:15 a.m.–10:30 a.m.	**Coffee Break**	Emerald Ballroom C
10:30 a.m.–	**CThB • Coherent Optical**	Emerald Ballroom A

12:05 p.m.	**Communication II**	
12:05 p.m.–1:30 p.m.	**Lunch Break (on your own)**	
1:30 p.m.– 3:35 p.m.	**CThC • Coherent Optical Communication III**	Emerald Ballroom A
3:35 p.m.–3:50 p.m.	**Coffee Break**	Emerald Ballroom C
3:50 p.m.– 5:25 p.m.	**CThD • Fundamental Coherent Science and Technology I**	Emerald Ballroom A
7:30 p.m.–10:00 p.m.	**COTA Rump Session**	Emerald Ballroom A

Friday, June 20, 2006

8:30 a.m.– 10:20 a.m.	**CFA • Fundamental Coherent Science and Technology II**	Emerald Ballroom A
10:20 a.m.–10:35 a.m.	**Coffee Break**	Emerald Ballroom Foyer
10:35 a.m.– 12:25 p.m.	**CFB • Coherent LIDAR II**	Emerald Ballroom A
12:25 p.m.–1:30 p.m.	**Lunch Break (on your own)**	
1:30 p.m.– 3:20 p.m.	**CFC • Fundamental Coherent Science and Technology III**	Emerald Ballroom A
3:20 p.m.–3:35 p.m.	**Coffee Break**	Emerald Ballroom Foyer
3:35 p.m.– 5:25 p.m.	**CFD • Coherent Optical Communication IV**	Emerald Ballroom A

Abstracts

●Sunday, June 25, 2006●

Emerald Ballroom Foyer
9:00 a.m.–5:00 p.m.
Registration Open

OSuA ● High Power Fiber Lasers and Amplifiers Workshop I

Emerald Ballroom B
10:00 a.m.–12:00 p.m.
OSuA ● High Power Fiber Lasers and Amplifiers Workshop I
Clifford Headley; OFS Labs, USA, Presider

OSuA1 ● 10:00 a.m. **•Invited•**
Fiber Lasers vs. Solid-State Lasers: Which Is Better? *Ken-ichi Ueda; Univ. of Electro-Communications, Japan*. No abstract available.

OSuA2 ● 10:30 a.m. **•Invited•**
High Peak Power Fiber Laser Technologies, *Almantas Galvanauskas; Univ. of Michigan, USA*. No abstract available.

OSuA3 ● 11:00 a.m. **•Invited•**
High Power, High Reliability ErYb Optical Amplifiers, *Douglas P. Holcomb; Bell Labs, Lucent Technologies, USA*. High Power Optical Amplifiers (HPOAs) are key components in high-bandwidth, free-space communication systems. Erbium/Ytterbium (ErYb) co-doped cladding-pumped technology provides high power and efficiency. Some design choices driven by requirements for high reliability are described.

OSuA4 ● 11:30 a.m. **•Invited•**
Pump Sources and Related Devices for High-Power Fiber Laser Systems, *Christoph Harder; ETH Zurich, Switzerland*. We will review the state-of-the-art and the physical, as well as engineering, limits of high performance, low cost diode lasers and fiber combiners for fiber lasers.

12:00 p.m.–1:00 p.m.
Lunch Break (on your own)

OSuB ● High Power Fiber Lasers and Amplifiers Workshop II

Emerald Ballroom B
1:00 p.m.–2:30 p.m.
OSuB ● High Power Fiber Lasers and Amplifiers Workshop II
Berthold Schmidt; Bookham Switzerland AG, Switzerland, Presider

OSuB1 ● 1:00 p.m. **•Invited•**
High Power, Narrow Linewidth Fiber Amplifiers, *Stuart Gray; Corning Inc., USA*. Amplification of narrow linewidth signals in optical fibers is limited by stimulated Brillouin scattering (SBS). We discuss novel fiber designs that limit SBS allowing the amplification of narrow linewidth signals to kilowatt power levels.

OSuB2 ● 1:30 p.m. **•Invited•**
Continuous-Wave and Pulsed Operation of High-Power Fiber Lasers, *Michalis Zervas; Univ. of Southampton, UK.* No abstract available.

OSuB3 ● 2:00 p.m.
High Power Diode-Pumped Er: ZBLAN Double-Clad Fiber Lasers and Amplifiers, *Xiushan Zhu, Ravi Jain; Ctr. for High Technology Materials, USA.* 5 W Er: ZBLAN double-clad fiber lasers and amplifiers were demonstrated, respectively. Er/Pr co-doped ZBLAN fiber amplifier was found to have broader gain bandwidth than singly Er-doped.

OSuB4 ● 2:15 p.m.
Strictly-All-Fiber 1.55μm High Peak Power High Average Power Source in a Side Coupled Pump Configuration, *Yaakov Glick; Soreq NRC, Israel*. A high peak-power source of 94kW, 0.49mJ/pulse and high average power of 7.3W is presented. This is evidently the highest peak power reported in a strictly-all-fiber source at Erbium eyesafe wavelengths in the nsec regime.

Emerald Ballroom Foyer
2:30 p.m.–2:55 p.m.
Coffee Break

OSuC ● High Power Fiber Lasers and Amplifiers Workshop III

Emerald Ballroom B
2:55 p.m.–4:25 p.m.
OSuC ● High Power Fiber Lasers and Amplifiers Workshop III
Clifford Headley; OFS Labs, USA, Presider

OSuC1 ● 2:55 p.m. **•Invited•**
GaSb Based High-Power Pump Lasers Emitting around 2um, *Marc Kelemen; Fraunhofer Inst. for Applied Solid State Physics, Germany*. We report on (AlGaIn)(AsSb)-based high-power diode lasers fabricated as single-emitters and linear laser arrays, all devices emitting at around 2 μm, suitable for pumping of laser systems emitting in the 2-4 μm wavelength regime.

OSuC2 ● 3:25 p.m. **•Invited•**
High Power CW Lasers, *Denis Gapontsev; IPG Photonics, USA.* No abstract available.

OSuC3 ● 3:55 p.m. **•Invited•**
Towards All Fiber High Power Amplifiers, *Marc D. Mermelstein; OFS Labs, USA.* No abstract available.

•Monday, June 26, 2006•

Emerald Ballroom Foyer
7:30 a.m.–5:00 p.m.
Registration Open

OMA • OAA Welcome Remarks

Emerald Ballroom B
8:30 a.m.–8:45 a.m.
OMA • OAA Welcome Remarks

OMB • OAA Plenary Session

Emerald Ballroom B
8:45 a.m.–10:00 a.m.
OMB • OAA Plenary Session

OMB1 • 8:45 a.m. •Plenary•
Lightwave Capacity Demand in a 20-Years Horizon and Optical Fiber Bandwidth "Finiteness", *Emmanuel Desurvire, Alcatel Submarine Networks, France.* Twenty years from now, lightwave systems will carry vastly increased amounts of internet traffic. However, today's knowledge (2006) points to ultimate technology limits in the transport layer, heralding the end of an "Optical Moore's Law". Therefore, it is worth to put future capacity demand estimates in perspective with the "finiteness" of fiber bandwidth and sketch long-term research avenues to meet the challenge.

OMB2 • 9:25 a.m. •Plenary•
Optical Amplifiers: Current and Future Applications and Opportunities, *Bruce Nyman, Princeton Lightwave, USA.* Optical amplifiers enabled the deployment of WDM systems in communications networks. They have matured from a breakthrough technology to being a commodity. What are the next technologies and applications that will generate new business opportunities?

Emerald Ballroom Foyer
10:00 a.m. –10:30 a.m.
Coffee Break

OMC • High Power Fiber Lasers and Amplifiers

Emerald Ballroom B
10:30 a.m.–12:15 p.m.
OMC • High Power Fiber Lasers and Amplifiers
Dominique Hamoir; ONERA, France, Presider

OMC1 • 10:30 a.m. •Invited•
High Peak Power Fiber Amplifiers, *John Minelly; Aculight Corp., USA.* No abstract available.

OMC2 • 11:00 a.m.
Gain-Switching, ASE Suppression and Efficiency Enhancement in a Low Repetition Rate Pulsed Yb-Doped Fiber Amplifier, *Marc D. Mermelstein; OFS Labs, USA.* A pulsed-pump technique reduces inter-pulse ASE by 10 dB and increases the amplifier efficiency by 4 dB relative to a cw-pumped amplifier in a low-repetition rate (0.5 kHz) Yb-doped fiber amplifier.

OMC3 • 11:15 a.m.
Sub-Picosecond Pulse Amplification in a Short Length, Highly Doped Erbium/Ytterbium Phosphate Fiber Amplifier, *Arturo Chavez-Pirson[1], Wenyan Tian[1], Shibin Jiang[1], Gregory Katona[2], Jane Lee[2], Axel Schülzgen[2], Nasser Peyghambarian[2]; [1]NP Photonics, USA, [2]Optical Sciences Ctr., Univ. of Arizona, USA.* We demonstrate sub-picosecond pulse amplification in a single mode, high gain, and short length (8cm) erbium-ytterbium phosphate fiber amplifier. The amplifier operates in saturation producing 100 mW of average power and 2 nJ per pulse.

OMC4 • 11:30 a.m.
All-Fiber Source of High-Power Picosecond Pulses at 1.5um Using Short and Heavily Doped Phosphate-Fiber Amplifier, *Pavel Polynkin, Alexander Polynkin, Dmitriy Panasenko, Masud Mansuripur, Jerome Moloney, Nasser Peyghambarian; College of Optical Sciences, Univ. of Arizona, USA.* We report an all-fiber source of high-power picosecond pulses at 1.5µm. Rapid amplification in heavily-doped phosphate fiber produces pulses with peak power of 16.6kW while pulse distortion is minimal in either temporal or spectral domain.

OMC5 • 11:45 a.m.
A Novel 800 nm Double-Clad Optical Fiber Amplifier with 980 nm Pumping, *Pramod R. Watekar, Seongmin Ju, Won -Taek Han; Gwangju Inst. of Science and Technology, Republic of Korea.* We report realization of a novel double-clad Yb/Tm-doped 800 nm amplifier. Peak gain of 6.5 dB at 800 nm and the full-width-half-maximum bandwidth of 33 nm were obtained upon pumping with 980 nm laser diode.

OMC6 • 12:00 p.m.
Widely Tunable Semiconductor Master Oscillator-Fiber Amplifier with 9W Output at 1080nm, *Balaji Adhimoolam[1], Marvin Klein[2], Ian Lindsay[1], Petra Gross[1], Klaus-Jochen Boller[1]; [1]Faculty of Applied Physics, The Netherlands, [2]Art Innovation B.V, The Netherlands.* We describe a semiconductor amplifier based laser utilizing an acousto-optic tunable filter to achieve 36 nm tuning in 5 ms. The 50 mW output was amplified to over 9 W in an ytterbium-doped fiber amplifier.

12:15 p.m.–1:30 p.m.
Lunch Break (on your own)

OMD • Novel Materials and Mode Locked Lasers

Emerald Ballroom B
1:30 p.m.–3:30 p.m.
OMD • Novel Materials and Mode Locked Lasers
Karsten Rottwitt; COM Ctr., Denmark, Presider

OMD1 • 1:30 p.m. •Invited•
Silicon Raman Amplifiers, *Bahram Jalali; Univ. of California at Los Angeles, USA.* No abstract available.

OMD2 • 2:00 p.m.
Maximal Total Gain of Non-Tapered Silicon-on-Insulator Raman Amplifiers, *Hagen Renner, Michael Krause; Technische Univ. Hamburg-Harburg, Germany.* We give explicitly the optimal length and pump power for non-tapered SOI Raman amplifiers resulting in the maximum possible total gain. The latter can be increased equally well by decreasing carrier lifetime or linear losses.

OMD3 • 2:15 p.m.
Carbon Nanotube-Based All-Fiber Mode-Lockers with Tapered Fibers, *Yong-Won Song[1], Keiyo Morimune[1], Sze Y. Set[2], Shinji Yamashita[1]; [1]Univ. of Tokyo, Japan, [2]Alnair Labs Corp., Japan.* We demonstrate a novel all-fiber mode-locker functioned by the interaction of Carbon nanotubes with the evanescent field of propagating light in a tapered fiber. Our polarization independent scheme ensures high nonlinear effect from the nanotubes.

OMD4 • 2:30 p.m.
Generation of Low-Repetition Rate High-Energy Picosecond Pulses from a Single-Wall Carbon Nanotube Mode-Locked Fiber Laser, *Kok Hann Fong[1], Sang Yuep Kim[1], Kikuchi Kazuro[1], H. Yaguchi[2], Sze Y. Set[2]; [1]Univ. of Tokyo, Japan, [2]Alnair Labs, Japan.* By increasing the cavity length of a carbon nanotube-based passively mode-locked fiber laser, we demonstrate the generation of a high-energy (2.5 nJ), near transform-limited picosecond pulse train at a fundamental repetition rate of 1.77 MHz.

OMD5 • 2:45 p.m. •Invited•
Erbium Doped Fiber and Highly Nonlinear Fiber Based on Bismuth Oxide Glasses, *Naoki Sugimoto; Asahi Glass Company, Japan.* 500-fs pulse amplification without spectrum broadening can be achieved using bismuth based EDF. On the other hand, highly nonlinear fiber (Gamma=1350 W-1km-1) can be obtained using high refractive index bismuth based glass.

OMD6 ● 3:15 p.m.
Stabilization of Mode-Locked Fiber Lasers Using Bismuth-Oxide-Based Highly Nonlinear Fiber, *Shinji Yamashita, Daisuke Yamane; Univ. of Tokyo, Japan*. We propose and demonstrate a stabilization method of actively mode-locked fiber lasers using a short length of Bismuth-oxide-based highly nonlinear fiber. The supermode noise could be successfully suppressed in a mode-locked fiber laser at 10GHz.

Emerald Ballroom Foyer
3:30 p.m.–4:00 p.m.
Coffee Break

OME ● Novel Semiconductor Device and Slow Light in Semiconductor

Emerald Ballroom B
4:00 p.m.–5:30 p.m.
OME ● Novel Semiconductor Device and Slow Light in Semiconductor
Hitoshi Kawaguchi; Yamagata Univ., Japan, Presider

OME1 ● 4:00 p.m. **•Invited•**
Uncooled QD Pump Laser, *Alfred Forchel; Julius Maximilians-Univ., Germany*. No abstract available.

OME2 ● 4:30 p.m. **•Invited•**
Slow Light in QW and QD SOA, *Shun L. Chuang; Univ. of Illinois, USA*. Slow light and fast light at room temperature using coherent population oscillation effects in quantum-well and quantum-dot semiconductor optical amplifiers are demonstrated experimentally and compared well with theoretical results.

OME3 ● 5:00 p.m.
10GHz Tunable Slow Light in 1.3 μm Quantum Dot Vertical-Cavity Surface-Emitting Laser Amplifier, *Chun-Ting Lin[1], P. C. Peng[1], H. C. Kuo[1], W. K. Tsai[1], S. C. Wang[1], S. Chi[1,2], B. S. Chiou[3], G. Lin[4], H. P. Yang[4], K. F. Lin[4], J. Y. Chi[4]; [1]Inst. of Electro-Optical Engineering, Natl. Chiao-Tung Univ., Taiwan, [2]Dept. of Electrical Engineering, Yuan Ze Univ., Taiwan, [3]Dept. of Electronics Engineering and Inst. of Electronics, Innovative Packaging Res. Ctr., Natl. Chiao-Tung Univ.., Taiwan, [4]Electronics and System Lab, Industrial Technology Res. Inst., Taiwan*. This investigation experimentally demonstrates tunable slow light by varying the bias currents in a 1.3 μm quantum dot vertical-cavity surface-emitting laser. The maximum delay of 42 ps at 10 GHz is achieved.

OME4 ● 5:15 p.m.
True-Time Delay by Slow Light in a Semiconductor Waveguide with Alternating Amplifying and Absorbing Sections, *Filip Öhman, Jesper Mørk; COM•DTU Dept. of Communications, Optics & Materials, Denmark*. Modeling of slow light in a semiconductor waveguide with alternating gain and absorption sections demonstrate an increase in time delay by concatenating segments. A true-time delay is predicted over a large bandwidth at high frequency.

Emerald Ballroom A
5:30 p.m.–7:00 p.m.
Conference Reception

●Tuesday, June 27, 2006●

Emerald Ballroom Foyer
8:00 a.m.–5:00 p.m.
Registration Open

OTuA ● New Applications

Emerald Ballroom B
8:30 a.m.–10:00 a.m.
OTuA ● New Applications
Presider To Be Announced

OTuA1 ● 8:30 a.m. **•Invited•**
Optical Sources for WDM-PON, *Chang-Hee Lee; KAIST, Republic of Korea*. WDM-PON has been considered as the ultimate solution for access networks. A cost-effective optical source that supports color-free operation is essential for deployable system. This paper will discuss recent progress of optical sources for WDM-PON.

OTuA2 ● 9:00 a.m.
60 km Optically-Amplified PON Repeatered Transmission: 1.24 Gbit/s Upstream and 2.5 Gbit/s Downstream PON System with 128x Splitter, *Ken-Ichi Suzuki; NTT Access Service Systems Labs, NTT Corp., Japan*. We successfully demonstrate a 60 km optically-amplified PON repeatered transmission experiment using a commercial 1.24 Gbit/s upstream and 2.5 Gbit/s PON system using our proposed optical-amplifier-based PON repeater and a 128x splitter.

OTuA3 ● 9:15 a.m. **•Invited•**
Optical Label Switching Functionalities Employing Semiconductor Optical Amplifiers, *Idelfonso Tafur Monroy[1,2], A. M. J. Koonen[1], J. J. Vegas Olmos[1], N. Yan[1], C. Peucheret[2], E. V. Breusegem[3]; [1]Eindhoven Univ. of Technology, The Netherlands, [2]Dept. of Communications Optics and Materials, COM DTU, Denmark, [3]Ghent Univ., The Netherlands*. Optical labelling of data packets enables high router throughputs. Semiconductor optical amplifiers (SOAs) are key building blocks to implement the functionalities required for fast optical label switching.

OTuA4 ● 9:45 a.m.
High-Speed Gain Control for EDWA in Optical Burst Switching Node Employing Wavelength Converters, *Katsuhiro Shimizu[1,2], Abdullah Al Amin[1], Shunsuke Tanaka[1], Mitsuru Takenaka[1,3], Toshiharu Miyahara[2,3], Tatsuo Hatta[2,3], Kuniaki Motoshima[2], Motoshi Ono[3,4], Yuki Kondo[3,4], Naoki Sugimoto[4,3], Ichiro Ogura[3,5], Yoshiaki Nakano[1]; [1]Univ. of Tokyo, Japan, [2]Mitsubishi Electric Corp., Japan, [3]Optoelectronic Industry and Technology Development Association (OITDA), Japan, [4]Asahi Glass Co., Ltd., Japan, [5]NEC Corp., Japan*. We have experimentally confirmed that a high-speed gain-control scheme for Er-doped bismuthate waveguide amplifiers effectively reduces gain excursion in burst signal amplification, resulting in error free wavelength conversion in burst optical network nodes.

Emerald Ballroom C
10:00 a.m.–5:00 p.m.
Exhibit Open

Emerald Ballroom C
10:00 a.m.–10:30 a.m.
Coffee Break

OTuB ● Fiber Design

Emerald Ballroom B
10:30 a.m.–12:15 p.m.
OTuB ● Fiber Design
Li Qian; Univ. of Toronto, Canada, Presider

OTuB1 ● 10:30 a.m. **•Invited•**
Fibers in High Performance Amplifiers, *Bera Palsdottir; OFS Fitel Denmark I/S, Denmark*. No abstract available.

OTuB2 ● 11:00 a.m.
Dynamic Behavior of Spectral Hole Burning in EDFA, *Maxim Bolshtyansky, Nicholas King, Gregory Cowle; JDS Uniphase, USA*. The dynamic behavior of spectral hole burning effect is investigated both experimentally and numerically for a transient controlled EDFA. The effect introduces a gain offset and impacts transient behavior of the surviving channel.

OTuB3 ● 11:15 a.m.
Limiting Effects on Similariton Pulse Compression in a Dispersion Decreasing Fiber Amplifier, *David Méchin, Vladimir I. Kruglov, Sung-Hoon Im, John D. Harvey; Dept. of Physics, Univ. of Auckland, New Zealand*. The influence of higher-order nonlinear effects and a non-ideal input pulse on similariton pulse compression in a decreasing dispersion fiber amplifier has been studied experimentally and theoretically. Pulsewidths less than 50fs pulses should be attainable.

OTuB4 ● 11:30 a.m.
Brillouin Amplification for Wavelength and Linewidth Measurement with Femtometer Resolution, *Thomas Schneider, Markus Junker, Kai-Uwe Lauterbach; Deutsche Telekom AG, Germany*. We present a new method for the wavelength and linewidth measurement of optical sources with a resolution in the femtometer range, based on the very low bandwidth and amplification characteristics of stimulated Brillouin scattering.

OTuB5 ● 11:45 a.m. **•Invited•**
Novel Fibers, *Peter G. Kazansky; Optoelectronics Res. Ctr., UK*. No abstract available.

12:15 p.m.–1:30 p.m.
Lunch Break (on your own)

OTuC ● SOA-Based All Optical Processing

Emerald Ballroom B
1:30 p.m.–3:15 p.m.
OTuC ● SOA-Based All Optical Processing
Juerg Leuthold; Univ. of Karlsruhe (TH), Germany, Presider

OTuC1 ● 1:30 p.m. **•Invited•**
Cancellation of Non-Linear Patterning in Semiconductor Amplifier Based Switches, *Robert J. Manning; Univ. College Cork, Ireland*. We describe a new method for all-optical wavelength conversion using self-gain modulation in two semiconductor optical amplifiers. This new configuration gives higher-speed operation with low patterning impairments. Error-free performance at 170.4 Gbit/s is demonstrated.

OTuC2 ● 2:00 p.m.
Recovery Dynamics of the 'Turbo-Switch, *Robin P. Giller, Robert J. Manning, David Cotter; Photonic Systems Group, Tyndall Natl. Inst. and Dept. of Physics, Univ. College Cork, Ireland*. The gain and phase dynamics of an optically excited 'turbo-switch' are measured for the first time. The results indicate potential for wavelength conversion at speeds >170Gbit/s, and optical regeneration at input pulse energies ~ 250fJ.

OTuC3 ● 2:15 p.m.
Dynamics of Linewidth-Enhancement Factor in Semiconductor Optical Amplifiers, *J. Wang[1], C. G. Poulton[1], A. Maitra[1], S. Cabot[2], J. Jaques[2], W. Freude[1], J. Leuthold[1]; [1]Inst. of High-Frequency and Quantum Electronics, Germany, [2]Lucent Technologies, USA*. It is shown that the linewidth-enhancement α-factor in a semiconductor optical amplifier has a significant temporal dependence. A time window with a small or even a negative α-factor is observed in experiments and in calculations.

OTuC4 ● 2:30 p.m.
New Method for Characterizing the Injected-Carrier-to-Photon Conversion Efficiencies inside the Ultrafast All-Optical Semiconductor Gates, *Jun Sakaguchi[1], Yoshiyasu Ueno[1], Kohsuke Nishimura[2], Tomonori Yazaki[2]; [1]Univ. of Electro-Communications, Japan, [2]KDDI R&D Labs Inc., Japan*. We propose a new method to characterize the conversion efficiency from the injected carriers to the excess photons in the process of all-optical gating in SOA, and investigated the efficiencies of SOAs with different structures.

OTuC5 ● 2:45 p.m.
Multi-Pump Four-Wave Mixing in a Semiconductor Optical Amplifier for Wavelength Multicast of NRZ-DPSK Signals, *Mable P. Fok, Chester Shu; Chinese Univ. of Hong Kong, Hong Kong*. We demonstrate wavelength multicast of 10-Gb/s NRZ-DPSK signals by four-wave mixing in a semiconductor optical amplifier. Using three input optical pumps, one-to-six multicast is achieved with an output channel spacing of 200 GHz.

OTuC6 ● 3:00 p.m.
Noise Filtering and Pulse Shaping in SOA-Based 2R Regenerators, *Roderick P. Webb; Tyndall Natl. Inst., Ireland*. The integrating effect of the slow nonlinearity in SOAs is shown to have a critical influence on noise filtering and pulse shaping. Simulations and theory show that up to twenty 2R regenerators may be concatenated.

Emerald Ballroom C
3:15 p.m.–3:45 p.m.
Coffee Break

OTuD ● Transmission and Other Systems

Emerald Ballroom B
3:45:00 p.m.–5:30 p.m.
OTuD ● Transmission and Other Systems
Katsuhiro Shimizu; Mitsubishi Electric Corp., Japan, Presider

OTuD1 ● 3:45 p.m. **•Invited•**
Advanced Raman Amplified Transmission Systems in Long-Haul and High-Capacity Photonic Networks, *Hiroji Masuda; NTT Network Innovation Labs, Japan*. High-performance Raman-amplified transmission systems in trunk networks, which use a combination of distributed Raman amplification and a lumped inline fiber amplifier, are reviewed in terms of the SNR and gain-bandwidth enhancement of WDM signals.

OTuD2 ● 4:15 p.m. **•Invited•**
Nonlinear Optical Approaches for the Generation of Multi-Wavelength Outputs from Fiber Lasers, *Chester Shu; Chinese Univ. of Hong Kong, Hong Kong*. We have demonstrated the generation and stabilization of tunable multi-wavelength output from an erbium-doped fiber laser using stimulated Brillouin scattering and four-wave mixing respectively in the fiber cavity.

OTuD3 ● 4:45 p.m.
Repeaterless Optical System Demonstration in a Tropical Environment Using Double Pass Remote EDFA, *Joao B. Rosolem[1], Miriam Regina X. de Barros[1], Roberto Arradi[1], Sandro M. Rossi[1], Antonio A. Juriollo[1], Jaime A. Matiuso[1], Eduardo Mobilon[1], Domingos S. dos Reis[2], Romel Domingues[2], Jose Vicente Fior[2]; [1]CPqD Foundation, Brazil, [2]Eletronorte S. A., Brazil*. We present a repeaterless optical system field demonstration using double-pass remote EDFA aiming to obtain cost-effective design. The system, installed in a 400 km link in Amazon region showed error free operation during the test.

OTuD4 ● 5:00 p.m.
Channel Performance Sensitivity to Transmitter Parameters in Long-Haul DWDM Systems Employing RZ and CRZ Modulation Formats, *Bamdad Bakhshi, Ekaterina A. Golovchenko, Stuart Abbott; Tyco Telecommunications, USA*. We experimentally examine the impact of various transmitter parameters on channel performance in long-haul DWDM-systems, employing RZ and CRZ formats. We show that proper adjustments of RZ-modulation depth and phase-modulation settings profoundly impact transmission quality.

TuD5 ● 5:15 p.m.
Bidirectional 16x10 Gb/s WDM-DPSK Transmission over 120 km SMF by Using Two Common SOAs, *Roberto Proietti[1], Nicola Calabretta[1], Antonio D'Errico[1], Giampiero Contestabile[1], Ernesto Ciaramella[1], Michele Guglielmucci[2]; [1]Scuola Superiore Sant'Anna, Italy, [2]Inst. Superiore delle Comunicazioni e Tecnologie dell'Informazione (ISCOM), Italy*. We demonstrate the longest bidirectional and unrepeatered SOA-based transmission of 16x10Gbit/s DPSK-channels over single-mode fiber. DPSK constant-envelope prevents Cross-Gain Modulation in SOA-boosters. A new WDM-DSPK demodulator strongly enhances the signal tolerance to chromatic dispersion.

Emerald Ballroom B
7:30 p.m.–10:00 p.m.
OAA Rump Session

●Wednesday, June 28, 2006●

Emerald Ballroom Foyer
8:00 a.m.–5:00 p.m.
Registration Open

CWA ● COTA Welcome Remarks

Emerald Ballroom B
8:45 a.m.–9:00 a.m.
CWA ● COTA Welcome Remarks

JWA ● Joint OAA/COTA Plenary Session

Emerald Ballroom B
9:00 a.m.–9:45 a.m.
JWA ● Joint OAA/COTA Plenary Session

JWA1 ● 9:00 a.m. **•Plenary•**
To Be Announced, *Ronald Holzwarth; Menlo Systems GmbH, Germany.* No abstract available.

Emerald Ballroom C
9:45 a.m.–4:30 p.m.
Exhibit Open

Emerald Ballroom C
9:45 a.m.–10:15 a.m.
Coffee Break

OWA ● Optical Parametric Amplifiers

Emerald Ballroom B
10:15 a.m.–12:00 p.m.
OWA ● Optical Parametric Amplifiers
Anderson S. L. Gomes; UFPE, Brazil, Presider

OWA1 ● 10:15 a.m. **•Invited•**
Fiber-Optic Parametric Devices for DWDM, *Hugo Fragnito, José M. Chavez Boggio, Diego J. Marconi; Univ. Estadual de Campinas, Brazil*. Fiber-Optic parametric devices (FOPDs) can exhibit flat spectral response over the full high bandwidth of DWDM. We review selected topics of FOPDs, including limitations arising from fiber non-uniformity and Brillouin scattering.

OWA2 ● 10:45 a.m.
Broadband and Low Ripple Double-Pumped Parametric Amplifier and Wavelength Converter Using HNLF, *Jose M. Chavez Boggio[1], Jorge D. Marconi[1], Hugo L. Fragnito[1], Scott R. Bickham[2], Claudio Mazzali[2]; [1]Unicamp, Brazil, [2]Corning Inc., USA*. We report on a double-pumped fiber optical parametric amplifier and wavelength converter with flat gain (35.0±1.5dB) over 71nm using a highly non-linear dispersion shifted fiber with low longitudinal variation of the zero dispersion wavelength (<±0.1nm).

OWA3 ● 11:00 a.m.
Properties of Pump-Induced Noise in Fiber Optic Parametric Amplifiers, *Per Kylemark, Magnus Karlsson, Peter Andrekson; Chalmers Univ. of Technology, Sweden*. We investigate the pump-induced noise in fiberoptic parametric amplifiers theoretically and experimentally, and find unique features with respect to wavelength dependence and noise statistics.

OWA4 ● 11:15 a.m.
Modelocked Multiwavelength Ring Laser Using Parametric Amplification in Highly Non-Linear Fibre, *Benjamin Cuenot[1], Andrew Ellis[1], Colin J. McKinstrie[2]; [1]Photonic Systems Group, Ireland, [2]Bell Labs, USA*. A modelocked multiwavelength ring laser is demonstrated showing up to six simultaneous propagating modes. The measured pulse width is 7 ps at a repetition rate of 9.4 GHz.

OWA5 ● 11:30 a.m.
Gain Clamping Performance of a Feed-Forward Pump Control Method with Non-Flat Signals in a Multi-Wavelength-Pumped Discrete Raman Fiber Amplifier, *Xiang Zhou, Martin Birk; AT&T Lab, USA*. We present a detailed experimental investigation on the gain clamping performance of our recently proposed feed-forward pump control technique with non-flat launch signals in a four-wavelength backward-pumped C-band discrete Raman fiber amplifier.

OWA6 ● 11:45 a.m.
Quantum Cloning with a Broadband Optical Amplifier, *Bing Qi[1], Li Qian[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 study the quantum cloning fidelity of a broadband optical amplifier followed by optimal filters. Counter-intuitively, when the average input photon number is below one, such system is no better than a random cloning machine.

CWB ● Coherent LIDAR I

Emerald Ballroom A
10:15 a.m.–12:05 p.m.
CWB ● Coherent LIDAR I
Rongqing Hui, Univ. of Kansas, Presider

CWB1 ● 10:15 a.m. **•Invited•**
Coherent Detection with Arrays of Photon-Counting Detectors, *Jonathan Ashcom, Sumanth Kaushik, Richard Heinrichs; MIT Lincoln Lab, USA*. This talk will present the first experimental demonstration of coherent detection using an array of photon-counting detectors. These measurements use an array of Geiger-mode avalanche photodiodes with integrated CMOS timing circuitry, and show the potential for shot-noise-limited detection in the single-return-photon regime with comparable local oscillator power. The high-bandwidth timing circuitry and potential to fabricate large arrays enable range-resolved Doppler and angularly-resolved Doppler laser radar measurements. Laboratory results agree well with computer simulations.

CWB2 ● 10:40 a.m.
Frequency-Resolved Range/Doppler Coherent LIDAR with a Femtosecond Fiber Laser, *William C. Swann, Nathan R. Newbury; NIST, USA*. We present a frequency-resolved coherent LIDAR (FReCL) based on a frequency comb source that provides higher performance than that of conventional pulsed range/Doppler LIDARs, reduces local oscillator timing requirements, and compensates for path dispersion.

CWB3 ● 10:55 a.m.
Real-Time Range-Doppler Radar Imaging Using a Coherent Holographic Analog Optical Signal Processor, *Randy R. Reibel[1], Zachary Cole[1], Brant Kaylor[1], Trenton Berg[1], Kristian D. Merkel[1], W. Randall Babbitt[2]; [1]S2 Corp., USA, [2]Spectrum Lab, Montana State Univ., USA*. A range-Doppler radar signal processor based upon coherent holographic analog optical signal processing is discussed. Advantages over conventional range-Doppler processors include increased bandwidths (>30 GHz), enhanced dynamic range, and ability to process any waveform type.

CWB4 ● 11:10 a.m. **•Invited•**
Development of the Laser Absorption Spectrometer for Atmospheric CO_2 Measurements, *Gary Spiers, David Tratt, Sven Geier, Mark Phillips, Robert Menzies; JPL, USA*. No abstract available.

CWB5 ● 11:35 a.m.
Coherent Photon Counting Ladar, *Jane X. Luu, Leaf A. Jiang; MIT Lincoln Lab, USA*. Although photon-counting detectors are traditionally used only to detect intensity modulation, we demonstrate that photon-counting detector arrays can be successfully used and in fact offer significant benefits in heterodyne detection, especially in ladar systems.

CWB6 ● 11:50 a.m.
Turbulence Mitigation for Coherent Ladar using Photon Counting Detector Arrays, *Leaf A. Jiang, Jane X. Luu; MIT Lincoln Lab, USA*. The atmospheric turbulence-limited aperture size for coherent ladar can be significantly increased by propagating the local oscillator with the signal through the turbulent medium and detecting the return signal with an array of photon-counting detectors.

JWB ● OAA/COTA Poster Session

Emerald Ballroom C
12:30 p.m.–2:30 p.m.
JWB ● OAA/COTA Poster Session

JWB1
Cross Gain Modulation in Asymmetrical Multi-Quantum Well Semiconductor Optical Amplifier, *S. M. Wan[1], Hon Ki Tsang[1], Y. S. Su[2], C. F. Lin[2]; [1]Chinese Univ. of Hong Kong, Hong Kong, [2]Natl. Taiwan Univ., Taiwan*. Cross gain modulation in an asymmetrical multi-quantum well semiconductor optical amplifier is studied. The wider bandgap quantum wells act as carrier reservoirs for the narrower bandgap quantum wells which thus have reduced cross-gain modulation.

JWB2
All-Optical Ultrafast OTDM Demultiplexing By Using an Unbiased Semiconductor Optical Amplifier, *Stefano Caputo[1], Claudio Crognale[2]; [1]SMD Sud elettronica, Italy, [2]TechnoLabs S.p.a., Italy*. The preliminary study of the performances of an all-optical de-multiplexer based on the Cross Gain Modulation in unbiased Semiconductor Optical Amplifiers is presented. The 1ps FWHM pulses extraction from a 0.1THz Return-to-Zero data-stream is shown.

JWB3
Multi-Channel Polarization-Insensitive Wavelength Converter Based on a Single SOA, *Przemek J. Bock[1], Zhenguo G. Lu[1], Jiaren Liu[1], Peng Lin[1], Mirek Florjanczyk[2], Trevor J. Hall[2]; [1]Inst. for Microstructural Sciences, Canada, [2]Univ. of Ottawa, Canada*. By using a co-polarized pumping technique in a polarization-insensitive semiconductor optical amplifier, we have demonstrated a multi-channel polarization-insensitive wavelength converter with uniform conversion efficiency across the whole gain profile range of the semiconductor optical amplifier.

JWB4
An N-nary Photonic Transistor Based on Semiconductor Optical Amplifier Microstructure, *Shaowen Song; Wilfrid Laurier Univ., Canada*. A 20 nm line width N-nary photonic transistor design based on a heterojunction microstructure similar to a SOA is presented. Commercial computer software was used to simulate and test the design and its applications.

JWB5
Power Variable Fiber Ring Combining EDFA and SOA for Optical Tunable Delay Lines, *Katsumi Takano[1], Kiyoshi Nakagawa[1], Katsuhiro Shimizu[2], Kuniaki Motoshima[2], Hiromasa Ito[3]; [1]Yamagata Univ., Japan, [2]Mitsubishi Electric Corp., Japan, [3]Tohoku Univ., Japan*. Power variable fiber rings are demonstrated using the combination of EDFA and SOA for ring loss compensation. It is applicable for tunable delay lines in optical packet switching node when saturable absorbers follow the ring.

JWB6
Multiple Access Interference Noise Suppression in an Optical CDMA System by Time Gating with the TOAD, *Ivan Glesk, C-S. Bres, Yue-Kai Huang, Darren Rand, Paul R. Prucnal; Princeton Univ., USA*. We demonstrate error-free operation of 4 simultaneous users in a fast frequency-hopping time-spreading OCDMA system. SOA-based ultrafast all-optical sampling gate was used to eliminate multiple access interference and to increase the number of simultaneous users.

JWB7
EDFA Per-Band Gain-Tilt Compensation, *Po Shan Chan, Chi Yung Chow, Hon Ki Tsang; Chinese Univ. of Hong Kong, Hong Kong*. A wavelength dependent per-band add/drop EDFA gain-tilt compensation using an electronic variable optical attenuator was implemented. The high-speed per-band gain compensation was achieved using a feed-forward circuit to control a multichannel electronic variable optical attenuator.

JWB8
Control Process Gain of Erbium Doped Fiber Amplifiers with Wavelength Division Multiplexed Signals, *Dan Kilper, Michael Waldow, Walter Etter, Chongjin Xie; Bell Labs, USA*. The pump-to-output-power control process gain is measured for a gain-flattened erbium doped fiber amplifier as a function of wavelength division multiplexed signal channel configuration and compared with wavelength independent measures.

JWB9
Boundless-Range Optical Phase Shifters and Sideband Reduction, *Christi Madsen, Michael Thompson, Donald Adams, Mehmet Solmaz; Texas A&M Univ., USA*. A boundless-range phase shifter is demonstrated at 10GHz using a dual parallel electro-optic modulator. Sideband and carrier rejections over 30dB are achieved using a coherent optical spectrum analyzer to verify the operation.

JWB10
Tunability of a Single Frequency EDF Ring Laser Based on the Bending Losses of a Depressed-Cladding Fiber, *Matteo Foroni, Letizia Ruggeri, Federica Poli, Paolo Gaboardi, Annamaria Cucinotta, Stefano Selleri; Univ. of Parma, Italy*. The bending losses of a depressed-cladding fiber have been exploited to tune the wavelength of a single frequency erbium doped fiber ring laser. This novel tuning method has been applied in S-band and in C-band.

JWB11
Time-Domain Analysis of a Novel Phase-Locked Coherent Optical Demodulator, *Darko Zibar, Leif A. Johansson, Hsu-Feng Chou, Anand Ramaswamy, John E. Bowers; Dept. of Electrical and Computer Engineering, Univ. of California at Santa Barbara, USA*. Detailed analysis of a novel highly linear phase-locked coherent optical demodulator is presented. We investigate how loop gain, phase-modulator non-linearity and amplitude modulation influence the Signal to Interference Ratio (SIR) of the demodulated signal.

JWB12
Coherence in Optical Frequency-Modulated Continuous-Wave Interference, *Jesse Zheng; PhotonTech, Canada*. A coherence theory of optical frequency-modulated continuous-wave (FMCW) interference is introduced, which is modified from the classical coherence theory and can explain the effect of the spectrum bandwidth of optical source on the beat signal.

JWB13
Experimental Evidence of Spatial Coherence Moirè, *Roman Castaneda, Jorge A. Herrera, Mario A. Usuga-Castañeda; Univ. Nacional de Colombia, Colombia*. We present the experimental evidence of spatial coherence moirè, produced by the superposition of uncorrelated spatial coherence wavelets. We show that it can be modulated using a procedure called *filtering of classes of radiator pairs*.

JWB14
Angle En-Decoding for Photonic RF Amplifiers and A/D Converters, *Geert J. Wyntjes, David Rall, Jay Atkinson; Visidyne Inc, USA*. We will discuss the advantages of linear angle, phase encoding between pairs of optical carriers, beams, and its recovery through interferometry in the same domain for, in the design of RF amplifiers and analog-to-digital converters.

JWB15
Generation of Continuous-Wave 916 nm and 458 nm Nd:LuVO$_4$ Lasers, *Chunyu Zhang[1], Ling Zhang[1], Chi Zhang[1], Zhiyi Wei[1], Zhiguo Zhang[1], HuaiJin Zhang[2], Jiyang Wang[2], Chunqing Gao[3]; [1]Inst. of Physics, Chinese Acad. of Sciences, China, [2]Natl. Lab of Crystal Materials and Inst. of Crystal Materials, Shandong Univ., China, [3]Dept. of Optical Engineering, School of Information Science and Technology , Beijing Inst. of Technology, China*. We reported the CW Nd:LuVO$_4$ lasers operating at 916 nm and 458 nm for the first time. The maximum output power of 930 mW at 916 nm and 50 mW of 458 nm were obtained.

JWB16
Diode-Pumped Passively Mode-Locked 912-nm Nd:GdVO$_4$ Laser, *Chi Zhang[1,2], Ling Zhang[1], Chunyu Zhang[1], Dehua Li[1], Zhiyi Wei[1], Zhiguo Zhang[1], Wenbo Li[2]; [1]Beijing Natl. Lab for Condensed Matter Physics, Inst. of Physics,Chinese Acad. of Sc, China, [2]School of Science, Beijing Jiaotong Univ., China*. We demonstrated the first mode-locked Nd:GdVO$_4$ laser of 912 nm. Using a semiconductor saturable-absorber mirror for passive mode locking, stable output power of 30.8 mW is obtained at a repetition rate of 152 MHz.

JWB17
Diode-Pumped Passively Mode-Locked Nd:LuVO$_4$ Laser Operating at 916 nm, *Ling Zhang[1], Chi Zhang[1], Chunyu Zhang[1], Zhiyi Wei[1], Zhiguo Zhang[1], Huaijin Zhang[2], Jiyang Wang[2], Stephan Strohmaier[3], Hans Eichler[3]; [1]Inst. of Physics, China, [2]Natl. Lab of Crystal Materials and Inst. of Crystal Materials, China, [3]Optical Inst., Technical Univ. Berlin, Germany*. We demonstrated a mode-locked Nd:LuVO$_4$ laser operating at 916 nm. Using a semiconductor saturable-absorber mirror for passive mode locking, stable average output power of 26 mW was obtained at a repetition rate of 152 MHz.

JWB18
Electromagnetic Spatial Coherence Wavelets and Radiometry, *Roman Castaneda, Jorge A. Herrera; Univ. Nacional de Colombia sede Medellin, Colombia*. Generalised radiance tensors are introduced. The trace of the electric tensor allows defining the generalised radiant intensity and the generalised radiant emittance. The trace of the mixed tensor generalises the Poynting vector.

JWB19
Adaptive Optics in Free-Space Coherent Laser Systems, *Aniceto Belmonte; Dept. of Signal Theory and Communications, Technical Univ. of Catalonia, Spain*. The aim of this study is to consider the possibility of using new, affordable adaptive optics technologies to improve substantially the performance and reliability of free-space laser systems based on the heterodyne detection scheme.

JWB20
Measurement of Fluid Velocities by Means of Photo-ElectroMotive Force Effect, *Maximino L. Arroyo Carrasco[1], Silvino Muñoz Solís[1], Marcela Maribel Méndez Otero[1], Erwin A. Martí Panameño[1], Ponciano Rodrígez Montero[2]; [1]FCFM, Postgrado en Física Aplicada, BUAP, Puebla, Mexico, [2]INAOE, Coordinación de Óptica, Puebla, Mexico*. It is possible to measure the velocity of fluids with the interference between scattered light from the fluid and a phase modulated reference beam by means of photodetectors based on photo ElectroMotive Force Effect.

JWB21
Improvement of CSO/CTB Performances Employing Up-Converted and Polarization Modulation Techniques, *Wen-Shing Tsai, Hai-Han Lu, Shah-Jye Tzeng, Je-Wei Liaw, Yu-Jie Ji; Natl. Taipei Univ. of Technology, Taiwan*. A two-wavelength WDM CATV transport system that employed up-converted and polarization modulation (PolM) techniques is proposed and demonstrated. Good performances of CSO and CTB were obtained accompanied by acceptable CNR value in our proposed system.

JWB22
Doppler Frequency Estimation with a Dual Wavelength Fiber Coherent Lidar, *Jean-Pierre Cariou, Matthieu Valla; ONERA, France*. We propose a new technique using a transmitter with two simultaneous phase correlated wavelengths. Heterodyne signals are correlated to give the Doppler information. The performances of our system are compared to the conventional lidar ones.

JWB23
Non-Optimality of Distributed Amplification in Presence of Nonlinear Phase Noise, *Alan Pak Tao Lau, Joseph M. Kahn; Stanford Univ., USA*. We study the optimization of the number of amplifiers in a link of fixed overall length with nonlinear phase noise, and show that bit-error probability and capacity are optimized by a finite number of amplifiers.

JWB24
Optical Phase-Locked Loop Performance in Homodyne Detection Using Pulsed and CW LO, *Pak S. Cho; CeLight, Inc., USA*. Theoretical comparison of balanced and Costas optical phase-locked loops performance in homodyne detection using pulsed- and CW-LO is reported. Analytical expressions of the total phase error variances for pulsed-LO in terms of CW-LO are presented.

JWB25
Comparing the Performances of Optical DQPSK Signal Generated by Single Modulator with and without Pulse Carver, *Peng Wei-Ren, Tsai Shen-You, Chen Jason (Jyehong), Chi Sien; Inst. of Electro-Optical Engineering, Natl. Chiao-Tung Univ., Taiwan*. Optical DQPSK signals are generated using one DD-MZM. Using a RZ carver, the ripples in the NRZ format can be effectively suppressed and 4 dB receiving sensitivity improvement can be achieved after 60km fiber transmission.

JWB26
Error Probabilities in Optical Transmission Systems Based on DPSK and OOK, *Xianming Zhu, Shiva Kumar; McMaster Univ., Canada*. Variance of nonlinear phase noise in dispersion-managed systems based on differential phase-shift keying is examined analytically. Error probabilities for systems based on DPSK and OOK formats are evaluated and compared.

JWB27
A Unified Theory of Quantum Limits for Optically Pre-Amplified and Coherent Detection, *Moshe Nazarathy; EE Dept., Technion, Israel Inst. of Technology, Israel*. We develop a unified theory of ideal error rate performance and quantum limit sensitivities for a large variety of optical modulation formats under four detection schemes: optically pre-amplified direct detection, coherent homodyne / (a)synchronous heterodyne.

JWB28
Receiver Design Tradeoffs in High-speed Equalized Links Based on Sequence Estimation, *Nikola Alic, George C. Papen, Yeshaiahu Fainman, Stojan Radic; Univ. of California San Diego, USA*. We experimentally investigate the effect of different receiver designs on the performance of equalized 10 Gb/s links relying on sequence estimation.

JWB29
A Bidirectional DWDM-PON Based on VCSELs Injection-Locked Technique and Data Comparator, *Wen-Shing Tsai, Hai-Han Lu, Shah-Jye Tzeng, Tzu-Shen Chien, Bo-Siao Cheng, Chien-Chou Chen; Natl. Taipei Univ. of Technology, Taiwan*. A bidirectional DWDM-PON based on vertical cavity surface emitting lasers (VCSELs) injection locked technique and data comparator is proposed and demonstrated. Improved performances of BER and eye diagram were observed in our proposed DWDM-PON.

JWB30
ASE Correction for Automatic Signal-Power Control in an EDFA, *Lijie Qiao, Paul J. Vella; BTI Photonic Systems, Canada*. An EDFA was automated for constant communication-channel power control based on a simple theoretical model that allowed firmware-based calculations of total ASE power in terms of Gain, channel-wavelength and power. Model was experimentally verified.

JWB31
Gain Reciprocity in Fiber Optical Parametric Amplifiers, *Michel E. Marhic, Georgios Kalogerakis, Leonid G. Kazovsky; Stanford Univ., USA*. A fiber OPA operating in the small-signal gain regime can exhibit the same gain spectrum when amplifying in either direction. This is true even in the presence of random longitudinal variations of dispersion and birefringence.

JWB32
Optical Pulse Compression in Single-Mode Fibers Induced by Cross-Phase Modulation in Semiconductor Optical Amplifiers, *Claudio Crognale[1], Luigi Rosa[1], Stefano Caputo[2]; [1]TechnoLabs S.p.A, Italy, [2]SMD Elettronica, Italy*. Simulations have shown that a SOA-based pump-probe scheme and an optical fiber in cascade can compress 1ps FWHM Gaussian unchirped pulse sequence up to 327fs FWHM in the anomalous dispersion regime, without any pattern dependence.

JWB33
Optical Amplifier Hybrid Devices for S-Band Telecommunications: A Comparison, *Anderson S. L. Gomes[1], Glendo F. Guimaraes[1], Bernardo B. C. Kyotoku[1], Joao F. L. Freitas[1], Marcia B. Costa e Silva[1], Djeisson H. Thomas[2], Jean P. Weid[2], Stefan R. Luthi[1]; [1]UFPE, Brazil, [2]CETUC, Brazil*. Amplifier hybrids coupling different amplifier types are characterized and evaluated for application in S-band telecommunications. Combinations including a fiber-optic parametric gain module are also studied for S-C/L band wavelength conversion.

JWB34
Cost-Effective Multi-Functional EDFA for Metropolitan Area Networks, *Julio C. R. F. Oliveira[1], Joao B. Rosolem[1], Antonio A. Juriollo[1], Murilo A. Romero[2], Aldario A. C. Bordonalli[3]; [1]CPqD Foundation, Brazil, [2]Dept. of Electrical Engineering, Univ. of São Paulo, Brazil, [3]School of Electrical and Computer Engineering, Univ. of Campinas, Brazil*. We present a cost-effective double pass EDFA configuration with embedded chromatic dispersion compensation and optical gain control functions. The amplifier was characterized and tested over a 10 Gb/s x 16 DWDM system showing excellent performance.

JWB35
Accurate Modeling of Fiber OPAs with Nonlinear Ellipse Rotation Terms in the Split-Step Fourier Method, *Michel Marhic[1], Andres A. Rieznik[2], L. G. Kazovsky[1], Hugo L. Fragnito[2]; [1]Stanford Univ., USA, [2]State Univ. of Campinas, Brazil*. We improve the accuracy of the split-step Fourier method by exactly treating nonlinear ellipse rotation terms. Results obtained this way for two-pump OPAs are significantly different from those obtained by neglecting ellipse rotation terms.

JWB36
Accurate Modeling and Experimental Validation of a Singlemode 4 Watt Output Power Double Cladding Erbium Ytterbium Fibre Amplifier, *Bertrand Morasse[1], Stéphane Chatigny[1], Carl Hovington[1], Michel Piché[2]; [1]Coractive, Canada, [2]Ctr. d'Optique, de Photonique et de Lasers, Univ. Laval, Canada*. We developed a model that accurately predicts the performance of high power double cladding erbium/ytterbium fibre amplifiers. We obtained a perfect agreement between the model and experimental data for a 4 watt output power amplifier.

JWB37
Examination of the Hole Burning in Raman Gain Spectra at High Pump and Signal Powers, *S. A. Babin, D. V. Churkin, S. I. Kablukov, E. V. Podivilov; Inst. of Automation and Electrometry, Russian Federation*. The experimental investigation of Raman gain spectra has been performed by CARS technique. It has been shown that the Raman gain profile saturates homogeneously without spectral hole burning even at high power levels.

JWB38
Investigation of Side Spontaneous Emission of Silica-Based Erbium Doped Fibers by Integrating Sphere, *Debao Zhang, Setsuhisa Tanabe; Graduate School of Human and Environmental Studies, Kyoto Univ., Japan*. The spectral power of side spontaneous emission was evaluated quantitatively on erbium-doped fibers with an integrating sphere. The side spontaneous emission power was much larger than ASE power and nearly saturated at the lower pump power.

JWB39
Characteristics of All-Optical Ultra-Fast Retiming Switches Using Cascade of Second Harmonic Generation and Difference Frequency Mixing in Periodically Poled Lithium Niobate Waveguides, *Yutaka Fukuchi, Toru Kawashima, Masami Akaike, Joji Maeda; Tokyo Univ. of Science, Japan*. We numerically calculate the performance of all-optical retiming switches employing the cascaded second-order nonlinear effect in quasi-phase-matched lithium niobate waveguides. A time offset between the signal and clock pulses can improve the timing-jitter transfer characteristics.

JWB40
Hybrid Erbium/Raman Fiber Amplifier with High Dynamic Range and Low Gain Ripple in Entire C-Band, *Rasmus Kjær[1], Leif K. Oxenløwe[1], Palle Jeppesen[1], Bera Palsdottir[2], Carsten G. Jørgensen[2]; [1]COM, Denmark, [2]OFS Fitel Denmark, Denmark*. A standard dual-stage EDFA is combined with a dispersion-compensating Raman amplifier to obtain flat C-band gain in a high-gain range from 20 dB to 33 dB. The amplifier may find use in long-span repeater links.

JWB41
Multiwavelength EDF Ring Laser Tunable through the Bending Losses of a Depressed-Cladding Fiber, *Matteo Foroni, Letizia Ruggeri, Federica Poli, Annamaria Cucinotta, Stefano Selleri; Univ. of Parma, Italy*. A tunable narrow-linewidth triple-wavelength erbium-doped fiber ring laser has been experimentally demonstrated. The bending losses of a depressed-cladding fiber have been exploited to tune the laser wavelength in S, C and L band.

JWB42
Flexible Brillouin Bandwidth Broadening for an Amplification, Filtering or Millimeter Wave Generation Systems, *Markus Junker[1,2], Thomas Schneider[1], Max J. Ammann[2], Andreas T. Schwarzbacher[2], Kai-Uwe Lauterbach[1]; [1]Deutsche Telekom AG Fachhochschule Leipzig, Germany, [2]Dublin Inst. of Technology, Ireland*. In this paper a simple method for the tunable bandwidth enhancement of Stimulated Brillouin Scattering is presented. It is based on the simultaneous use of several modulated pump sources in the system.

JWB43
Gain and Noise Figure Measurement for Optical Fiber Amplifiers by Using an ASE Source and DWDM Filters, *Lih-Gen Sheu[1], Kun-Yan Chuang[1], De-Cheng Hong[1], Yan-Xian Wang[1], Wei-Xiang Huang[1], Wei Hsu[1], Yi-Ping Wang[2], Yinchieh Lai[3]; [1]Dept. of Electro-Optical Engineering, Vanung Univ., Taiwan, [2]Dept. of Electrical Engineering, Kuang Wu Inst. of Technology, Taiwan, [3]Inst. of Electro-Optical Engineering, Natl. Chiao-Tung Univ., Taiwan*. We propose a low-cost scheme for characterizing optical amplifiers. By linearly fitting the input/output optical spectra measured with an ASE source and DWDM filters, the results excellently match the data obtained by the TDE method.

JWB44
S+C+L Band Double-Pass EDFA, *Matteo Foroni, Letizia Ruggeri, Federica Poli, Annamaria Cucinotta, Stefano Selleri; Univ. of Parma, Italy*. A new S+C+L band double-pass EDFA has been experimentally demonstrated. Almost 20 *dB* gain has been measured in a 120-*nm* range, with a 30 *dB* peak in each band for a -30 *dBm* signal power.

JWB45
Reflective Type Raman Amplifier for Loss Compensation in Dispersion Compensating Fiber, *Jeng Cherng Dung, Ying Ren Chen; Natl. Dong Hwa Univ., Taiwan*. We demonstrate the reflective type Raman amplifier in the dispersion compensating fiber which is composed of circulator and Faraday rotator mirror. The gain of the reflective type is higher than that of conventional single-pass type.

OWB ● Integrated Semiconductor Device and Switching Application of SOA

Emerald Ballroom B
2:30 p.m.–3:45 p.m.
OWB ● Integrated Semiconductor Device and Switching Application of SOA. *Ken Morito; Fujitsu Labs Ltd., Japan, Presider*

OWB1 ● 2:30 p.m. **•Invited•**
SOA Based Devices for All Optical Signal Processing, *Alistair J. Poustie; Corning Res. Ctr., UK*. No abstract available.

OWB2 ● 3:00 p.m. **•Invited•**
SOA Based Optical Packet Switching for High Performance Computing, *B. Roe Hemenway; Corning, Inc., USA*. No abstract available.

OWB3 ● 3:30 p.m.
Densely-Spaced, Polarization-Insensitive, Low-Noise, High-Saturation-Power Semiconductor Optical Amplifier Array, *Martin H. Hu, Herve P. LeBlanc, Caneau G. Catherine, Sean Coleman, Xingsheng Liu, Chung-en Zah; Corning Inc, USA*. A 10-element SOA array with a pitch spacing of 33.8μm was fabricated. The array has fiber-fiber gain of 15.7dB, 3-dB saturation power >16dBm, noise figure <7.5dB and polarization dependence of gain <0.7dB.

CWC • Coherent Optical Communication I

Emerald Ballroom A
2:30 p.m.–3:55 p.m.
CWC • Coherent Optical Communication I
Moshe Nazarathy; Technion, Israel Inst. of Technology, Israel, Presider

CWC1 • 2:30 p.m. **•Invited•**
Fieldable Digital Coherent Interferometric Communication and Sensing Application Domains, *Isaac Shpantzer; CeLight Inc., USA*. A layered architecture unifying optical coherent communications and interferometric sensing via digitally stabilized quadrature modulator and homodyne receiver augmented by digital noise reduction and channel compensation algorithms stacks, form new paradigm for coherent fieldable applications.

CWC2 • 2:55 p.m.
Integrated $LiNbO_3$ Modulator for High-Speed Optical Quadrature Phase Shift Keying, *Tetsuya Kawanishi[1], Takahide Sakamoto[1], Tetsuya Miyazaki[1], Masayuki Izutsu[1], Takahisa Fujita[2], Kaoru Higuma[2], Shingo Mori[2], Junichiro Ichikawa[2]; [1]Natl. Inst. of Information and Communications Technology, Japan, [2]Sumitomo Osaka Cement Co., Ltd., Japan*. We investigated high-speed optical differential quadrature-shift-keying (DQPSK) modulation using an integrated LiNbO3 modulator with two sub Mach-Zehnder structures. A bias condition monitor technique was also proposed for automatic bias control in DQPSK modulation.

CWC3 • 3:10 p.m.
DSP-Based Coherent Detection Techniques, *Georgios Kalogerakis, Wei-Tao Shaw, Leonid G. Kazovsky; Stanford Univ., USA*. Two digital signal processing techniques for phase estimation of coherent PSK systems, namely feedforward carrier recovery and digital delay lock loop, are analyzed and simulated. Limitations due to laser linewidth and processing delay are considered.

CWC4 • 3:25 p.m.
BER Estimation of QPSK Homodyne Detection with Feedforward Carrier Phase Estimation, *Gilad Goldfarb, Guifang Li; College of Optics and Photonics: CREOL and FPCE, USA*. An approximate analytical expression for the bit error rate of a QPSK homodyne receiver employing digital signal processing for carrier recovery is derived. BER estimated using the analytical expression shows excellent agreement with Monte-Carlo simulations.

CWC5 • 3:40 p.m.
System Performance of Coherent Optical Orthogonal Frequency Division Multiplexing, *William Shieh, Chandra Athaudage; Univ. of Melbourne, Australia*. Coherent optical orthogonal frequency division multiplexing is proposed to combat optical dispersion. We show that optical-signal-to-noise-ratio (OSNR) penalty at 10 Gb/s is maintained below 2 dB for 3000-km transmission of standard-single-mode fibre without dispersion compensation.

Emerald Ballroom C
3:45 p.m.–4:15 p.m.
Coffee Break

CWD • Coherent Biosensing and Imaging I

Emerald Ballroom A
4:10 p.m.–5:30 p.m.
CWD • Coherent Biosensing and Imaging I
Aristide Dogariu; College of Optics & Photonics: CREOL & FPCE, USA, Presider

CWD1 • 4:10 p.m. **•Invited•**
New Techniques for Signal Optimization in Harmonic and Multiphoton Absorption Fluorescence Microscopy, *Jeffrey Squier; Colorado School of Mines, USA*. No abstract available.

CWD2 • 4:35 p.m. **•Invited•**
Entangled-Photon Optical Coherence Tomography, *Malvin C. Teich, Magued B. Nasr, Alexander V. Sergienko, Bahaa E. A. Saleh; Boston Univ., USA*. Quantum-optical coherence tomography (QOCT) makes use of entangled twin-photon light to perform axial optical sectioning of objects with improved resolution by virtue of dispersion cancellation.

CWD3 • 5:00 p.m.
Swept Source Fourier Domain Optical Coherence Tomography, *Jun Zhang, Bin Rao, Qiang Wang, Zhongping Chen; Univ. of California at Irvine, USA*. Swept laser based Fourier domain optical coherence tomography (FDOCT) systems were designed and developed. 3-D structure, Doppler and polarization imaging with high speed and high sensitivity were described and demonstrated

CWD4 • 5:15 p.m.
Fiber Grating Sensor Array Interrogation Using a Frequency-Shifted Interferometer and Fourier Analysis, *Yu Liu[1], Li Qian[1], Bing Qi[1], Xijia Gu[2]; [1]Univ. of Toronto, Canada, [2]Ryerson Univ., Canada*. We interrogate an 11-grating sensor array with random wavelength overlap using a novel frequency-shifted interferometer. Fourier analysis of the interference signal as a function of the frequency shift resolves the positions of the grating.

OWC • Raman and Parametric Amplifiers and Their Applications

Emerald Ballroom B
4:15 p.m.–5:30 p.m.
OWC • Raman and Parametric Amplifiers and Their Applications. *Presider To Be Announced*

OWC1 • 4:15 p.m. **•Invited•**
Phase-Sensitive Parametric Amplifiers, *Prem Kumar; Northwestern Univ., USA*. No abstract available.

OWC2 • 4:45 p.m.
Raman Amplification in Multi-Mode Fiber: Reduction of Inter-Symbol Interference via Mode Selective Gain, *Arup Polley, Stephen E. Ralph; Georgia Tech, USA*. We present the theoretical and experimental results demonstrating Raman amplification in multi-mode fiber and mode selective gain. These results suggest a new method to increase data rates in multi-mode fiber links.

OWC3 • 5:00 p.m.
An SNR Enhanced Transmission System over DSF Using Extended L-Band EDFAs and Bidirectional Distributed Raman Amplification, *Hiroji Masuda, Yutaka Miyamoto; NTT Network Innovation Labs, Japan*. A novel SNR-enhanced transmission system over DSF that uses phosphorous co-doped silicate EDFAs and bidirectional distributed Raman amplification is proposed; it achieves 3-dB SNR enhancement for signal wavelengths from 1573 to 1620 nm.

OWC4 • 5:15 p.m.
Experimental Validation of Calculated OSNR Penalty Due to Signal-Pump-Signal Crosstalk in Co-Pumped Raman Amplifiers, *Dominique Annie Mongardien, Sophie Borne, Catherine Martinelli, Dominique Bayart; ALCATEL, France*. OSNR penalty due to signal-pump-signal crosstalk in forward pumped Raman amplifiers has been measured, fair agreement has been obtained with our simulation tool. Calculations have shown system penalty as high as 1 dB over E-LEAF.

OWD • OAA Postdeadline Papers

To Be Announced
5:30 p.m. –6:00 p.m.
OWD • OAA Postdeadline Papers

•Thursday, June 29, 2006•

Emerald Ballroom Foyer
8:00 a.m.–5:00 p.m.
Registration Open

CThA • Coherent Biosensing and Imaging II

Emerald Ballroom A
8:30 a.m.–10:15 a.m.
CThA • Coherent Biosensing and Imaging II
Zhongping Chen; Univ. of California at Irvine, USA, Presider

CThA1 • 8:30 a.m. **•Invited•**
Comprehensive Screening for Disease with Optical Frequency-Domain Imaging, *Brett E. Bouma; Harvard Medical School and Massachusetts General Hospital, USA*. No abstract available.

CThA2 • 8:55 a.m. **•Invited•**
Quantitative Multiplex CARS Micro-Spectroscopy in Congested Spectral Regions, *Michiel Muller; Univ. of Amsterdam, The Netherlands*. Novel procedures are presented to extract vibrational information from multiplex CARS data - with and without the use of *a priori* information of the sample - with particular emphasis on highly congested spectral regions.

CThA3 • 9:20 a.m. **•Invited•**
Low-Coherence Enhanced Backscattering for Biomedical Applications, *Vadim Backman; Northwestern Univ., USA*. No abstract available.

CThA4 • 9:45 a.m.
Heterodyne Optical Coherent Tomography (HOCT) System, *James F. Holmes; OGI School of Science and Engineering, USA*. The system which we designed and tested is essentially a bistatic optical radar. It is different from OCT and may have some advantages and/or options to augment OCT's imaging into scattering material such as tissue.

CThA5 • 10:00 a.m.
A Novel Frequency-Modulated Continuous-Wave Interferometric Displacement Sensor, *Jesse Zheng; PhotonTech, Canada*. This paper introduces a novel reflectometric fiber-optic displacement sensor, which is based on the principle of optical frequency-modulated continuous-wave (FMCW) interference and has an accuracy of 0.02 μm in a measurement range of 1000 μm.

Emerald Ballroom C
10:00 a.m.–4:00 p.m.
Exhibit Open

Emerald Ballroom C
10:15 a.m.–10:30 a.m.
Coffee Break

CThB • Coherent Optical Communication II

Emerald Ballroom A
10:30 a.m.–12:05 p.m.
CThB • Coherent Optical Communication II
Reinhold Noe; Univ. Paderborn, Germany, Presider

CThB1 • 10:30 a.m. **•Invited•**
Coherent Detection for Fiber Optic Communications Using Digital Signal Processing, *Michael Taylor; Univ. College London, UK*. The arrival recently of gigabit rate digital signal processing technology means that coherent detection can once again be considered for optical communications. The key advantages of coherent over direct detection will be presented, together with experimental results.

CThB2 • 10:55 a.m.
Integrated Optical Coherent Balanced Receiver, *Pak S. Cho[1], Geof Harston[1], Art Greenblatt[1], Arkady Kaplan[1], Yaakov Achiam[2], Ralf M. Bertenburg[2], Andreas Brennemann[2], Benjamim Adoram[3], Paul Goldgeier[3], Arie Hershkovits[3]; [1]CeLight, Inc., USA, [2]synQPSK Consortium, Univ. Paderborn, Germany, [3]Elisra Group, Israel*. A 1550-nm coherent receiver with a $LiNbO_3$ optical hybrid and balanced photoreceivers integrated in a single compact package is reported. Frequency response of the integrated receiver and bit-error-rate measurements of optical PSK signals are described.

CThB3 • 11:10 a.m. **•Invited•**
Phase-Diversity Homodyne Receiver for Coherent Optical Communications, *Kazuro Kikuchi; RCAST, Univ. of Tokyo, Japan*. We develop a phase-diversity homodyne optical receiver, where the carrier-phase drift is estimated with digital signal processing on the homodyne-detected signal. Multi-level phase-shift keying (PSK) signals up to 8-PSK are successfully demodulated at 10 Gsymbol/s.

CThB4 • 11:35 a.m.
Data-Aided Multi-Symbol Phase Estimation for Receiver Sensitivity Enhancement in Optical DQPSK, *Xiang Liu; Lucent Technologies, USA*. We present a data-aided multi-symbol phase estimation scheme to improve the receiver sensitivity of direct-detection DQPSK to approach that of coherent-detection QPSK in optically pre-amplified receivers. Performance-enhancement of >2 dB is obtained in a nonlinear-regime

CThB5 • 11:50 a.m.
Approaching Coherent Homodyne Performance with Direct Detection Low-Complexity Advanced Modulation Formats, *Moshe Nazarathy, Yoav Yadin; EE Dept., Technion, Israel Inst. of Technology, Israel*. We introduce decision-feedback based realizations of considerably reduced complexity for the recently proposed Multi-Chip DPSK advanced modulation formats. These new direct detection systems emulate coherent homodyne PSK by improved estimation of the self-homodyne reference phase.

12:05 p.m.–1:30 p.m.
Lunch Break (on your own)

CThC • Coherent Optical Communication III

Emerald Ballroom A
1:30 p.m.–3:35 p.m.
CThC • Coherent Optical Communication III
Kaizuro Kikuchi; Univ. of Tokyo, Japan, Presider

CThC1 • 1:30 p.m. **•Invited•**
Modulation and Detection Techniques for Optical Communication Systems, *Joseph Kahn; Stanford Univ., USA*. Performance and implementation complexity of various binary and nonbinary modulation methods with coherent, differentially coherent and noncoherent detection are compared. Nonbinary modulation with coherent detection maximizes spectral efficiency and improves tolerance to transmission impairments, while enabling effective, low-complexity electrical compensation of these impairments.

CThC2 • 1:55 p.m.
Closed-Loop Control of $LiNbO_3$ Quadrature Modulator for Coherent Communications, *Pak S. Cho[1], Jacob B. Khurgin[2], Isaac Shpantzer[1]; [1]CeLight, Inc., USA, [2]Johns Hopkins Univ., USA*. Closed-loop control of $LiNbO_3$ quadrature modulator for quaternary phase-shift-keyed transmission in coherent communications is reported. Simulations and experimental results of the feedback control loop for maintaining operating points of the quadrature modulator are described.

CThC3 • 2:10 p.m.
System Sensitivity of Multi-Level 16-QAM and QPSK to Transmitter Imperfections in Different Modulator Designs, *Louis C. Christen, Alan E. Willner; Univ. of Southern California, USA*. The impact imperfections have on two modulators capable of generating arbitrary-quadrature-waveforms is determined. Power penalties are generated for 16-QAM and QPSK for various imperfections showing increased tolerance in the single-dual-drive design and in 16-QAM.

CThC4 ● 2:25 p.m. **•Invited•**
European "synQPSK" Project: Toward Synchronous Optical Quadrature Phase Shift Keying with DFB Lasers, *Reinhold Noe[1], Ulrich Rückert[1], Yakoov Achiam[2], Franz Josef Tegude[3], Henri Porte[4]; [1]Univ. Paderborn, Germany, [2]CeLight Israel Ltd., Israel, [3]Univ. Duisburg-Essen, Germany, [4]Photline, France*. Key components for a synchronous 10-Gbaud, 40-Gbit/s QPSK polarization division multiplex transmission testbed are being developed: $LiNbO_3$ Z-cut QPSK modulator, $LiNbO_3$ 90° hybrid co-packaged with balanced photoreceiver OEICs, SiGe/CMOS circuits for digital signal processing.

CThC5 ● 2:50 p.m.
Real-time Synchronous QPSK Transmission with Standard DFB Lasers and Digital I&Q Receiver, *Timo Pfau[1], Sebastian Hoffmann[1], Ralf Peveling[1], Suhas Bhandare[1], Selwan K. Ibrahim[1], Olaf Adamczyk[1], Mario Porrmann[1], Reinhold Noé[1], Yakoov Achiam[2]; [1]Univ. Paderborn, Germany, [2]CeLight Israel Ltd., Israel*. For the first time synchronous QPSK data is transmitted in real-time with standard DFB lasers. FEC-compatible performance is reached at 400 Mbaud after 63-km of fiber. Self-homodyne operation with an ECL is error-free.

CThC6 ● 3:05 p.m.
Hardware-Efficient and Phase Noise Tolerant Digital Synchronous QPSK Receiver Concept, *Sebastian Hoffmann, Timo Pfau, Olaf Adamczyk, Ralf Peveling, Mario Porrmann, Reinhold Noé; Univ. Paderborn, Germany*. Simulation results and a first standard cell CMOS implementation are reported for efficient carrier and data recovery methods in the IF domain of digital I&Q receivers, for synchronous QPSK transmission with standard DFB lasers.

CThC7 ● 3:20 p.m.
Polarization Diversity Transmitter and Optical Nonlinearity Mitigation Using Polarization-Time Coding, *Yan Han, Guifang Li; College of Optics and Photonics, Univ. of Central Florida, USA*. Polarization diversity transmitter is proposed to realize polarization-insensitive coherent detection using polarization-time coding. It can significantly reduce cross-phase-modulation-induced polarization scattering in wavelength-division multiplexing systems. Polarization-time coding is analogous to space-time coding in wireless communications.

Emerald Ballroom C
3:35 p.m.–3:50 p.m.
Coffee Break

CThD ● Fundamental Coherent Science and Technology I

Emerald Ballroom A
3:50 p.m.–5:25 p.m.
CThD ● Fundamental Coherent Science and Technology I
Lute Maleki; JPL, USA, Presider

CThD1 ● 3:50 p.m. **•Invited•**
Optical Signal Processing for RADAR & LIDAR Applications, *Daniel Dolfi, Loïc Morvan, Sylvie Tonda-Goldstein, Jean-Pierre Huignard; Thales Res. & Technology, France*. We propose to review optical processing concepts for both radar and lidar applications. These architectures can provide lidar systems with target identification capabilities and radar systems with time delay based processing, over a large instantaneous frequency bandwidth.

CThD2 ● 4:15 p.m.
Fiber Array Phase Cohering: Holographic vs. Numerical, *Benjamin Braker, Max Colice, Kelvin Wagner; Optoelectronic Computing Systems Ctr., USA*. Coherent optical systems can be fed by phase cohered fiber arrays that maintain constant phase across the array. We present and compare results for arrays cohered by holography, redundant spacing calibration, and optical self-calibration.

CThD3 ● 4:30 p.m. **•Invited•**
Slow Light: Fundamentals & Applications, *Jacob B. Khurgin; Johns Hopkins Univ., USA*. Fundamental principles behind the "slow light" phenomena in atomic media, photonic structures, amplifiers, and others will be outlined . Figures of merit for possible applications in optical buffers, switches and other devices will be discussed.

CThD4 ● 4:55 p.m.
Real Time Wideband RF Spectrometer Using Spatial Spectral Optical Sensor Materials, *Randy R. Reibel[1], Zachary Cole[1], Trenton Berg[1], Brant Kaylor[1], Luke R. Mauritisen[1], Kristian D. Merkel[1], R. Krishna Mohan[2], Tiejun Chang[2], Mingzhen Tian[2], W. Randy Babbitt[2], Kelvin H. Wagner[3]; [1]S2 Corp., USA, [2]Spectrum Lab, USA, [3]Univ. of Colorado, USA*. We discuss a novel coherent optical system for unity probability of intercept sensing of wideband RF transmissions. The core optical sensor materials can currently capture >30 GHz instantaneous bandwidths with bettern than 30 kHz resolution.

CThD5 ● 5:10 p.m.
Whispering Gallery Mode Spool as an Optical Buffer, *Andrey B. Matsko, Anatoliy A. Savchenkov, Lute Maleki; JPL, USA*. We discuss designs of photonic systems based on the propagation of light beams with nonzero angular momentum in cylindrical waveguides for applications as all-optical buffers.

Emerald Ballroom A
7:30 p.m.–10:00 p.m.
COTA Rump Session

•Friday, June 30, 2006•

CFA • Fundamental Coherent Science and Technology II

Emerald Ballroom A
8:30 a.m.–10:20 a.m.
CFA • Fundamental Coherent Science and Technology II
John Bowers; Univ. of California at Santa Barbara, USA, Presider

CFA1 • 8:30 a.m. **•Invited•**
Advances in Coherent Optical Spectroscopy, *Jun Ye; JILA, Univ. of Colorado & NIST, USA*. No abstract available.

CFA2 • 8:55 a.m.
Homodyne QPSK Detection for Quantum Key Distribution, *Marcia B. Costa e Silva[1], Qing Xu[1], Sébastien Agnolini[1], Philippe Gallion[1], Francisco J. Mendieta[2]; [1]Ecole Natl. Supérieure de Télécommunications, France, [2]CICESE, Mexico*. We present a QKD system with fainted pulses using self-homodyne coherent detection in optical fibers at 1543nm. BB84 protocol key is encoded in the optical phase using a two-electrode Mach-Zehnder modulator, producing a QPSK modulation.

CFA3 • 9:10 a.m.
SFDR Improvement of a Coherent Receiver Using Feedback, *Hsu-Feng Chou, Anand Ramaswamy, Darko Zibar, Leif A. Johansson, John E. Bowers, Mark Rodwell, Larry Coldren; Univ. of California at Santa Barbara, USA*. A novel coherent optical receiver is proposed and experimentally demonstrated by using a feedback technique capable of reducing the nonlinear distortion in a traditional receiver while retaining the signal to noise ratio.

CFA4 • 9:25 a.m. **•Invited•**
Phase-Locking in Semiconductor Lasers & Arrays, *Amnon Yariv; Caltech, USA*. No abstract available.

CFA5 • 9:50 a.m.
Experimental Demonstration of Coherent Optical I/Q Demodulation of Analog RF Signals, *Thomas R. Clark, Michael L. Dennis; Johns Hopkins Univ. Applied Physics Lab, USA*. We report the experimental demonstration of a coherent optical phase modulation receiver utilizing the simultaneous in-phase and quadrature-phase demodulation of analog radio frequency signals to achieve highly linear photonic transport.

CFA6 • 10:05 a.m.
Performance of Analog Photonic Links Employing Phase Modulation, *Frank Bucholtz, Vincent J. Urick, Matthew S. Rogge, Keith J. Williams; NRL, USA*. We discuss the operating principles of phase modulation in analog photonic links and compare the performance to the more widely-used intensity-modulated links. Experimental results are presented for RF gain and spurious-free dynamic range.

Emerald Ballroom Foyer
10:20 a.m.–10:35 a.m.
Coffee Break

CFB • Coherent LIDAR II

Emerald Ballroom A
10:35 a.m.–12:25 p.m.
CFB • Coherent LIDAR II
Richard Heinrichs, MIT Lincoln Lab, USA, Presider

CFB1 • 10:35 a.m. **•Invited•**
Polypulse Coherent Lidar Waveforms for Coherent Lidar Measurements, *Philip Gatt, Sammy Henderson; Lockheed Martin Coherent Technologies, USA*. No abstract available.

CFB2 • 11:00 a.m.
A Birefringent Fiber Frequency-Modulated Continuous-Wave Interferometric Gyroscope, *Jesse Zheng; PhotonTech, Canada*. This paper describes a new type of fiber-optic gyroscopes, which is based on the principle of frequency-modulated continuous-wave (FMCW) interference and uses the beat signal from a birefringent fiber coil to measure inertia rotation velocity.

CFB3 • 11:15 a.m.
Improved Tunable Differential-Absorption Lidar Using Coherent Summation of Multiple Optical Heterodyne Detectors, *Dennis K. Killinger, Priyavadan Mamidipudi; Univ. of South Florida, USA*. A multi-aperture dual-balanced heterodyne 1.55 μm Differential-Absorption Lidar was used for laser tunable laser absorption spectroscopic sensing of a gas in a remote cell. Improvements were observed using coherent summation of the multi-detector DIAL signals.

CFB4 • 11:30 a.m. **•Invited•**
Fundamental Comparison of Direct and Coherent Lidar System Performance, *Sammy W. Henderson, Philip Gatt; Lockheed Martin Coherent Technologies, USA*. No abstract available.

CFB5 • 11:55 a.m.
High-Resolution Range and Doppler LADAR Using Broadband Coherent Optical Processing, *Peter A. Roos[1], W. Randall Babbitt[1], Zachary Cole[2], Brant Kaylor[2], Trenton Berg[2], Kristian D. Merkel[2], Randy R. Reibel[2]; [1]Spectrum Lab, Montana State Univ., USA, [2]S2 Corp., USA*. We demonstrate sub-nanosecond range and sub-50-Hz Doppler resolved LADAR measurements using spatial-spectral holographic processing in rare-earth ion doped crystals. Our measurements highlight the ability of this technique to process broadband analog optical pseudo-random noise waveforms

CFB6 • 12:10 p.m.
Simplified Coherent Detection Scheme for FM Chirped Laser Radar, *Peter Adany, Rongqing Hui, Chris Allen; Dept. Electrical Engineering and Computer Science, Univ. of Kansas, USA*. A simplified optical homodyne detection scheme for FM chirped lidar is proposed where dechirping is performed within the photodetector. The concept is validated by experiment and a comparison between coherent and direct detection is presented.

12:25 p.m.–1:30 p.m.
Lunch Break (on your own)

CFC • Fundamental Coherent Science and Technology III

Emerald Ballroom A
1:30 p.m.–3:20 p.m.
CFC • Fundamental Coherent Science and Technology III
Paul W. Juodawlkis; MIT Lincoln Lab, USA, Presider

CFC1 • 1:30 p.m. **•Invited•**
LIGO - Highly Stabilized Lasers in Search of Gravitational Waves, *David H. Reitze; Univ. of Florida, USA*. The Laser Interferometer Gravitational Wave Observatory (LIGO) has begun the search for gravitational waves from the universe. In this talk, we describe LIGO and emphasize the role that highly stabilized lasers play in its functioning.

CFC2 • 1:55 p.m.
Reducing the Linewidth of Fiber-Laser Frequency Combs, *Nathan R. Newbury, John J. McFerran, William C. Swann; NIST, USA*. Fiber laser-based frequency combs typically exhibit broad optical linewidths, particularly in the wings. These broadened linewidths originate from white amplitude noise on the pump laser, which can be eliminated to achieve sub-Hz offset frequency linewidths.

CFC3 • 2:10 p.m.
Tunable Frequency Comb Generator Based on $LiNbO_3$ Ring Resonator, *Arkady M. Kaplan, Arthur Greenblatt, Geof Harston, Pak S. Cho, Yaakov Achiam, Isaac Shpantzer; CeLight Inc., USA*. A new type of tunable waveguide optical frequency comb generator (FCG) integrated in a $LiNbO_3$ ring resonator cavity is presented. The modeling of the integrated ring FCG, performance simulation and initial experimental results are described.

CFC4 ● 2:25 p.m. **•Invited•**

High-Power, Ultra-Narrow Linewidth Fiber Lasers, *Shibin Jiang; NP Photonics, Inc., USA*. Development of high-power ultra-narrow linewidth fiber lasers is reviewed, including our recent achievement in developing a high power actively stabilized Brillouin fiber laser with linewidth of less than 200 Hz.

CFC5 ● 2:50 p.m.

Ultra-Narrow Linewidth and High Frequency Stability Laser Sources, *Jean-François Cliche, Martin Allard, Michel Têtu; TeraXion, Canada*. This paper deals with improving coherence length of fiber and semiconductor lasers using a linewidth-reduction-system and absolute frequency-locking. Linewidths below kilohertz and relative frequency stability > 2×10^{-12} for 100s averaging time are obtained.

CFC6 ● 3:05 p.m.

A High Efficiency, Current Injection Based Quantum-Well Phase Modulator Monolithically Integrated with a Tunable Laser for Coherent Systems, *Matthew N. Sysak, Leif A. Johannson, Larry A. Coldren, Mark Rodwell, John E. Bowers; Univ. of California at Santa Barbara, USA*. A monolithically integrated tunable laser and quantum-well phase modulator is demonstrated. Phase efficiency under forward bias is improved >20dB at low frequencies compared with reverse bias. Bandwidths >30 GHz are demonstrated in frequency modulation measurements.

Emerald Ballroom Foyer
3:20 p.m.–3:35 p.m.
Coffee Break

CFD ● Coherent Optical Communication IV

Emerald Ballroom A
3:35 p.m.–5:25 p.m.
CFD ● Coherent Optical Communication IV
Pak S. Cho; CeLight, Inc., USA, Presider

CFD1 ● 3:35 p.m. **•Invited•**

Coherent Optical Free-Space Communications, *Ronald Phillips; Univ. of Central Florida, USA*. No abstract available.

CFD2 ● 4:00 p.m.

Impact of Hilbert Transformation Order on SPM Effect in Optical BPSK-SSB Transmission, *Katsumi Takano, Takashi Murakami, Kazuhiro Kondo, Kiyoshi Nakagawa; Yamagata Univ., Japan*. Tolerance to SPM is evaluated in a dispersion-compensated transmission using optical BPSK single sideband modulation with all-optical Hilbert transformation. The lower order of approximated finite impulse response Hilbert transformation is more tolerant to fiber nonlinearity.

CFD3 ● 4:15 p.m. **•Invited**

Coherent Techniques for Optical Code-Division-Multiple-Access Systems, *Ken-ichi Kitayama; Osaka Univ., Japan*. With current mature optical device technology, OCDMA now deserves revisit. In this talk, recent progress of OCDMA both in the future FTTH access systems as well as label switchings in optical networks will be presented.

CFD4 ● 4:40 p.m.

Code Scrambling in Spectral Phase Encoded OCDMA Using Reconfigurable Integrated Ring Resonator Based Coders, *Anjali Agarwal, Ronald Menendez, Paul Toliver, Shahab Etemad, Janet Jackel; Telcordia Technologies, USA*. We demonstrate code scrambling, implemented in ring-resonator based integrated coders, for enhanced degree of confidentiality in a spectral phase encoded OCDMA system. The BER performance with an interfering user is better than 1×10^{-10}.

CFD5 ● 4:55 p.m.

Painless Fully Orthogonal Coherent OCDM, *Jacob B. Khurgin[1], A. Brinton Cooper[1], Pak S. Cho[2], Isaac Shpantzer[2]; [1]Johns Hopkins Univ., USA, [2]Celight Inc, USA*. Coherent phase coding and phase and polarization diversity detection offer realistic implementation of fully orthogonal large spectral density Optical Code Division Multiplexing (OCDM) that is completely free of multiple access interference and speckle noise.

CFD6 ● 5:10 p.m.

Coherent Homodyne Pulse Detection for a Spectral Phase-Encoded Optical CDMA System Using Synchronized Modelocked Lasers, *Wangkuen Lee[1], Myoung-taek Choi[1], Hossein Izadpanah[1], Peter J. Delfyett[1], Shahab Etemad[2]; [1]College of Optics & Photonics/CREOL at Univ. of Central Florida, USA, [2]Telcordia Technologies, USA*. The performance of coherent homodyne pulse detection of a synchronized modelocked semiconductor laser system is experimentally demonstrated. The numerical and experimental results of enhanced detection sensitivity with an improved SNR are reported.