OAA

Optical Amplifiers and Their Applications
Topical Meeting and Tabletop Exhibit
Collocated with the Symposium on All-Optical Signal-Processing

7-10 August 2005

Postdeadline Submission Deadline:
On-Site Deadline: 7 August 2005, 12:00 p.m. Noon (local time), Registration Desk

Hotel Inter-Continental Budapest
Budapest, Hungary

Technical Co-Sponsor:

IEEE/Lasers and Electro-Optics Society
Roland Eotvos Physical Society

European Physical Society
Scientific Association for Infocommunications Hungary

OAA Program Committee

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2. Semiconductor Devices and Functional Circuits

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3. Networks and Systems Circuits

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Robert Szipocs, *R&D Ultrafast Lasers Kft., Budapest, Hungary*

About OAA

The Optical Amplifiers and Their Applications Topical Meeting is dedicated to original research on optical amplification in fibers and active waveguides, including related materials, and to their applications in the areas of telecommunications, free space optics, sensors, and optical signal processing.

OAA Meeting Topics

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

Fiber and Active Waveguides
This area 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 optical amplifiers and their functional use for optical signal generation, amplification, switching, detection and optical signal processing. The following specific topics are included in this area:

- Devices for All-Optical Signal Processing , (e.g. Wavelength Conversion and Regeneration)
- Semiconductor Amplifiers
- Semiconductor Photonic Integrated Circuits
- Semiconductor Pump Lasers
- Planar Elements and Subsystems
- Sensors

- Optical Switches and Processing Elements
- Noise Dynamics
- Novel (e.g., Low Dimensional) Material Systems

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

- 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
- Bio and Medical Use 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

Optical Amplifiers and Their Applications
Hotel Inter-Continental ■ Budapest, Hungary

Welcome to the **2005 Optical Amplifiers and Their Applications Topical Meeting**! We are pleased to have you here in Budapest for what we promise will be an exciting and informative meeting.

The main goal of OAA is to provide a forum for the discussion of optical amplifiers, their technologies, and their applications by experts from both telecom and non-telecom fields of work. We hope you will enjoy the special atmosphere of the OAA meeting: no parallel sessions, a mix of presentations on technology and applications, a beautiful location, and the always lively and sometimes controversial "rump" session that provides a social setting for the participants to openly discuss issues related to optical amplifiers. A total of 83 papers will be presented. Presentations consist of 28 plenary and invited presentations, 39 oral presentations and 16 poster presentations.

Some of the highlights of the conference include:

Sunday, August 7	9:00 am – 12:00 pm	Workshop: What is the Role of Optical Amplifiers in FTTx Networks?
Sunday, August 7	1:30 pm – 6:15 pm	Symposium on All-Optical Signal-Processing
Monday, August 8	7:00 pm – 8:30 pm	Conference Reception
Tuesday, August 9	6:30 pm – 9:30 pm	Rump Session
Wednesday, August 10	5:15 pm – 6:30 pm	Postdeadline Paper Session

We hope that you enjoy your time with us this week in Budapest and look forward to your continued participation.

Jesper Mørk, *Technical Univ. of Denmark, Denmark*
Masashi Onishi, *Sumitomo Electric Ind. Ltd., Japan*
Atul Srivastava, *Bookham Technology PLC, USA*
General Chairs

Hitoshi Kawaguchi, *Yamagata Univ., Japan,*
Peter M. Krummrich, *Siemens AG, Germany*
Morten Nissov, *Tyco Telecommunications, USA*
Program Chairs

Welcome to Budapest!

Conference Highlights

What is the Role of Optical Amplifiers in FTTx Networks?
Sunday, August 7, 2005 ▪ 9:00 a.m. – 12:00 p.m.

FTTx is emerging as the most capable infrastructure for delivering future broadband services to homes and enterprises. This year, several regional service providers (RBOCs) in North America have announced plans to invest very significantly in building FTTx networks. In the Japanese high-speed access market, there is fierce competition between new players other than the traditional telecom carriers. Due to the competition, there is a very strong push to increase the bit rate to the end user beyond the limit of ADSL technology (40Mb/s), which has a user base exceeding 10 million. FTTx service with even higher bit rate (100Mb/s) is being offered at very competitive prices and the subscribers already exceed 1 million.

At this juncture, when service providers are committing resources to build fiber based access network, different network architectures are being discussed. Compared to the core network, the access infrastructure is characterized by moderate performance, very low cost and ease of operation. Several architectures of the access networks envision the use of optical amplifier. These include high power amplifiers for distribution of broadcast channels and low cost amplifiers for extending the reach of the network. This is perfect time to debate the pros and cons of using amplification in the FTTx access network and identify the most suitable technology for accomplishing both the performance and cost criteria of the network.

In this workshop the panelists will address the following questions:

- What are the options for FTTx networks being considered?
- Where is the need of amplification in the network?
- Which amplifier is suitable (EDFA, SOA, etc.) for FTTx network?
- At what price amplifiers become attractive for deployment?

Invited Speakers Include:

- An Overview of FTTx and Amplifiers from an Investor's Viewpoint, Barun Dutta, Alta Berkeley, UK
- FTTx Networks in Asia, Ken-ichi Suzuki, NTT Access Service Systems Lab, Japan
- Amplifiers for FTTx Networks, Peter Thorn, Bookham Technology, UK

Symposium on All-Optical Signal-Processing
Sunday, August 7 ▪ 1:30 p.m. – 6:00 p.m.
Monday, August 8 ▪ 10:30 p.m. – 12:15 p.m.

All-optical signal processing holds promise to significantly increase processing speed, to further leverage transparency and reduce latency of next generation IP based networks. In view of the many applications, major efforts all-over the world have led to the development of novel nonlinear materials, new device concepts and attractive signal processing architectures. While there are many new initiatives there are as many open questions with respect to material choice, reliability, ideal operational parameters, technological implementations and architecture.

This symposium aims to bringing together key players in the field of all-optical signal processing for the exchange of information and discussion of novel trends and the latest results in the field.

Topics covered by the symposium include:

- Novel materials (quantum structured nonlinear materials, semiconductors, nonlinear glasses, polymers,...)

- Enabling devices for signal regeneration, clock recovery, multiplexing, demultiplexing, wavelength conversion, switching, buffering, header recognition, etc.
- Parallel and serial all-optical data processors
- Fiber versus bulk device processing
- All-optical routers and cross-connects
- Architectures and system concepts for signal processing devices
- Novel protocols for transparent networks
- Discussion of latest results in terms of speed, efficiency and capacity

Conference Dinner
Monday, August 8 ■ 7:00 p.m. – 8:30 p.m.

Enjoy a wonderful evening with your colleagues tasting Hungarian cuisine. All conference participants are invited for dinner and drinks. Those wishing to purchase guest tickets for this event may do so for $65.00 US or 55.00 € per person.

OAA Rump Session Discussion
Tuesday, August 9 ■ 6:30 p.m. – 9:30 p.m.

The intent of the following questions and statements are meant to stimulate discussion at the OAA Rump Session scheduled for Tuesday, August 9 from 6:30 p.m. – 9:30 p.m. In order to keep to the tradition of spontaneity during this session viewgraphs prepared in advance will not be allowed to be presented.

Fiber and Active Waveguides

- Who cares about parametric amplifiers?
- Do we need pump lasers anymore?
- Is Raman finally dead?
- What is the fundamental upper limit of output power of optical amplifiers?
- Optical amplifiers for non-telecom applications are in vain.

Semiconductor Devices and Functional Circuits

- Is all-optical signal processing dead?
- What is the most promising application of SOAs?
- What is left to be understood for SOAs?
- Do we, e.g., understand the speed and power limitations, the role of novel materials like quantum dots, etc.?
- Will SOAs ever be sufficiently reliable for telecom applications?

Networks and Systems

- Coherent systems and the need for phase sensitive amplifiers.
- What are the new applications for optical amplifiers?
- Are we really prepared for a strong growth in capacity demand (assuming it happens soon)?
- Transparent networking, transient effects – Do we need transparent domains?
  How large? How as a systems engineer conduct performance monitoring?
- Optical/electrical signal processing, mitigation, 02R, 03R – do we need it?

Postdeadline Paper Session
Wednesday, August 10 ■ 5:15 p.m. – 6:30 p.m.

The Program Committee reviewed several papers and those who were deemed appropriate for postdeadline presentation will be presented during this session. Copies of the accepted postdeadline papers will be available to all conference participants on Tuesday, August 9.

Hotel Information

Hotel InterContinental Hotel
Budapest V.
Apáczai Csere J.u. 12-14
H-1368 Budapest
Hungary
Tel: +36 1 327 6333
Fax: +36 1 327 6357
E-mail: *budapest@interconti.com*

Business Center
Open: 24 hours a day.

The Business Center is conveniently located in the Lobby and offers the following services:

- Copying
- Faxing
- Secretarial services
- Computer / Internet access

The Hotel Inter-Continental Budapest also offers CyberAssist, which is the Inter-Continental chain's service that provides the guest with technical support when their own computers give them problems. From extra cables to troubleshooting software bugs, CyberAssist helps to keep the guest going.

Fitness Club
Open: Daily - 6:30 am to 9:30 pm.

The Fitness Club is complimentary to all guests staying at the hotel and is located on the 1st floor overlooking the Danube.

The Fitness Club features:

- Indoor reverse flow swimming pool
- Cardiovascular machines
- Weights
- Sauna
- Relaxation area
    - *Additional services include:*
    - Massage
    - *Pedicure services*

General Budapest Information

Budapest Card
The Budapest Card (Kártya) provides unlimited travel on public transport, free entry to 55 museums and discounts on everything from sightseeing tours to restaurant meals. Cards come in two or three day versions (4350 HUF and 5450 HUF respectively) and include a pocket sized brochure which contains maps of Buda, Pest and the metro system. For travelers using Budapest Airport's minibus or car rental service, the card remains valid for an additional two days (you can also purchase the card at the minibus desk). Children under 14 are automatically covered by adult cards.

Taxis
Budapest taxis have yellow number plates and yellow taxi signs on them. As long as you stick to cabs run by well-known companies such as Főtaxi (Tel: 2 222 222), Budataxi, City Taxi (Tel: 2 111 111) and 6x6 Taxi (2 666 666), overcharging shouldn't be a problem. There's no shortage of taxis in the downtown area and fares are generally cheap, although make sure the driver resets the meter before starting your journey.

The current flat rate for a taxi journey is around 300 HUF (6am to 10pm) with an additional 250 HUF for every kilometre travelled and a waiting fee of 60 HUF. If ordered in advance (by phone) you'll usually find both the per/km rate (and waiting rate) to be lower than for cabs hailed on the street. Note also that few cab drivers speak fluent English. If calling a taxi, switchboard operators generally speak English. Check the fare beforehand and see to it that the driver turns on the clock when starting off. Transit from Ferihegy Airport to the city is very expensive, so it is recommended the Airport Shuttle (Minibus) to reach town. The best idea is to call a taxi by phone, as major cab operators charge lower fees up-front than taxi cars hailed off the street.

Currency
The Hungarian currency is FORINT, in denominations: 20.000, 10.000, 5.000, 1.000, 500, 200 in banknotes and 100, 50, 20, 10, 5, 2, 1 Ft coins.

When changing money, remember that most payments are still made in cash. All major credit cards are accepted in Hungary in places displaying the emblem at the entrance. Euros are also widely accepted in most retailers and restaurants.

Banks
Most banks are open Mondays to Fridays from 9 a.m. to 3 p.m. The commercial banks are open Mondays to Thursdays from 8 a.m. to 3 p.m., and Fridays from 8 a.m. to 1 p.m. Money can be exchanged day and night at the hotel reception desks and on weekdays also in travel offices. Automatic currency exchange machines and automatic teller machines operate after hours.

Electricity
The voltage is 220 AC, 50 H, and outlets are the standard European two-prong type.

Telephone
Country code for Hungary: 36, Budapest: 1.

For long-distance calls within the borders of Hungary: 06

To make a call abroad from Hungary: dial 00, wait for the dialling tone, then dial the country and city code numbers (listed in the phone book) followed immediately by the number required.

Budapest telephone numbers have 7 digits, country numbers have 8 digits including the areal code number.

Public phones operate either with 10 and 20 HUF coins (min. 20 HUF required) or with phone cards that can be purchased in post offices, newsstands and cigarette shops.

Internet Access in Budapest
Of the major providers, the numbers given below can be used for Internet access while in Budapest:

AOL - Tel: (0)1 236 3555 and (0)1 429 8235 (up to 56.6bps, with $6.00 per hour surcharge)

AT & T Business Internet Service - Tel: (0)1 482 9300

CompuServe - Tel: (0)1 236 3555 (up to 56.6bps)

Cyber Cafes:

AMI Internet Coffee (Kávézó) - V. Váci utca 40, Tel: 267 1644, Open: 9 a.m.-2 am. daily, Website: www.amicoffee.hu, Metro: M1 Vörösmarty tér
Top marks to AMI for putting an Internet café slap bang in the middle of Budapest's Belváros (city centre) so that overseas visitors can send e-mails home to loved ones with minimal effort! PCs are standard (fairly low-spec machines) with 15" monitors, while the per hour charge of 700 HUF is reasonable considering the downtown location.

Internet Box (Bibak Bt.) - VI. Teréz körút 21, Tel: 269 1583, Website: www.bibak.hu, Metro: M3 Nyugati pu.
Nothing flashy by way of décor, but ADSL connections, fast 900Mhz PCs and a 600HUF per hour charge make the Internet Box a popular haunt.

Vista Visitor Centre - Paulay Ede u. 7, Tel: 429 9950, Fax: 429 9951, Open: 8 a.m.-11 p.m. Mon-Fri, 10am-11pm Sat, 10am-8pm Sun, E-mail: icafe@vista.hu, Website: www.vista.hu/en/cafe, Metro: M1 Oktogon
8 PCs, 128 Kbps Leased Line Connection, 15" and 17" Monitors, Internet Cards from 2,500 HUF to 10,000 HUF.

2005 OAA Program Committee

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Fiber and Active Waveguides

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Semiconductor Devices and Functional Circuits

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Janos Hebling, *Univ. of Pécs, Hungary*
Robert Szipocs, *R&D Ultrafast Lasers Kft., Budapest, Hungary*

2005 OAA Agenda of Sessions

Sunday, 7 August 2005		
9:00 AM – 12:00 PM	**SuA, What is the Role of Optical Amplifiers in FTTx Networks?**	*InterContinental Ballroom I*
12:00 PM – 1:30 PM	Sunday Lunch Break	*On your own*
1:30 PM – 3:45 PM	**SuB, All-Optical Symposium I**	*InterContinental Ballroom I*
3:45 PM – 4:15 PM	Sunday Afternoon Coffee Break	*Panorama Ballroom II-IV*
4:15 PM – 6:00 PM	**SuB, All-Optical Symposium I (Continued)**	*InterContinental Ballroom I*
Monday, 8 August 2005		
8:30 AM - 10:00 AM	**MA, Welcome and Plenary Session**	*InterContinental Ballroom I*
10:00 AM - 10:30 AM 10:00 AM - 3:30 PM	Monday Morning Coffee Break Exhibit Open	*Panorama Ballroom II-IV*
10:30 AM - 12:15 PM	**MB, All-Optical Symposium II**	*InterContinental Ballroom I*
12:15 PM - 1:30 PM	Monday Lunch Break	*On your own*
1:30 PM - 3:00 PM	**MC, Wide and Flat Fiber Amplifiers**	*InterContinental Ballroom I*
3:00 PM - 3:30 PM	Monday Afternoon Coffee Break	*Panorama Ballroom II-IV*
3:30 PM - 5:00 PM	**MD, High Capacity and Advanced Systems**	*InterContinental Ballroom I*
5:00 PM - 6:30 PM	**ME, Poster Session**	*Panorama Ballroom II-IV*
7:00 PM - 10:00 PM	Conference Reception	*Hotel InterContinental*
Tuesday, 9 August 2005		
8:30 AM - 10:00 AM	**TuA, Application of Nonlinear Process in Fiber**	*InterContinental Ballroom I*
10:00 AM - 10:30 AM 10:00 AM - 3:30 PM	Tuesday Morning Coffee Break Exhibit Open	*Panorama Ballroom II-IV*
10:30 AM - 12:00 PM	**TuB, Free Space Systems**	*InterContinental Ballroom I*
12:00 PM - 1:30 PM	Tuesday Lunch Break	*On your own*
1:30 PM - 3:00 PM	**TuC, Novel Semiconductor Devices and Materials**	*InterContinental Ballroom I*
3:00 PM - 3:30 PM	Tuesday Afternoon Coffee Break	*Panorama Ballroom II-IV*
3:30 PM - 5:00 PM	**TuD, High Power and Short Pulse Fiber Amplification**	*InterContinental Ballroom I*
6:30 PM - 9:30 PM	OAA Rump Session	*InterContinental Ballroom I*
Wednesday, 10 August 2005		
8:30 AM - 10:00 AM	**WA, Functional Semiconductor Photonic Circuits**	*InterContinental Ballroom I*
10:00 AM - 10:30 AM	Wednesday Morning Coffee Break	*Panorama Ballroom II-IV*
10:30 AM - 12:00 PM	**WB, Spectral Characteristics and Modeling of EDFA**	*InterContinental Ballroom I*
12:00 PM - 1:30 PM	Wednesday Lunch Break	*On your own*
1:30 PM - 3:00 PM	**WC, Unconventional Amplification Systems**	*InterContinental Ballroom I*
3:00 PM - 3:30 PM	Wednesday Afternoon Coffee Break	*Panorama Ballroom II-IV*
3:30 PM - 5:15 PM	**WD, Semiconductor All-Optical Signal Processing**	*InterContinental Ballroom I*
5:15 PM - 6:30 PM	Postdeadline Paper Session	*InterContinental Ballroom I*

2005 OAA Abstracts

■ **Sunday, 7 August 2005** ■

8:00 a.m.–6:00 p.m.
Registration

SuA ▪ What is the Role of Optical Amplifiers in FTTx Networks?

InterContinental Ballroom I
9:00 a.m.–12:00 p.m.
SuA ▪ What is the Role of Optical Amplifiers in FTTx Networks?
Atul Srivastava; Bookham Technology, USA, Presider

In this workshop panelists will address the following questions:

What are the options for FTTx networks being considered?
Where is the need of amplification in the network?
Which amplifier is suitable (EDFA, SOA, etc.) for FTTx network?
At what price amplifiers become attractive for deployment?

12:00 p.m.–1:30 p.m.
Lunch Break

SuB ▪ All-Optical Symposium I

InterContinental Ballroom I
1:30 p.m.–6:00 p.m.
SuB ▪ All-Optical Symposium I
Juerg Leuthold; Univ. of Karlsruhe (TH), Germany, Presider
Jesper Moerk; Technical Univ. of Denmark, Denmark, Presider

SuB1 ▪ 1:30 p.m. **►Invited◄**
All-Optical Signal Processing in Photonic Label Switching Routers, *S. J. Ben Yoo, Zhong Pan, Haijun Yang, Zuqing Zhu; Univ. of California at Davis, USA.*
This paper proposes and demonstrates an optical-label switching router with all-optical time-to-live, performance monitoring, label swapping, and 2R regeneration. Experimental results of unicast and multicast packet forwarding with contention resolution of asynchronously arriving variable-length packets.

SuB2 ▪ 2:00 p.m. **►Invited◄**
Technologies Enabling Ultrahigh Speed Transmission, *Reinhold Ludwig, S. Ferber, C. Boerner, C. Schubert, C. Schmidt-Langhorst, M. Kroh, V. Marembert, H. G. Weber; Heinrich-Hertz-Inst., Germany.*
We report on components and techniques for transmission beyond 100 Gbit/s. In particular the impact of phase-modulation, optical signal processing techniques, Raman amplification and fiber properties on the transmission performance are discussed.

SuB3 ▪ 2:30 p.m. **►Invited◄**
High-Bitrate and High-Capacity Field Transmission Trials, *Eugen Lach[1], M. Schmidt[1], M. Witte[1], K. Schuh[1], F. Buchali[1], H. Bülow[1], S. Vorbeck[2], M. Schneiders[2], R. Leppla[2], E. Le-Rouzic[3], S. Salaün[3], S. B. Papernyi[4], K. Sanapi[4]; [1]Alcatel R&I, Germany, [2]T-Systems International GmbH, Germany, [3]France Telecom R&D, France, [4]MPB Communication Inc., Canada.*
This paper gives an overview of key technologies applied for realisation of a 8x170Gbit/s DWDM system demonstrator and summarizes results of transmission experiments with Terabit/s capacity over long-haul distances over European fibre infrastructure.

SuB4 ▪ 3:00 p.m.
Reduction of Pattern Effects in an SOA-Based 40 Gb/s Wavelength Converter, *Vincent Marembert[1], Alessandro Marques de Melo[2], Sebastian Randel[2], Colja Schubert[1], Hans-Georg Weber[1], Klaus Petermann[2]; [1]Fraunhofer Inst. for Telecommunications, Germany, [2]Technische Univ. Berlin, Germany.*
We propose a simple filter scheme to reduce pattern effects in an SOA. This filter was applied to an SOA-based wavelength converter at 40Gb/s, resulting in a significant improvement of the wavelength converted data signal.

SuB5 ▪ 3:15 p.m. **►Invited◄**
Signal Processing in SOAs — Beyond the Limits of Carrier Relaxation, *Bernd Sartorius, S. Bauer, C. Bornholdt, H. P. Nolting, M. Schlak, J. Slovak, H. J. Wünsche; Heinrich-Hertz-Institut, Germany.*
SOAs are compact devices needing low control power for signal processing. Critical issues are the speed limitations caused by carrier relaxation. We present techniques for signal processing beyond these limits by exploiting ultra-fast intra-band effects.

3:45 p.m.–4:15 p.m.
Coffee Break

SuB6 ▪ 4:15 p.m. **►Invited◄**
Impact of Optical Filtering on Linear and Nonlinear Patterning Effects in SOA-Based All-Optical Switches, *Mads L. Nielsen, Jesper Moerk; Res. Ctr. COM, Technical Univ. of Denmark, Denmark.*
We theoretically explain the impact of optical filtering on the carrier density induced patterning effects in SOA-based all-optical switches. The theoretical findings are supported by both fundamental and systems-oriented experimental results.

SuB7 ▪ 4:45 p.m. **►Invited◄**
High-Contrast Vertical Cavity Semiconductor Switches, *Mircea D. Guina; Optoelectronics Res. Ctr., Finland.*
Recent progress in the development of ultrafast all-optical gates, based on saturable absorption effect in semiconductor structures with vertical architecture, is summarized. Performance and tradeoffs are discussed from design and technological points of view.

SuB8 ▪ 5:15 p.m. **►Invited◄**
Polarization Bistable VCSELS for All-Optical Signal Processing, *Hitoshi Kawaguchi; Yamagata Univ., Japan.*
Recent progress in polarization bistable VCSELs and their applications for all-optical signal processing such as flip-flop operation with very low switching energy and high repetition rate, signal regeneration, and optical buffer memory are presented.

SuB9 ▪ 5:45 p.m.
All-Optical AND Gate Using Nonlinear Polarization Rotation in a Bulk Semiconductor Optical Amplifier, *Li-Qiang Guo, Michael J. Connelly; ECE, Univ. of Limerick, Ireland.*
An all-optical AND gate is realized using a bulk semiconductor optical amplifier. The operation is based on signal-induced nonlinear polarization rotation of a probe light. The logic gate is conducted at bit rate of 2.488Gbit/s.

■ Monday, 8 August 2005 ■

7:30 a.m.–5:00 p.m.
Registration

MA ▪ Welcome and Plenary Session

InterContinental Ballroom I
8:30 a.m.–10:00 a.m.
MA ▪ Welcome and Plenary Session

MA1 ▪ 8:30 a.m. **►Invited◄**
Evolution of Optical Networks, *Andreas Gladisch; Deutsche Telekom, Germany.*
Abstract not available.

MA2 ▪ 9:15 a.m. **►Invited◄**
Optical Amplifiers Face Mid-Life Challenges, *Karen Liu; RHK, Inc., USA.*
The optical amplifier R&D community is challenged by its own success. After the telecom revolution, amplifiers continue to be a cornerstone of communications infrastructure but future breakthroughs must be different to recapture the excitement.

10:00 a.m.–10:30 a.m.
Coffee Break

MB ▪ All-Optical Symposium II

InterContinental Ballroom I
10:30 a.m.–12:15 p.m.
MB ▪ All-Optical Symposium II
Jesper Moerk; Technical Univ. of Denmark, Denmark, Presider
Juerg Leuthold; Univ. of Karlsruhe (TH), Germany, Presider

MB1 ▪ 10:30 a.m. **►Invited◄**
Recent Progress in Quantum-Dot Semiconductor Optical Amplifiers for Optical Signal Processing, *Tomoyuki Akiyama, K. Kawaguchi, M. Ekawa, M. Sugawara, H. Kuwatsuka, H. Sudo, K. Otsubo, S. Okumura, A. Uetake, F. Futami, S. Watanabe; Fujitsu Labs Ltd., Japan.*
This paper reviews recent developments in optical signal processing based on quantum-dot semiconductor optical amplifiers. With an ultrafast gain response unique to quantum dots, an optical regenerator having receiver-sensitivity improving capability of 4 dB at a BER of 10^{-9} and operating speed of > 40 Gb/s has been successfully realized with an SOA chip. This performance achieved together with simplicity of structure suggests a potential for low-cost realization of regenerative transmission systems.

MB2 ▪ 11:00 a.m. **►Invited◄**
Gain and Index Dynamics in Quantum Dash Optical Amplifiers, *Gadi Eisenstein; Technion, Israel.*
We demonstrate that cross saturation in InAs/InP Quantum-Dash optical amplifiers decreases with detuning and signal bit rate enabling wavelength conversion at moderate rates and multi channel amplification with no cross talk at high bit rates.

MB3 ▪ 11:30 a.m. **►Invited◄**
Theoretical Models of SOA-Based SMZ-Type Optical-3R Gates, *Yoshiyasu Ueno, Masashi Toyoda, Rei Suzuki; Univ. of Electro-Communications, Japan.*
We modeled the PDSMZ-type (UNI-type) 3R scheme and studied its available degree of amplitude-noise suppression in both '1' and '0' signals and possible waveform distortion. For evaluating the noise distribution, bit-error rates were calculated to below $1E^{-6}$.

MB4 ▪ 12:00 p.m.
Simultaneous Reshaping of OOK and DPSK Signals by a Fiber-Based All-Optical Regenerator, *Masayuki Matsumoto; Osaka Univ., Japan.*
Simultaneous reshaping of bit-interleaved RZ-OOK and RZ-DPSK signals by a fiber-based regenerator using four-wave mixing is numerically demonstrated. Influence of the pump phase modulation on the regenerator performance is also examined.

12:15 p.m.–1:30 p.m.
Lunch Break

MC ▪ Wide and Flat Fiber Amplifiers

InterContinental Ballroom I
1:30 p.m.–3:00 p.m.
MC ▪ Wide and Flat Fiber Amplifiers
Karsten Rottwitt; COM Ctr., Denmark, Presider

MC1 ▪ 1:30 p.m. **►Invited◄**
Erbium Doped Fibre for Spectrally Wide and Flat Gain EDFA: Past and Future Developments, *Pierre Sansonetti[1], E. Stoltz[1], L. Gasca[2], D. Bayart[2]; [1]Draka Foptica, France, [2]Alcatel R&I, France.*
Erbium doped fibre is key element in developing Erbium Doped Fibre amplifier with spectrally wide and flat gain for WDM applications. This paper will describe the progress made since the start and new improvement routes.

MC2 ▪ 2:00 p.m.
Broadband Amplification of Er-Doped Bismuthate Waveguide with > 10 dBm Output Powers from 1527 to 1573 nm, *Yuki Kondo[1,2], Motoshi Ono[1,2], Junichi Kageyama[1,2], Naoki Sugimoto[1,2]; [1]Asahi Glass Co., Ltd., Japan, [2]OITDA, Japan.*
Er-doped bismuthate waveguide having output powers of > 10 dBm from 1527 to 1573 nm and a maximum power of 16 dBm at 1560 nm is realized by optimizing waveguide length and reducing propagation loss.

MC3 ▪ 2:15 p.m.
Silica-Based Bismuth-Doped Fiber for Ultra Broad Band Light Source and Optical Amplification around at 1.1mm, *Tetsuya Haruna, Motoki Kakui, Toshiki Taru, Shinji Ishikawa, Masashi Onishi; Sumitomo Electric Industries, Ltd., Japan.*
We have successfully developed silica-based Bismuth-doped fiber (BiDF) by using the conventional fiber fabrication technique for the first time. Fluorescence over a 150nm bandwidth is observed in the 1100nm wavelength band by using fabricated fibers.

MC4 ▪ 2:30 p.m.
High Concentration Er^{3+}-Doped BaY_2F_8 Crystal Waveguides for Broadband Optical Amplification at 1.5 μm, *Veronica Toccafondo[1], Stefano Faralli[2], Elisa Sani[1], Alessandra Toncelli[1], Mauro Tonelli[1], Fabrizio Di Pasquale[2]; [1]NEST- Physics Dept., Univ. of Pisa, Italy, [2]Scuola Superiore Sant'Anna, Italy.*
Integrated waveguide amplifiers based on high concentration Er^{3+} doped BaY_2F_8 crystals are numerically studied. Using realistic input data measured on grown crystal samples, we predict broad amplification bandwidth exceeding 80 nm with 1480 nm pumping.

MC5 ▪ 2:45 p.m.
S-Band EDFA with ASE Suppression Induced by Bending Loss of Depressed-Cladding Active Fiber, *Paolo Vavassori[1], Matteo Foroni[2], Federica Poli[2], Annamaria Cucinotta[2], Stefano Selleri[2]; [1]PETROCERAMICS S.r.l, Italy, [2]Univ. of Parma, Italy.*
A S-band single-stage depressed-cladding silica-based EDFA has been obtained by suppressing C-band ASE through the bending losses. A 25.3 dB gain has been obtained at 1504 nm for a bending diameter of 15 cm.

3:00 p.m.–3:30 p.m.
Coffee Break

MD ▪ High Capacity and Advanced Systems

InterContinental Ballroom I
3:30 p.m.–5:00 p.m.
MD ▪ High Capacity and Advanced Systems
TBA, Presider

MD1 ▪ 3:30 p.m. **►Invited◄**
Coherent Optical Communications: What Next? *Guifang Li, Cheolhwan Kim, Yan Han, Kevin Croussore, Inwoong Kim; Univ. of Central Florida, USA.*
Modulation formats for optical communication have evolved from NRZ to RZ to CSRZ, and recently to D(Q)PSK, a coherent modulation technique. Coherent optical communications, extensively investigated before the arrival of EDFA, is attracting renewed interest.

MD2 ▪ 4:00 p.m.
Impact of Self- and Cross-Phase Modulation on Highly Efficient Discrete Raman Amplifier for 10-Gb/s 100-GHz-Spaced WDM Transmission, *Yoshihiro Emori[1,2], Yuki Taniguchi[1], Ryuichi Sugizaki[1], Takeshi Yagi[1], Misao Sakano[1], Lynn E. Nelson[2]; [1]The Furukawa Electric Co., Ltd., Japan, [2]OFS Labs, USA.*
We investigate the nonlinear penalty caused by self- and cross-phase modulation in highly efficient discrete Raman amplifiers with different dispersion coefficient by using 40×10Gb/s, 100GHz-spaced L-band WDM signals for non-dispersion-compensated 1000-ps/nm transmission.

MD3 ▪ 4:15 p.m.
Experimental Investigation of MPI Tolerances of Modulation Formats and Consequences for Raman Amplification, *Peter M. Krummrich, Claus-Joerg Weiske, Wolfgang Schairer, Franz-Josef Quirin; Siemens AG, Germany.*
The combined impact of amplified spontaneous emission and multiple path interference on different modulation formats was investigated experimentally. Design rules for systems using Raman amplification could be derived.

MD4 ▪ 4:30 p.m.
High Speed Raman Modulation for Reliable Scientific-Observatory Undersea Cable Networks, *Katsuhiro Shimizu[1], Toshiyuki Tokura[1], Tasuku Fujieda[1], Kenichi Asakawa[2]; [1]Mitsubishi Electric Corp., Japan, [2]Japan Agency for Marine–Earth Science and Technology, Japan.*
A telemetry transmission system for next generation scientific-observatory underwater cable networks is discussed. Raman modulation using a highly nonlinear fiber achieves transmission capacity adequate for cost-effective undersea observatories that are simple, reliable and upgradable.

MD5 ▪ 4:45 p.m.
Compact EDFA for CWDM Multi-Channel Applications, *Lijie Qiao, Paul J. Vella; BTI Photonic Systems, Canada.*
An EDFA uses commercially available Erbium-doped fiber in a unique design that is optimized to amplify CWDM channels in the C-and L-bands of the spectrum. Low-cost, wide-bandwidth, flat-gain and low-noise-figure performance is achieved.

ME ▪ Poster Session

Panorama Ballroom II-IV
5:00 p.m.–6:30 p.m.
ME ▪ Poster Session

ME1
Reduction of Polarization Dependent Gain Due to Signal-to-Signal Raman Interaction in Fibre Raman Amplifier, *Li Zhaohui, Chao Lu; Inst. for Infocomm Res., Singapore.*
An excellent polarization dependent gain (PDG) suppression technique using a polarization scrambler is proposed in this paper. Investigations on PDG due to signal-to-signal Raman interaction among 40 WDM signal channels were carried out experimentally.

ME2
Numerical Investigation of Raman Amplification Properties in Photonic Crystal Fibers, *Shailendra K. Varshney, Kunimasa Saitoh, Masanori Koshiba; Hokkaido Univ., Japan.*
A full-vectorial finite-element method is used to investigate Raman amplification properties of photonic crystal fibers. Raman gain of 9 dB is obtained in 4-km length of PCF with a high optical signal-to-noise ratio.

ME3
Polarization Independent Two-Pump Optical Fibre Parametric Amplifier with Polarization Mode Dispersion, *Takeshi Ozeki, Takuro Kanou, Satoshi Seki; Sophia Univ., Japan.*
Two-pump optical fibrer parametric amplifier with polarization mode dispersion is examined experimentally and theoretically. We separate, for the first time, effects of basic parameters of polarization mode dispersion on polarization dependent gain variation.

ME4
Novel Method for End-Pumping of Double-Clad Fiber Amplifiers: Principle and Tailoring the Cross Section, *Pavel Peterka, Ivan Kasik, Vlastimil Matejec, Pavel Honzatko, Jiri Slanicka; Inst. of Radio Engineering and Electronics, Czech Republic.*
We present a novel end-pumping method for double-clad fiber amplifiers and lasers. Commercial fusion splicer can be used for connecting the signal and pump fiber directly to the double-clad fibers with tailored cross section.

ME5
Benefits of Bi-Directional Raman Pumping for 10 Gb/s C-Band WDM Transmission over Long DSF Spans, *Gabriele Bolognini[1], Giovanni Sacchi[2], Stefano Faralli[1], Claudia Cantini[1], Fabrizio Di Pasquale[1]; [1]Scuola Superiore Sant'Anna, Italy, [2]CNIT, Italy.*
Benefits and penalties of bi-directional Raman pumping are evaluated for 10Gb/s C-band WDM transmission over long dispersion-shifted fiber spans. Optimisation of Raman pumping and channel power permits increase in span budget up to 17 dB.

ME6
Pulse Compression with Highly Nonlinear Photonic Crystal Fibers by Optimization of Input and Output Chirp Parameters up to the Third-Order, *Róbert Szipőcs[1], Julia Fekete[1], Ákos Bányász[1], Zoltán Várallyay[2]; [1]Res. Inst. for Solid State Physics and Optics, Hungary, [2]Budapest Univ. of Technology and Economics, Hungary.*
Photonic crystal fiber is used for pulse compression of sub-nJ pulses. Simulations show that optimizing input chirp of seed pulse 6fs compressed pulses can be obtained. Calculations are carried out for sub-ps pulses as well.

ME7
Amplification in Er^{3+}, Er^{3+}/Eu^{3+} and Er^{3+}/Ce^{3+} Doped Tellurite Glass Fibres Pumped at 980 nm, *Shaoxiong Shen, Animesh Jha, P. Joshi, Lihui Huang; Univ. of Leeds, UK.*
Amplification properties have been compared in Er^{3+}, Er^{3+}/Eu^{3+} and Er^{3+}/Ce^{3+} doped tellurite glass fibres using a 980 nm pumping scheme. Codoping with Ce^{3+} is more efficient from the ESA measurement.

ME8
Semiconductor Optical Amplifier Bar Prober, *Martin H. Hu, Benjamin Hall, Catherine Caneau, Herve LeBlanc, Sean Coleman, Xingsheng Liu, Nick Visovsky, Chung-En Zah; Corning Inc, USA.*
This paper describes an SOA bar prober used as a high-throughput, manufacturing-oriented testing system. It is capable of automatically measuring optical gain, far-field, L-I and V-I characteristics of individual chips of multiple SOA bars.

ME9
Simulation and Design of Ultrafast All-Optical Boolean XOR Gate with Semiconductor Optical Amplifier-Assisted Sagnac Switch, *Kyriakos Zoiros, George Papadopoulos, Christos S. Koukourlis, Thanassis Houbavlis; Lightwave Communications Res. Group, Democritus Univ. of Thrace, Greece.*
The critical operational parameters of an ultrafast all-optical Boolean XOR gate implemented with a semiconductor optical amplifier-assisted Sagnac switch are appropriately selected through numerical simulation to ensure optimum design and performance.

ME10
Performance Investigation of All-Optical Boolean XOR Gate Using Semiconductor Optical Amplifier-Based Mach-Zehnder Interferometer, *Kyriakos E. Zoiros, Thanassis Houbavlis; Lightwave Communications Res. Group, Democritus Univ. of Thrace, Greece.*
An ultrafast all-optical Boolean XOR gate implemented with a semiconductor optical amplifier-based Mach-Zehnder interferometer is numerically simulated to provide simple design rules for the optimization of the metrics that define the quality of switching.

ME11
Amplification of Picosecond Optical Pulses at 1080 nm Using an InGaAs/GaAs Quantum Well SOA, *Andrew J. Budz, Harold K. Haugen; McMaster Univ., Canada.*
Short picosecond optical pulses generated by a passively mode-locked quantum well diode laser are amplified using an InGaAs/GaAs flared-waveguide semiconductor optical amplifier. Post-compression of the amplified pulses yields durations as low as 520 fs.

ME12
Feasibility of 320Gbit/s OTDM Add/Drop Multiplexing Using an Optimized GT-SOA-MZI Gate, *Alessandro Marques de Melo, Sebastian Randel, Klaus Petermann; Technical Univ. of Berlin, Germany.*
We demonstrate through numerical simulations Add/Drop multiplexing from 320Gbit/s to base data rates of 10Gbit/s, 40Gbit/s and 80Gbit/s. Such high bit rates become feasible when using a GT-SOA-MZI gate in an optimized configuration.

ME13
Bessel-Gauss Beam Optical Resonator with Radially Polarized Output, *Sándor Lakó; Res. Inst. for Solid State Physics and Optics, Hungary.*
Optical resonator with Bessel-Gauss output is proposed in this paper based on laser quality produceable optical components. The above cavity emits radially polarised beam. The possibility of the pulsed operation is discussed.

ME14
Gain Tilt Monitoring of EDFA by Optical Filtering Techniques, *Po Shan Chan[1], Chi Sang Wong[2], Hon Ki Tsang[1]; [1]The Chinese Univ. of Hong Kong, Hong Kong Special Administrative Region of China, [2]Acasia Technologies Ltd., Hong Kong Special Administrative Region of China.*
We propose and demonstrate a potentially low cost gain-tilt monitoring scheme based on a thin film filter. A -0.25dB/nm filter was used to demonstrate experimentally detection of gain-tilt within +/- 0.1dB/nm.

ME15
Application of H-infinity Control on Pilot Tones in Erbium-Doped Fiber Amplifiers, *Yong Taing, Lacra Pavel; Univ. of Toronto, Canada.*
We propose the design and use of an H-infinity controller to suppress the effects of cross gain modulation due to supervisory pilot tones within Erbium-Doped Fiber amplifiers. Transient response improvements are shown through simulation.

ME16
All-Optical De-Multiplexer Based on Cross Gain Modulation in Semiconductor Optical Amplifiers, *Claudio Crognale, Stefano Caputo; C.N.X. S.p.A. Siemens, Italy.*
The preliminary numerical analysis of the performances of an all-optical de-multiplexer based on the Cross Gain Modulation in Semiconductor Optical amplifiers is presented. The 1ps FWHM pulses extraction from a 0.1THz Return-to-Zero data-stream is shown.

7:00 p.m.–8:30 p.m.
Conference Reception

■ Tuesday, 9 August 2005 ■

8:00 a.m. – 5:00 p.m.
Registration

TuA ▪ Application of Nonlinear Process in Fiber

InterContinental Ballroom I
8:30 a.m.–10:00 a.m.
TuA ▪ Application of Nonlinear Process in Fiber
Tadashi Sakamoto; NTT Photonics Labs, Japan, Presider

TuA1 ▪ 8:30 a.m. **►Invited◄**
Specific Sources of Noise in Distributed Raman Amplifiers, *Catherine Martinelli; Alcatel R&I, France.*
Distributed Raman amplification is a key technique for improving the reach and capacity of fiber transmission systems. We present this advantage and then address some DRA-specific sources of noise particularly challenging for optimal system design.

TuA2 ▪ 9:00 a.m.
S-Band Discrete Raman Amplifier Using High Raman Gain Fiber, *Yuki Taniguchi[1], Yoshihiro Emori[1,2], Atsushi Oguri[1], Ryuichi Sugizaki[1], Misao Sakano[1], Takeshi Yagi[1]; [1]Furukawa Electric Co., Ltd., Japan, [2]OFS Labs, USA.*
We have developed a practical S-band discrete Raman amplifier using a high-Raman-gain fiber. Amplifier output of +4.5dBm/ch×30ch with 14-dB net-gain and 1-dB flatness is achieved by using single stage configuration and only three laser diodes.

TuA3 ▪ 9:15 a.m.
Stabilization of Multiwavelength Mode-Locked Fiber Laser Using an Intracavity SOA, *Atsushi Inaba[1], Shinji Yamashita[2]; [1]Dept. of Frontier Informatics, Univ. of Tokyo, Japan, [2]Dept. of Electronic Engineering, Univ. of Tokyo, Japan.*
We propose and demonstrate a stabilization method of a multiwavelength actively mode-locked fiber laser using an intracavity SOA. The supermode noise could be successfully suppressed in a 4-wavelength mode-locked fiber laser at 10 GHz.

TuA4 ▪ 9:30 a.m. **►Invited◄**

Distributed and Multiplexed Fiber Optic Sensors and Their Applications to Smart Structures and Smart Materials, *Kazuo Hotate; Univ. of Tokyo, Japan.*
We have studied "fiber optic nerve systems" for "smart structures and smart materials," in which an optical fiber acts as a sensor to measure distribution of strain or pressure along it. In our laboratory, an original technique has been developed to analyze the distributed optical parameters along the fiber by use of synthesis of correlation characteristics of continuous lightwave. By this technique, "fiber optic nerve systems" with a high spatial resolution and a fast measurement speed have been developed.

10:00 a.m.–10:30 a.m.
Coffee Break

TuB ▪ Free Space Systems

InterContinental Ballroom I
10:30 a.m.–12:00 p.m.
TuB ▪ Free Space Systems
Stojan Radic; Univ. of Califonia at San Diego, USA, Presider

TuB1 ▪ 10:30 a.m. **►Invited◄**

High-Performance Free-Space Laser Communications and Future Trends, *David Caplan; MIT Lincoln Lab, USA.*
Photon-efficient free-space laser communication systems offer the potential for flexible, costeffective, high-speed connectivity suitable for ultra-long-haul intersatellite and interplanetary links. Transmitter and receiver design options and performance limitations for these links will be presented.

TuB2 ▪ 11:00 a.m. **►Invited◄**

Atmospheric Sensing and Free-Space Communications, *George C. Papen; Univ. of California at San Diego, USA.*
Recent work in high efficiency, narrow linewidth, high power optical amplifier systems makes them attractive candidates for remote sensing applications. We present results of fiber-based system to measure water vapor and discuss recent trends in building fiber-based remote sensing systems.

TuB3 ▪ 11:30 a.m. **►Invited◄**

Optical Amplifiers in Space Communication Links, *Walter Leeb; Technische Univ. Wien, Austria.*
In terminals for free-space laser links, optical amplifiers boost transmit powers into the Watt range. As pre-amplifiers, they help obtaining sensitivities of a few ten photons/bit. Concepts and requirements for such applications are discussed.

12:00 p.m.–1:30 p.m.
Lunch Break

TuC ▪ Novel Semiconductor Devices and Materials

InterContinental Ballroom I
1:30 p.m.–3:00 p.m.
TuC ▪ Novel Semiconductor Devices and Materials
Berthold Schmidt; Bookham Switzerland AG, Switzerland, Presider

TuC1 ▪ 1:30 p.m. **►Invited◄**

Quantum Dots for Semiconductor Amplifiers and High Speed Lasers, *Dieter H. Bimberg; Tech. Univ. Berlin, Germany.*
Quantum Dots present unique gain media for high speed photonic devices at 1310 and 1550 nm offering features sought-after for long time like 10 Gbit/sec ultra-low bit error rate direct modulation or ultrafast gain recovery.

TuC2 ▪ 2:00 p.m.

Record High Saturation Power (+22 dBm) and Low Noise Figure (5.7 dB) Polarization-Insensitive SOA Module, *Ken Morito, Shinsuke Tanaka; Fujitsu Labs Ltd., Japan.*
A polarization-insensitive SOA module having a MQW SOA chip in a polarization diversity configuration exhibited a record-high saturation output power of +22 dBm and a very low noise figure of 5.7 dB at 1550 nm.

TuC3 ▪ 2:15 p.m.

Spectrum-Sliced Wavelength Conversion Using Four-Wave Mixing from a Semiconductor Optical Amplifier, *David I. Forsyth, Michael J. Connelly; Dept. ECE, Univ. of Limerick, Ireland.*
Four-wave mixing is an established and useful method of converting data from one wavelength channel to another. In this paper, we achieve four-wave mixing from an incoherent ASE source with reduction in relative intensity noise.

TuC4 ▪ 2:30 p.m. **►Invited◄**

Noise and Linearity Investigation on SOA-Modulatorsin SCM Systems, *Tibor Berceli, Eszter Udvary; Budapest Univ. of Technology and Economics, Hungary.*
The semiconductor optical amplifier (SOA) can be used as an efficient high-speed modulator in subcarrier multiplexed (SCM) systems. The modulation response, the noise performance and nonlinear behavior of SOAs are investigated and experimentally demonstrated.

3:00 p.m.–3:30 p.m.
Coffee Break

TuD ▪ High Power and Short Pulse Fiber Amplification

InterContinental Ballroom I
3:30 p.m.–5:00 p.m.
TuD ▪ High Power and Short Pulse Fiber Amplification
Clifford Headley; OFS Labs, USA, Presider

TuD1 ▪ 3:30 p.m. **►Invited◄**

Current Progress in High Power Lasers and Amplifiers, *Johan Nilsson[1], P. Dupriez[1], Y. Jeong[1], J. K. Sahu[1], C. A. Codemard[1], D.B S. Soh[1], C. Farrell[1], J. Kim[1], A. Piper[2], A. Malinowski[1], D. J. Richardson[1]; [1]Univ. of Southampton, UK, [2]Southampton Photonics, Inc., UK.*

We review recent advances of high-power fiber lasers and amplifiers based on the latest experimental results. Key technologies that led to kilowatt level fiber based devices and the potential for further progress will be discussed.

TuD2 ▪ 4:00 p.m.

345 mW Single-Frequency Tm^{3+}-Sb Co-Doped DFB Fibre Laser MOPA at 1836 nm, *Nyuk Y. Voo, Jayanta K. Sahu, Morten Ibsen; Univ. of Southampton, UK.*

We demonstrate an in-band pumped (1565 nm) continuous-wave (CW) single-frequency distributed-feedback fibre laser operating at 1836 nm with an output power of ~5 mW and amplified to 345 mW using a master-oscillator power amplifier configuration.

TuD3 ▪ 4:15 p.m.

Suppression of Stimulated Brillouin Scattering in an Er-Yb Fiber Amplifier Utilizing Temperature-Segmentation, *Marc D. Mermelstein, Andrew D. Yablon, Clifford Headley; OFS Labs, USA.*

Temperature segmentation of a narrow linewidth double clad Er-Yb fiber amplifier at intervals comparable to the temperature-equivalent Brillouin gain-bandwidth suppresses stimulated Brillouin scattering by ~ 7.1 dB relative to a uniform room-temperature amplifier.

TuD4 ▪ 4:30 p.m.

Temperature Dependence of Ytterbium Doped Fiber Amplifiers, *Xiang Peng, Joseph McLaughlin, Liang Dong; IMRA America, Inc., USA.*

Temperature dependence of ytterbium doped amplifiers has been accurately determined by using a novel technique. The results show that good intrinsic output power stability over temperature change can be achieved in ytterbium doped amplifiers.

TuD5 ▪ 4:45 p.m.

Boron Co-Doped Bi_2O_3-Based Erbium Doped Fiber for Short Pulse Amplification, *Seiki Ohara, Tomoharu Hasegawa, Naoki Sugimoto; Asashi Glass Co. Ltd., Japan.*

We demonstrate short pulse amplification, and compare the nonlinear tolerance of a Bi_2O_3-based Erbium doped fiber (EDF) with a conventional silica-based EDF. The Bi_2O_3-based EDF shows highly nonlinear tolerance and superior short pulse amplification performances.

5:00 p.m.–6:30 p.m.
Dinner Break

6:30 p.m.–9:30 p.m.
Rump Session

■ **Wednesday, 10 August 2005** ■

8:00 a.m.–5:00 p.m.
Registration

WA ▪ Functional Semiconductor Photonic Circuits

InterContinental Ballroom I
8:30 a.m.–10:00 a.m.
WA ▪ Functional Semiconductor Photonic Circuits
Atul Srivastava; Bookham Technology, USA, Presider

WA1 ▪ 8:30 a.m. **►Invited◄**

Large-Scale DWDM Photonic Integrated Circuits, *Radha Nagarajan, Mehrdad Ziari, Masaki Kato, Charles Joyner, Richard Schneider, Johan Bäck, Jeffrey Bostak, Timothy Butrie, Andrew Dentai, Tarun Desikan, Vincent Dominic, Peter Evans, Mike Kauffman, Damien Lambert, Sheila Hurtt, Atul Mathur, Richard Miles, Matthew Mitchell, Mark Missey, Sanjeev Murthy, Alan Nilsson, Frank Peters, Stephen Pennypacker, Jacco Pleumeekers, Randal Salvatore, Rory Schlenker, Robert B. Taylor, Huan-Shang Tsai, Michael F. Van Leeuwen, Jonas Webjorn, Jagdeep Singh, Stephen G. Grubb, Drew Perkins, Michael Reffle, David G. Mehuys, Fred A. Kish, David F. Welch; Infinera, USA.*

A review of high density, dense wavelength division multiplexed photonic integrated circuits is presented. These integrated circuits have 10 channels or more with aggregate data rates up to 400Gbit/s.

WA2 ▪ 9:00 a.m. **►Invited◄**

Digitally Tunable Laser Using SOA and Optical Filters, *Shinji Matsuo; NTT Photonics Labs, Japan.*

A monolithically integrated digitally tunable laser has been developed, in which a ladder filter and a ring resonator are integrated with a semiconductor optical amplifier. In this device, the widely tunable ladder filter selects one channel from the periodic channels of the ring resonator. The device exhibited 37-channel 100-GHz-spacing digitally tunable laser operation. To improve the device performance, we developed a tunable laser incorporating a chirped ladder filter, in which we obtained one dominant passband.

WA3 ▪ 9:30 a.m.

Reliability of a Semiconductor Optical Amplifier under High Carrier Injection Operation, *Hiroyasu Mawatari, Fumio Ichikawa, Kazuo Kasaya, Hiroyuki Ishii, Hiromi Oohashi, Yuichi Tohmori; NTT Photonics Labs, Japan.*

The small change in the gain of a semiconductor optical amplifier during degradation is clarified under high carrier injection conditions. The decrease in gain is estimated to be 5% under 105 hours of operation.

WA4 ▪ 9:45 a.m.
Measurement of Very Low Residual Reflections in Lensed-Fiber Pigtailed Semiconductor Optical Amplifier, *Martin H. Hu, Michael H. Rasmussen, Catherine Caneau, Herve Leblanc, Sean Coleman, Xingsheng Liu, Hong K. Nguyen, Nick Visovsky, Chung-en Zah; Corning Inc., USA.*
The reflections from different surfaces in a lensed-fiber pigtailed SOA were measured. The SOA facet reflection is as low as -60dB. The fiber lens reflectivity is reduced from -37 to -47dB by AR coating.

10:00 a.m.–10:30 a.m.
Coffee Break

WB ▪ Spectral Characteristics and Modeling of EDFA

InterContinental Ballroom I
10:30 a.m.–12:00 p.m.
WB ▪ Spectral Characteristics and Modeling of EDFA
Li Qian; Univ. of Toronto, Canada, Presider

WB1 ▪ 10:30 a.m. ►Invited◄
Emission Cross-Section Synthesis in Rare Earth Doped Optical Fiber, *Kyunghwan Oh, S. Yoo, U. C. Ryu, S. T. Kim; GIST, Republic of Korea.*
Novel techniques to control the effective emission cross-section of a rare-earth doped fiber with functional cladding structures are reviewed. Evanescent wave filtering with absorbing inner clad ring and W-type three layered fiber structure are discussed.

WB2 ▪ 11:00 a.m.
Origin of Multi-Hole Structure in Gain Spectrum of Erbium-Doped Fiber Amplifier, *Shunsuke Ono[1], Setsuhisa Tanabe[2], Masato Nishihara[1], Etsuko Ishikawa[1]; [1]Photonic Systems Lab, Network Systems Labs, Fujitsu Labs Ltd., Japan, [2]Kyoto Univ., Japan.*
Multi-hole structure with eleven gain spectral holes has been observed in Erbium-doped fiber for the first time. This paper reports the relationship between the multi-hole spectrum and the Stark energy structure of the Er^{3+} ion.

WB3 ▪ 11:15 a.m.
Gain Spectra Control of TDFA-EDFA Hybrid Fiber Amplifiers Employing Pump Loss Control, *Tadashi Sakamoto, Makoto Yamada; NTT Photonics Labs, Japan.*
We have demonstrated a gain spectra control scheme for TDFA-EDFA hybrid amplifiers that employs pump loss control. The gain spectra were controlled within ± 0.4 dB for a signal input power change of 20 dB.

WB4 ▪ 11:30 a.m.
Highly Erbium-Doped Fibers Characterization and Modeling for Erbium Doped Fiber Amplifiers in WDM Regime, *Christian Simonneau, Christine Moreau, Laurent Gasca, Dominique Bayart; Alcatel R&I, France.*
Simple experiments are used to determine ion-pairs percentage and macroscopic homogeneous upconversion in highly Erbium-doped fibers. Using these parameters in a Giles-based model enable to predict Optical-Power-Conversion-Efficiency of WDM-EDFAs with a fair agreement.

WB5 ▪ 11:45 a.m.
Characterization of Site Dependent Pumping in EDFA, *Maxim Bolshtyansky, Nicholas King, Gregory Cowle; JDS Uniphase, USA.*
Site Dependent Pumping in EDFA has similar nature to Spectral Hole Burning effect, thus similar approach for characterization and modeling can be used. The wavelength selective effect on gain can reach several dB in EDFA.

12:00 p.m. – 1:30 p.m.
Lunch Break

WC ▪ Unconventional Amplification Systems

InterContinental Ballroom I
1:30 p.m.–3:00 p.m.
WC ▪ Unconventional Amplification Systems
Guifang Li; Univ. of Central Florida, USA, Presider

WC1 ▪ 1:30 p.m. ►Invited◄
Applications of Optical Parametric Process, *Atsushi Takada, Wataru Imajuku, Toshio Morioka, Kazuo Hagimoto; NTT Corp., Japan.*
Recent progress in parametric waveband conversion for grouped-wavelength path allocation and features of the phase-sensitive parametric amplifier are described after briefly introducing the application of the optical parametric process to optical communication.

WC2 ▪ 2:00 p.m.
Gain-Clamped Praseodymium-Doped Fiber Amplifier for Burst-Mode Amplification, *Ken-Ichi Suzuki, Youichi Fukada, Koichi Saito, Yoichi Maeda, Yasuyuki Okumura; NTT Access Service Systems Labs, NTT Corp., Japan.*
We propose a burst-mode optical amplifier based on a gain-clamped praseodymium-doped fiber amplifier (PDFA) to enlarge the transmission distance between an OLT and ONUs regardless of transmission bit-rate and/or transmission protocol.

WC3 ▪ 2:15 p.m.
Brillouin Amplification of Harmonics Generated by External Modulation for Radio over Fiber Applications with Ultra Low Phase Noise Properties, *Markus Junker[1,2], Thomas Schneider[1], Max J. Ammann[2], Andreas T. Schwarzbacher[2]; [1]Deutsche Telekom Fachhochschule Leipzig, Germany, [2]School of Electronic & Communications Engineering, Dublin Inst. of Technology, Ireland.*
In this paper we show preliminary results of Brillouin amplification of sidebands generated by external modulation trigger a narrowband electrical carrier signal for radio over fiber applications and discuss the low phase properties.

WC4 ▪ 2:30 p.m.
Triple Band Silica Based Double Pass EDFA with an Embedded DCF Module for CWDM Applications, *Joao Batista Rosolem[1], Antonio Amauri Juriollo[1], Roberto Arradi[1], Antonio Donizete Coral[1], Julio Cesar Oliveira[1], Murilo Araujo Romero[2]; [1]CPqD Telecom & IT Solutions, Brazil, [2]Dept. of Electrical Engineering-Univ. of Sao Paulo, Brazil.*
We present a double pass triple-band EDFA with an embedded DCF experimentally characterized over the CWDM grid. It is shown that the amplifier can extend the bus topology link length beyond the 100 km limit.

WC5 ▪ 2:45 p.m.
Impact of MEMS-Based Optical Cross Connect Switching on Optical Amplifier Transient Response for Automatically Switched Optical Network Applications, *Makoto Murakami, Takeshi Seki, Kazuhiro Oda,* Joji Yamaguchi*; NTT, Japan.*
We show that significant optical power excursion due to EDFA transient response in future automatically switched optical networks is effectively suppressed by a precise switching control technique considering both MEMS mirror motion and EDFA response.

3:00 p.m.–3:30 p.m.
Coffee Break

WD ▪ Semiconductor All-Optical Signal Processing

InterContinental Ballroom I
3:30 p.m.–5:15 p.m.
WD ▪ Semiconductor All-Optical Signal Processing
Antonella Bogoni; CNIT, Italy, Presider

WD1 ▪ 3:30 p.m. **►Invited◄**
Optical Signal Processing and Telecommunication Applications, *H. J. S. Dorren, M. T. Hill, Y. Liu, E. Tangdiongga, M. K. Smit, G. D. Khoe; Eindhoven Univ. of Technology, Netherlands.*
We discus the role of optical signal processing in photonic packet routing. We discuss wavelength conversion at 160 Gbit/s in a single semiconductor optical amplifier and an integrated photonic flip-flop.

WD2 ▪ 4:00 p.m.
First Demonstration of Extinction Ratio Improvement by Two-Wave Competition in Ultra-Long SOAs, *Bernd Sartorius, Gero Bramann, Ulrike Busolt, Hans-Peter Nolting, Michael Schlak, Christian Schmidt, Hans-Juergen Wünsche; Heinrich-Hertz-Inst., Germany.*
Extinction ratio improvement of modulated signals by Two-Wave Competition has been demonstrated for the first time. Experiments at 5GHz using 4mm long devices achieved 2dB improvement, theory predicts 9dB at 40GHz for 8mm ultra-long SOAs.

WD3 ▪ 4:15 p.m.
All-Optical Flip-Flop Based on an Active Stopband-Tapered DFB Structure, *Wolfgang Freude, Ayan Maitra, Jin Wang, Oliver Huegel, Christopher Poulton, Juerg Leuthold; High-Frequency and Quantum Electronics Lab, Germany.*
Flip-flop operation with low power threshold in the 50 μW range can be achieved with an active DFB grating having a tapered corrugation amplitude.

WD4 ▪ 4:30 p.m.
Dependence of Efficiency Ratio of Xpm to XGM on Control Pulse Propagation Direction in SOA, *Kohsuke Nishimura[1,2], Masashi Usami[1,2], Tatsuya Asai[3], Katsuyuki Utaka[3]; [1]KDDI R&D Labs Inc., Japan, [2]OITDA, Japan, [3]Waseda Univ., Japan.*
We have found that non-uniform gain distribution formed by propagation of CW probe light along SOA causes difference in efficiency ratio of Xpm to XGM according to the propagation direction of control pulse.

WD5 ▪ 4:45 p.m.
Fast Nonlinear-Polarization-Switching in SOAs for 40 Gb/s Optical Processing, *Giampiero Contestabile[1], Nicola Calabretta[1], Ernesto Ciaramella[1], Marco Presi[2]; [1]Scuola Superiore Sant'Anna Pisa, Italy, [2]Univ. di Pisa, Italy.*
We experimentally demonstrate all-optical wavelength conversion at 40 Gb/s by means of Nonlinear-Polarization-Switching in an SOA. Using an amplifier optimized for fast gain recovery, we report both usual single and simultaneous multi-conversion to different wavelengths.

WD6 ▪ 5:00 p.m.
Multiwavelength Mode-Locked Fiber Ring Laser with a Lyot Filter and a Hybrid Gain Medium, *Ivan Evans, Michael J. Connelly; Univ. of Limerick, Ireland.*
A multiwavelength fiber ring laser is presented. Simultaneous mode-locking of 30 channels is demonstrated at 1 GHz repetition rate. The influence of semiconductor amplifier bias on the devices performance is investigated, particularly at high bias.

Postdeadline Paper Session

InterContinental Ballroom I
5:15 p.m.–6:30 p.m.
Postdeadline Paper Session

2005 OAA Key to Authors and Presiders

2005 OAA Update Sheet

Technical Program Updates

Paper TuD4 – withdrawn.