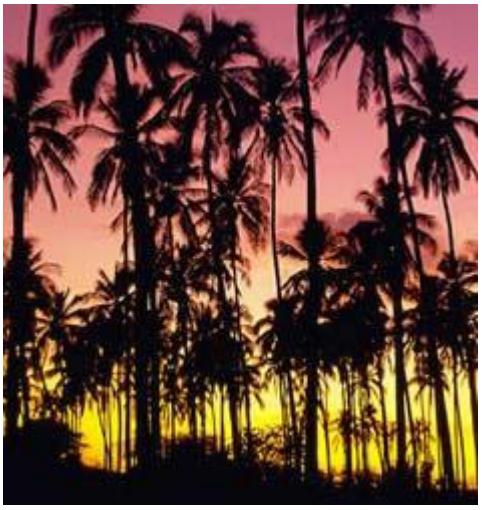
Nonlinear Optics (NLO)

17 July - 22 July 2011, Marriott Kauai Beach Resort, Kauai, Hawaii, United States



Follow Miaochan Zhi, as she blogs about NLO!

NLO - An international forum for discussion of all aspects of nonlinear optics, including new phenomena, novel devices, advanced materials and applications.

Nonlinear optical phenomena are being studied and applied over a wide range of energies and powers, from single-photons to petawatts, and over broad spectral regimes, from THz to X-ray frequencies. The purpose of this meeting is to provide an international forum for discussion of all aspects of nonlinear optics, including new phenomena, novel devices, advanced materials and applications. NLO 2011 will also celebrate 50 years of nonlinear optics through several devoted presentations.

Symposium Celebrating the 50th Anniversary of Nonlinear Optics

Plenary Speaker:

NWA1, 8:00--9:00
Long and Short Entangled Photons (pdf), Steve Harris, *Stanford Univ., USA*

Invited Speakers:

NWA2, 9:00--9:30
The Birth of Nonlinear Optics (pdf), Nicolaas Bloembergen, *Univ. of Arizona, USA*

NWA3, 9:30--10:00
The Beginnings of Quantum Nonlinear Optics and Optical Phase Conjugation-Answers to Communication Challenges (pdf), Amnon Yariv, *Caltech, USA*

NWB1, 10:30--11:00
Surface Nonlinear Optics (pdf), Ron Shen, *Univ. of California at Berkeley, USA*

NWB2, 11:00--11:30
50 Years of Nonlinear Optics, Tunable Sources From OPOs to Coherent X-rays (pdf), Robert Byer, *Stanford Univ., USA*

NWB3, 11:30--12:00
Vacuum Nonlinear Optics, Nonlinear QED (pdf), Gérard Mourou, *Ecole Polytechnique, France*

All conference paper authors are invited to submit their work to coordinated special issues, to appear in Optics Express and Optical Materials Express. To find out more visit http://www.opticsinfobase.org/oe/journal/oe/feature_announce/NLO.cfm

View the conference program and plan your itinerary for the conference

View My Schedule
Customize your program

- Browse speakers and the agenda of sessions
- Browse sessions by type or day.
- Search by author, title, OCIS code and more.
- Plan and print your personal itinerary before coming to the conference

Chairs:

- Daniel Gauthier, *Duke Univ., USA*
- Takunori Taira, *Inst. for Molecular Science, Laser Res. Ctr., Japan*
- Benoît Boulanger, *Univ. de Grenoble, France*
- Steven Cundiff, *JILA/Univ. of Colorado and NIST, USA*

Sponsors:

OSA

Nonlinear Optics (NLO)

17 July - 22 July 2011, Marriott Kauai Beach Resort, Kauai, Hawaii, United States

Program

The Nonlinear Optics meeting is an international forum for discussion of all aspects of nonlinear optics, including new phenomena, novel devices, advanced materials and applications. If you would like to be considered as a presenter, please review the topic categories below and the author/presenter information for submission guidelines.

A number of distinguished **invited speakers** have been invited to present at the meeting. In addition, the organizers have planned a number of **special events** to make your meeting experience more enjoyable!

View the conference program and plan your itinerary for the conference

- Browse speakers and the agenda of sessions
- Browse sessions by type or day.
- Search by author, title, OCIS code and more.
- Plan and print your personal itinerary before coming to the conference

Meeting-at-a-Glance

A tentative general schedule of the meeting is listed below. Please check back frequently for updates.

	Sunday, 17 July	Monday, 18 July	Tuesday, 19 July	Wednesday, 20 July	Thursday, 21 July	Friday, 22 July
Technical Sessions		8.15–10.00 10.30–12.30 19.30–21.30	8.00–10.00 10.30–12.30 19.30–21.30	8.00–10.00 10.30–12.30 14.00–15.30	8.00–10.00 10.30–12.30 19.30–21.30	8.00–10.00 10.30–12.30
Poster Sessions				15.30–17.00		
Coffee Breaks		10.00–	10.00–	10.00–10.30	10.00–	10.00–

		10.30	10.30		10.30	10.30
Luau				18.00-21.00		
		7.15-1.00	7.30-1.00	7.30-12.30	7.30-12.30	
Registration Open	14.00-18.00	19.00-21.30	19.00-21.30	13.30-17.00	19.00-21.30	7.30-12.30

*Tentative schedule subject to change

About Nonlinear Optics

Nonlinear optical phenomena are being studied and applied over a wide range of energies and powers, from single-photons to petawatts, and over broad spectral regimes, from THz to X-ray frequencies. The purpose of this meeting is to provide an international forum for discussion of all aspects of nonlinear optics, including new phenomena, novel devices, advanced materials and applications. NLO 2011 will also celebrate 50 years of nonlinear optics through several devoted presentations.

Papers are being considered in the following topic categories:

Fundamental studies and new concepts

- Quantum optics, computation and communication
- Single-photon nonlinear optics
- Solitons and nonlinear propagation
- Ultrafast phenomena and techniques
- Surface, interface and nanostructure nonlinearities
- Microcavity and microstructure phenomena
- High intensity and relativistic nonlinear optics
- Slow light
- Coherent control
- Pattern formation in nonlinear optical systems
- Nonlinear nanophotonics

Nonlinear media

- Atoms, molecules and condensates
- Cold atoms
- Dielectrics
- Semiconductors
- Nanostructures
- Photonic bandgap structures
- Fibers and waveguides
- Photorefractives

Novel lasers and frequency converters
Micro solid-state photonics
Applications

- Lasers and amplifiers
- Frequency converters and high harmonics generation
- Optical communications
- Photonic switching
- Ultrafast measurement

- Frequency combs and optical clocks
- THz generation, spectroscopy and imaging
- Nonlinear x-ray optics
- Materials processing
- Optical storage
- Biological elements
- Laser induced fusion

Call for Papers

View the Nonlinear Optics Call for Papers PDF in early 2011.

Nonlinear Optics (NLO)

17 July - 22 July 2011, Marriott Kauai Beach Resort, Kauai, Hawaii, United States

Special Events

- Hawaiian Cultural Workshop
- Luau
- Poster Sessions
- Postdeadline Sessions
- Symposium Celebrating the 50th Anniversary of Nonlinear Optics

Hawaiian Cultural Workshop for NLO attendees and their families in Traditional & Modern Hula and Chants with Ka'iulani Visiko

Dates: Tuesday, 19 July and Wednesday, 20 July 2011
Time: 9.00 –11.30
Location: Puna Court, Kauai Marriott Resort & Beach Club
Cost: US $50 per person (not included in registration fees)

There will be a 15 minute coffee break with Wayne “Kimo” Knox at 10.00 each day.

On Wednesday, 20 July, 2011, there will be an opportunity to perform what you learned in the workshop at the Conference Luau during Kimo and Ka'iulani's Cocktail Hour Concert. **

****Note: Luau admission ticket required to participate. Additional tickets may be purchased at Registration until 18.30, Monday, 18 July 2011.****

For Ka'iulani's Workshop you'll need:

- Tank top or t-shirt
- Shorts or sarong
- Bare feet
- Notepad and pencil
- Much ALOHA and FUN!!

Open to members, family, and friends (Children 12 years old and under must have a parent present at all times).

For more information and any questions, visit www.GalleryKauai.com or contact Kimo and Ka'iulani by email, or call +1 585.313.1195.

Luau

The luau will be held on Wednesday 20 July from 18.00–21.00. The luau will feature traditional Hawaiian food and entertainment and is open to all paid full technical registrants. To add extra luau tickets to an existing registration, contact custserv@osa.org or visit Registration on-site before 18.30, Monday, 18 July 2011.

Poster Sessions

Poster sessions are an integral part of the technical program and offer a unique networking opportunity, where presenters can discuss their results one-to-one with interested parties. Each author is provided with a 4 ft. × 8 ft. (1.22 m × 2.44 m) board on which to display the summary and results of his or her paper.

Postdeadline Sessions

The postdeadline session is an opportunity to showcase the most late-breaking innovations in the field.

Symposium Celebrating the 50th Anniversary of Nonlinear Optics

Since the famous paper in Physical Review Letters by P. Franken, et al., demonstrating nonlinear optical effects for the first time appeared in 1961, NLO 2011 will be the natural opportunity to celebrate the 50th anniversary of nonlinear optics. A special symposium will be organized, giving a unique chance to see and hear some of the leading people who helped to found nonlinear optics.

Invited Speakers include:

Plenary Speaker:
Long and Short Entangled Photons, (pdf) Steve Harris, *Stanford Univ., USA*

Invited Speakers:
The Birth of Nonlinear Optics, (pdf) Nicolaas Bloembergen, *Univ. of Arizona, USA*
50 Years of Nonlinear Optics, Tunable Sources From OPOs to Coherent X-rays , (pdf) Robert Byer, *Stanford Univ., USA*
Vacuum Nonlinear Optics, Nonlinear QED, (pdf) Gérard Mourou, *Ecole Polytechnique, France*
Surface Nonlinear Optics, (pdf) Ron Shen, *Univ. of California at Berkeley, USA*
The Beginnings of Quantum Nonlinear Optics and Optical Phase Conjugation-Answers to Communication Challenges, (pdf) Amnon Yariv, *Caltech, USA*

Altos Photonics, Inc.
201 S. Wallace, Ste. B2C
Bozeman, MT 59715 USA
P: +1 866.658.5404
F: +1 866.658.7357
sales@altosphotonics.com
www.altosphotonics.com
Altos Photonics offers pulsed solid-state lasers and tunable systems for research and industrial application, as well as related components and accessories. Laser components include UV and IR optics, non-linear crystals (BBO, KTP, ZGP, KYW, KGW, etc), optical mounts, USB-controlled stages, and laser safety glasses. Altos Photonics sells and services products from Ekspla, Eksma Optics, and Light Conversion & Standa. Since 1997, we have been partnering with outstanding researchers throughout the Americas to better understand and manipulate materials using photonics.

Femtolasers, Inc.
One Mifflin Place
119 Mount Auburn Street Suite 400
Cambridge, MA 02138 USA
P: +1 978.456.9920
F: +1 978.456.9922
Infofli@femtolasers.com
http://www.femtolasers.com
FEMTOLASERS is the premier manufacturer of reliable ultrafast laser oscillator and amplifier solutions. We offer optical pulses down to 7 fs with multi-MW and GW peak powers at MHz and kHz repetition rates. We also feature the patented FEMTOOPTICS™ portfolio of high performance optics for demanding ultrafast applications.

Photonics Media/Laurin Publishing
2 South Street, Berskhire Common
P.O. Box 4949
Pittsfield MA 1201 USA
P: +1 413.499.0514
F: +1 413.442.3180
photonics@laurin.com
www.photonics.com
Photonics Media – the Pulse of the Industry – invites you to explore the information leader and all that we have to offer. As the publisher of Photonics Spectra, BioPhotonics and EuroPhotonics magazines, Photonics Buyers' Guide, Photonics.com, and more, we bring you the news, research and applications articles you need to succeed. Many of our offerings are available to you free-of-charge.

OSA would like to give a special Thank You to our Sponsors!

HAMAMATSU
PHOTON IS OUR BUSINESS

Newport
Experience | Solutions

THORLABS

The organizers of Nonlinear Optics (NLO) gratefully acknowledge the generous support of the following government agencies:

AIR FORCE OFFICE OF SCIENTIFIC RESEARCH
UNITED STATES AIR FORCE

NATIONAL SCIENCE FOUNDATION

Thank You!

Nonlinear Optics (NLO)

Joint International Symposium on Optical Memory & Optical Data Storage (ISOM/ODS)

17 – 22 July, 2011

Marriott Kauai Beach Resort

Kauai, Hawaii, USA

Conference Program

NLO Committee

Daniel Gauthier, Duke Univ., USA, **General Chair**
Takunori Taira, Inst. for Molecular Science, Laser Res. Ctr., Japan, **General Chair**

Benoît Boulanger, Univ. de Grenoble, France, **Program Chair**
Steven Cundiff, JILA/Univ. of Colorado and NIST, USA, **Program Chair**

Program Committee

Ady Arie, Tel Aviv Univ., Israel
Gaetano Assanto, Univ. of Rome "Roma Tre", Italy
Andrius Baltuska, Technical Univ. Vienna, Austria
Jean-Claude Diels, Univ. of New Mexico, USA
Majid Ebrahim-Zadeh, ICFO - The Inst. of Photonics Science, Spain
Benjamin Eggleton, Univ. of Sydney, Australia
Akira Furusawa, Univ of Tokyo, Japan
Joseph W. Haus, Univ. of Dayton, USA
Fatih Ilday, Bilkent Univ., Turkey
Prem Kumar, Northwestern Univ., USA
Fredrik Laurell, Royal Inst. of Technology, Sweden
Martii Kauranen, Tampere Univ. of Technology, Finland
Wayne H. Knox, Inst. of Optics, Univ. of Rochester, USA
J. Nathan Kutz, Univ. of Washington, USA
Daniel Mittleman, Rice Univ., USA
Ichiro Shoji, Chuo Univ., Japan
Herbert Winful, Univ. of Michigan, USA

ISOM Program Committee

ISOM Organizing Committee

K. Ogawa, Univ. of Tokyo, **Chair**
R. Ito, Meiji Univ., **Exofficio**
Y. Mitsuhashi, JST, **Exofficio**
M. Onoe, Univ. of Tokyo, **Exofficio**
Y. Sakurai, Osaka Univ. , **Exofficio**
T. Toshima, NTT Elec. , **Exofficio**
Y. Tsunoda, Hitachi, **Exofficio**
H. Ishihara, JSAP
K. Itoh, Osaka Univ.
T. Iwanaga, NEC
K. Kime, Mitsubishi
Y. Kubota, Toshiba
M. Kume, Sanyo
S. Matsumura, Pioneer
H. Miyajima, MSJ
M. Nakamura, Hitachi
K. Nishitani, Sony
Y. Odani, OITDA
K. Ohta, Sharp
S. Ohara, Panasonic
M. Shinoda, Mitsubishi
H. Tokumaru, NHK
H. Yoshida, Mitsubishi Chem.

ISOM Advisory Committee

D. Chen, Chen & Associates Consulting
I. Fujimura, Ricoh
K. Fushiki, Nikkei BP
K. Goto, Tokai Univ.
Y. Ichioka, Nara Nat. College of Tech.
N. Imamura, TeraHouse
A. Itoh, Nihon Univ.
U. Itoh, AIST
T. Kondo, JVC
T. Kubo, T. Kubo Engineering Science Office
S. Kubota, Univ. of Tokyo
T. Maeda, JST
M. Mansuripur, Univ. of Arizona
M. Mori, NatureInterface
T. Murakami, OITDA
T. Ohta, Ovonic Phase-Change Lab
M. Ojima, Hitachi
Y. Okino, Kansai Univ.
Y.-P. Park, Yonsei Univ.
J. Saito, Nikon
S. Sugiura, Pioneer
H. Ukita, Ritsumeikan Univ.
F. Yokogawa, Pioneer

ISOM Steering Committee

M. Shinoda, Mitsubishi, **Chair**
K. Ito, Ricoh, **Vice-Co-Chair**
Y. Murakami, Sharp, **Vice-Co-Chair**
Y. Tsuchiya, Sanyo, **Vice-Co-Chair**
M. Aiba, Sony
A. Furuya, NTT
R. Katayama, Fukuoka Inst. Tech.
Y. Kawata, Shizuoka Univ.
H. Kobori, Toshiba
Y. Marutani, Nichia
K. Sano, Panasonic
Y. Sasaki, Nippon Sheet Glass
T. Shimano, Hitachi
T. Tanabe, Ibaraki Nat. College of Tech.
S. Tanaka, Pioneer
E. Watanabe, Univ. of Electro-Communications

ISOM Technical Program Committee

Y. Kawata, Shizuoka Univ., **Chair**
M. Irie, Osaka Sangyo Univ., **Vice-Co-Chair**
T. Kikukawa, TDK, **Vice-Co-Chair**
T. Shintani, Hitachi, **Vice-Co-Chair**
C.-T. Chong, DSI
F. X. Gan, CAS
S. Hasegawa, Fujitsu Labs
S. Higashino, Sony
D.-R. Huang, Nat'l Dong Hwa Univ.
S. Ichiura, Sanyo
M. Itonaga, JVC KENWOOD
J.-H. Kim, LG
J.-H. Kim, Samsung
Y.-J. Kim, Yonsei Univ.
T. Milster, Univ. of Arizona
A. Nakamura, Panasonic
M. Nakano, Pioneer
T. Okumura, Sharp
I.-S. Park, Samsung
N.-C. Park, Yonsei Univ.
T. Schlesinger, Carnegie Mellon Univ.
T. Shimura, Univ. of Tokyo
D.-H. Shin, Samsung
M. Takeda, Kyoto Inst. of Tech.
A. Tanaka, Mitsubishi Chem.
K. Tanaka, Teikyo-Heisei Univ.
S. Tatsuta, Toshiba
C.-H. Tien, Nat'l Chiao Tung Univ.
H. Tokumaru, NHK
J. Tominaga, AIST
D. P. Tsai, Nat'l Taiwan Univ.
T. Tsujioka, Osaka Kyoiku Univ.
K. Ueyanagi, Kyoto Univ.
P. Wehrenberg, Apple
D. C. Wright, Univ. of Exeter
S. Yagi, NTT
Y. Yamanaka, METI

ODS Advisory Committee

Robert R. McLeod, Univ. of Colorado, USA, **Chair**
Bernard W. Bell, Seagate Technology, USA
Chong Tow Chong, Data Storage Inst., Singapore
Kevin Curtis, RealD Inc., USA
Seiji Kobayashi, Sony Corp., Japan
Takeshi Maeda, Japan Science and Technology Agency, Japan
Masud Mansuripur, Univ. of Arizona, USA
Thomas D. Milster, Univ. of Arizona, USA
Tim Rausch, Seagate Technology, USA
Kimihiro Saito, Sony Corp., Japan
Barry H. Schechtman, Information Storage Industry Consortium, USA
Tuviah E. Schlesinger, Carnegie Mellon Univ., USA
Luping Shi, Data Storage Inst., Singapore
Takeshi Shimano, Hitachi, Ltd., Japan
Yun Sup Shin, LG Electronics Inc., Japan

ODS Program Committee

Ryuichi Katayama, Fukuoka Institute of Technology., Japan, **General Chair**
Susanna Orlic, Berlin Univ. of Technology, Germany, **General Chair**
Lambertus Hesselink, Stanford Univ., USA, **Program Chair**
Din Ping Tsai, Natl. Taiwan Univ., Taiwan, **Program Chair**

Kyung-Geun Lee, Samsung Electronics Co., Ltd., Japan
Vijayakumar Bhagavatula, Carnegie Mellon Univ., USA
Min Gu, Swinburne Univ., Australia
Jin-Hong Kim, LG Electronics Inc., Republic of Korea
Hiroyuki Minemura, Hitachi Ltd., Japan
Long-fa Pan, Tsinghua Univ., China
Tsutomu Shimura, Univ. of Tokyo, Japan
Yuzuru Takashima, Stanford Univ., USA
Kenji Tanaka, Sony Corp., Japan
Peter Török, Imperial College London, UK
Kazuo Watabe, Toshiba Corp., Japan
Paul J. Wehrenberg, Apple Computer, Inc., USA

Nonlinear Optics (NLO)

Joint International Symposium on Optical Memory &

Optical Data Storage (ISOM/ODS)

Aloha kākou! We are happy that you have joined us in Līhuʻe, Kauaʻi to share your latest research results in the two collocated topical meetings Nonlinear Optics (NLO) and the Joint International Symposium on Optical Memory & Optical Data Storage (ISOM/ODS).

This is the 10th time the Nonlinear Optics (NLO) Topical Meeting has visited the Hawaiian Islands. This meeting brings together a diverse group of presenters from around the world sharing an interest in the frontiers of research in nonlinear optics. We are especially happy to celebrate the 50th anniversary of nonlinear optics, with a special symposium on Wednesday. Submissions to the meeting are near an all-time high, an indication of the continued interest in the field that spans several decades. Over the next 5 days, there will be nearly 149 presentations including 3 plenary, 30 invited, 92 oral, and 24 poster presentations. The program is exceptional, with the first part of the week packed with exciting talks with two parallel sessions in most cases. The last 2 days revert to the typical relaxed atmosphere of the NLO meeting with mostly single sessions. In addition to topics such as nonlinear optical materials, spatial effects in nonlinear optic interactions, applications of nonlinear optics in quantum optics and optical telecommunication, high-field laser systems based on optical parametric chirped-pulse amplification, and nonlinear optical crystals that have been the strength of the NLO meeting, rapidly developing areas such as terahertz generation and nonlinearities, filamentation, plasmonics, quasi-phase matching, micro solid-state photonics, and nonlinear nanophotonics are also well represented.

As always, a key aspect of the topical meeting is the chance to network with colleagues from around the world. This year's conference is structured to provide ample opportunities for such interactions—and of course the traditional Wednesday evening luau!

ISOM 2011 is the 21st international conference, and ODS 2011 is the 27th annual conference on optical memories and technologies. This year the two meetings are jointly held in Kauai, Hawaii to encourage close collaboration and exchange of information between the participants of these meetings.

The 3rd generation high definition optical technologies were introduced about four years ago, and the initial adoption rate has been significant. On the heels of this success, ISOM/ODS 2011 continues its long tradition of looking to the future of optical memory and optical data storage. This year we have 23 Invited papers from countries around the world, covering a wide range of topics such as holographic, multilayer, super resolution and near field recording as well as component, and advanced drive technologies and testing.

This year a special session devoted to energy assisted magnetic recording with only invited speakers from major magnetic storage companies and academia is scheduled to reflect the growing interest and investment in merging optical and magnetic recording technologies.

The Program Committee has organized a rich program that includes in addition to the 23 invited, 26 oral contributed papers, and 44 contributed poster presentations spread over three days of technical sessions held Monday through Wednesday.

We welcome you to actively participate in all aspects of the conference and hope that you will benefit from these interactions and enjoy beautiful Kauai, Hawaii.

We are very interested in your opinions on how the meetings can be improved in the future. Please say hello to the General and Program Chairs of the meetings and let us know your thoughts.

We hope that you enjoy your time at the meeting and this opportunity to explore Līhuʻe and the rest of Kauaʻi.

Nonlinear Optics (NLO)

Daniel Gauthier, *Duke Univ., USA*, **General Chair**

Takunori Taira, *Inst. for Molecular Science, Japan*, **General Chair**

Benoît Boulanger, *Univ. de Grenoble, France*, **Program Chair**

Steven Cundiff, *JILA/Univ. of Colorado and NIST, USA*, **Program Chair**

Joint International Symposium on Optical Memory &

Optical Data Storage (ISOM/ODS)

Lambertus Hesselink, *Stanford Univ., USA*, **ODS Program Chair**

Din Ping Tsai, *Natl. Taiwan Univ., Taiwan*, **ODS Program Chair**
Yoshimasa Kawata, *Shizuoka Univ., Japan*, **ISOM Program Chair**

NLO Conference Highlights

Plenary Speakers

08:15--9:00
NMA1, **Quasi-phasematching: Spatial and Spectral Engineering of Nonlinear Optics**, *Martin Fejer, Stanford Univ., USA*

08:00--08:45
NThA1, **Nonlinear Optics at the Timescale of the Electron - Ultra Broadband Coherent X-Rays and Applications**, *Margaret Murnane, JILA, Univ. of Colorado, USA*

The 50 Years of Nonlinear Optics Symposium

NLO 2011 will celebrate 50 years of nonlinear optics through several devoted invited presentations held on Wednesday morning. See below for this exciting program.

Plenary Speaker:

08:00--09:00
NWA1, **Long and Short Entangled Photons**, Steve Harris, *Stanford Univ., USA*

Invited Speakers:

09:00--09:30
NWA2, **The Birth of Nonlinear Optics**, Nicolaas Bloembergen, *Univ. of Arizona, USA*

09:30--10:00
NWA3, **The Beginnings of Quantum Nonlinear Optics and Optical Phase Conjugation-Answers to Communication Challenges**, Amnon Yariv, *Caltech, USA*

10:30--11:00
NWB1, **Surface Nonlinear Optics**, Ron Shen, *Univ. of California at Berkeley, USA*

11:00--11:30
NWB2, **50 Years of Nonlinear Optics, Tunable Sources From OPOs to Coherent X-rays**, Robert Byer, *Stanford Univ., USA*

11:30--12:00
NWB3, **Vacuum Nonlinear Optics, Nonlinear QED**, Gérard Mourou, *Ecole Polytechnique, France*

12:00--12:30
NWB4, **Optical Parametric Amplifiers : From Broadly Tunable Past to Highly Powerful Future**, Algis Piskarskas, *Vilnius Univ., Lithuania*

The Luau

The Luau will be held on Wednesday, 20 July, from 18:00 to 21:00 in the Luau Gardens at the Marriott. The Luau will feature traditional Hawaiian food and entertainment and is included in all NLO full technical registrations. To add additional tickets, please visit Registration before 18:30 on Monday, 18 July.

Coffee Breaks and Exhibit Time

Coffee breaks and Exhibits are scheduled for Kauai Court, rain back up is the Puna Ballroom. The schedule is as follows:

Monday, 18 July	10:00 – 10:30
Tuesday, 19 July	10:00 – 10:30
Wednesday, 20 July	10:00 – 10:30 15:30 – 16:00
Thursday, 21 July	10:00 – 10:30
Friday, 22 July	10:00 – 10:30

Hawaiian Cultural Workshop for NLO attendees and their families in Traditional & Modern Hula and Chants with Ka'iulani Visiko

Dates: Tuesday, 19 July and Wednesday, 20 July 2011
Time: 9.00 –11.30
Location: Puna Ballroom D, Kauai Marriott Resort & Beach Club
Cost: US $50 per person (not included in registration fees)

There will be a 15 minute coffee break with Wayne “Kimo” Knox at 10:00 each day.

On Wednesday, 20 July, 2011, there will be an opportunity to perform what you learned in the workshop at the Conference Luau during Kimo and Ka'iulani's Cocktail Hour Concert. **

Note: Luau admission ticket required to participate. Additional tickets may be purchased at Registration until 18.30, Monday, 18 July 2011.

For Ka'iulani's Workshop you'll need: Tank top or t-shirt; shorts or sarong; bare feet; notepad and pencil; much ALOHA and FUN!! Open to members, family, and friends (Children 12 years old and under must have a parent present at all times).
For more information and any questions, visit www.GalleryKauai.com or contact Kimo and Ka'iulani by email, or call +1 585.313.1195

Joint International Symposium on Optical Memory & Optical Data Storage (ISOM/ODS) Highlights

Special Session on Hybrid Recording

On Tuesday evening, come join us for a special session devoted to energy assisted magnetic recording. This session consists exclusively of invited speakers from major magnetic storage companies and academia is intended to reflect the growing interest and investment in merging optical and magnetic recording technologies. The following presentations are a part of this exciting program:

19:00 – 19:30
OTuE1, **Energy Assisted Magnetic Recording**, Francis Liu; *Western Digital, USA*.

19:30 – 20:00
OTuE2, **Adjoint FDTD for Nanophotonic Device Optimization**, Paul Hansen[1], Yuxin Zheng[2], Eugene Perederey[1], Lambertus Hesselink[1,2]; *[1]Applied Physics, Stanford Univ-Geophysics Dept, USA; [2]Electrical Engineering, Stanford Univ., USA.*

20:00 – 20:30
OTuE3 , **Hybrid Recording Technology**, Tom Clinton; Research, *Hitachi Global Storage Technologies, USA*.

20:30 – 21:00
OTuE4, **Near Field Optical Characterization and Mechanical Flying Stability for HAMR**, Young-Joo Kim; *School of Mechanical Engineering, Yonsei Univ., Republic of Korea*.

21:00 – 21:30
OTuE5, **Future of Magnetic Recording**, Liu Bo; *Intermag, Canada*.

Coffee Breaks and Exhibit Times

Please see the NLO Highlights Listing for details. Additional Coffee Breaks for ISOM/ODS are listed below.

Monday, 18 July	15:45 – 16:15
Tuesday, 19 July	15:30 – 16:00
Wednesday, 20 July	15:30 – 16:00

Welcome Reception

The Welcome Reception for ISOM/ODS will be held at the Kauai Beach Resort on Sunday, 17 July from 18:00 – 19:00 by the pool. All ISOM/ODS registrants are welcome.

NLO Luau

The Luau is not part of the ISOM/ODS Technical Registration. To purchase a ticket for this event, please visit Registration before 18:30 on Monday, 18 July. The Luau is Wednesday, July 20th from 6:00 pm 9:00 pm in the Luau Gardens at the Marriott and will feature traditional Hawaiian food and entertainment.

	Kauai Ballroom, Kona	Kauai Ballroom, Halele'a	Kauai Ballroom, Ko'olau
Sunday, 17 July			
14:00–18:00	**Registration Open,** *Kauai Court*		
Monday, 18 July			
7:00–18:30	**Registration Open,** *Kauai Court*		
8:00–8:15	**Opening Remarks**, *Kauai Ballroom, Kona*		**Opening Remarks**, *Kauai Ballroom, Ko'olau*
8:15–10:00	**NMA ● Materials I**, *Kauai Ballroom, Kona*		**OMA • Keynote/Nano-photonics** *(ends at 10:15)*
10:00–10:30	**Coffee Break & Exhibit Time**, *Kauai Court*		
10:30–12:30	**NMB ● Quantum Optics I**	**NMC ● Terahertz**	*(starts at 10:45)* **OMB • Holographic Memory**
12:30–19:30	**Free Afternoon for NLO Sessions** *(on your own)*		
14:00 -- 15:45			**OMC • Components**
15:45 -- 17:15			**OMD • ISOM/ODS Poster Session I**, *Puna Ballroom*
17:15--18:45			**OME • Media/Fabrication**
19:30–21:30	**NMD ● Nonlinear Absorption and Magnetization**	**NME ● Lasers and OPOs**	
Tuesday, 19 July			
7:30–18:00	**Registration Open**, *Kauai Court*		
8:00–10:00	**NTuA ● Plasmons and Solitons**	**NTuB ● Nonlinear Spectroscopy I**	**OTuA • Near-field/Plasmonics**
10:00–10:30	**Coffee Break & Exhibit Time**, *Kauai Court*		
10:30–12:30	**NTuC ● Solitons**	**NTuD ● Materials II**	**OTuB • Femtosecond Applications/Phase-change**
12:30–19:30	**Free Afternoon for NLO Sessions** (*on your own*)		
14:00--15:30			**OTuC • Drive Technologies/Signal Processing**
15:30--17:00			**OTuD • ISOM/ODS Poster Session II,** *Puna Ballroom*
19:00–21:00	**Evening Registration Open,** *Kauai Court*		
19:30–21:30	**NTuE ● Waveguides**	**NTuF ● Biophotonics, Optomechanics and Optofluidics**	*(starts at 19:00)* **OTuE • Special Session on Hybrid Recording**
Wednesday, 20 July			
7:30–17:30	**Registration Open**, *Kauai Court*		
8:00–10:00	**NWA ● Symposium Celebrating the 50th Anniversary of Nonlinear Optics I,** *Kauai Ballroom, Kona*		
10:00–10:30	**Coffee Break & Exhibit Time**, *Kauai Court*		
10:30–12:30	**NWB ● Symposium Celebrating the 50th Anniversary of Nonlinear Optics II,** *Kauai Ballroom, Kona*		**OWA • Micro-hologram** *(ends at 12:00)*
12:30–14:00	**Lunch Break** *(on your own)*		
14:00–15:30	**NWC ● Quantum Optics II**	**NWD ● Frequency Comb Generation**	**OWB • Volume Recording**
16:00--17:00			**OWC • ISOM/ODS Postdeadline Session**
15:30–17:30	**NWE ● NLO Poster Session**, *Puna Ballroom*		
18:00–21:00	**Luau,** ***Luau Gardens (Rain back-up: Ka Mala)***		
Thursday, 21 July			
7:30–12:30	**Morning Registration Open**, *Kauai Court*		
8:00–10:00	**NThA ● High Intensities**, *Kauai Ballroom, Kona*		
10:00–10:30	**Coffee Break & Exhibit Time**, *Kauai Court*		
10:30–12:30	**NThB ● Photonic Crystal and Waveguides Arrays**	**NThC ● Modelocked Lasers and Continuum Generation**	
12:30–19:30	**Free Afternoon** (*on your own*)		
19:00–21:00	**Evening Registration Open,** *Kauai Court*		
19:30–21:30	**NThD ● Nanophotonics**, *Kauai Ballroom, Kona*		
Friday, 22 July			
7:30–12:00	**Morning Registration Open**, *Kauai Court*		
8:00–10:00	**NFA ● Frequency Combs and Waveform Synthesis**, *Kauai Ballroom, Kona*		
10:00–10:30	**Coffee Break & Exhibit Time**, *Kauai Court*		
10:30–12:30	**NFB ● Nonlinear Spectroscopy II**		

Nonlinear Optics (NLO) Abstracts

• Sunday, 17 July, 2011

Kauai Court, **14:00 – 18:00, Registration Open**

• Monday, 18 July, 2011

Kauai Court, **07:00 – 18:30, Registration Open**

Kauai Ballroom: Kona, **08:00 – 08:15, Opening Remarks**

NMA • Materials I

Kauai Ballroom, Kona
08:15–10:00
Carlota Canalias; KTH, Sweden, Presider

NMA1 • 08:15 Plenary
Quasi-phasematching: Spatial and Spectral Engineering of Nonlinear Optics, Martin Fejer[1]; [1]*Stanford Univ., USA.* Abstract not available.

NMA2 • 09:00
New Nonlinear Crystal for Three-wave Interactions with Transmission Extending from 1.7 to 25 μm., Valeriy Badikov[1], Dmitrii Badikov[1], Galina Shevyrdyaeva[1], Aleksey Tyazhev[2], Georgi Marchev[2], Vladimir Panyutin[2], Frank Noack[2], Valentin Petrov[2], Albert Kwasniewski[3]; [1]*High Technologies Laboratory, Russian Federation;* [2]*Max-Born-Institute, Germany;* [3]*Institute for Crystal Growth, Germany.* We have grown single crystals of PbIn6Te10, with clear transparency from 3 to 20 μm, and showed that it possesses sufficient birefringence for phase-matching of three-wave parametric interactions and a nonlinear coefficient of 51 pm/V.

NMA3 • 09:15
IR Broadband Generation in the New Crystal CdSiP2., Benoît Boulanger[1]; [1]*Joseph Fourier University, France.* We performed the direct measurement of the phase-matching tuning curves of the new nonlinear crystal CdSiP2. These data enable to establish very accurate Sellmeier equations showing the ability of CdSiP2 for broad band infrared generation.

NMA4 •09:30
Fabrication of Slant Quasi Phase Matching Structure in Mg-doped Congruent LiNbO3., Hideki Ishizuki[1], Takunori Taira[1]; [1]*Institute for Molecular Science, Japan.* We fabricated slant quasi-phase-matching structure in 2-mm-thick Mg-doped LiNbO3 crystal at 65° slant angle with 75-μm surface period. Slant QPM has a possibility of wafer-scale-aperture device, suitable for handling high power/energy lasers.

NMA5 • 09:45
Fabrication of a New Walk-off Compensating BBO Periodic Structure by Use of the Room-temperature-bonding Technique., Kenjiro Hara[1], Konosuke Takayanagi[1], Shinnosuke Matsumoto[1], Maki Nakajima[1], Ichiro Shoji[1]; [1]*Chuo University, Japan.* We have succeeded in developing a new walk-off compensating BBO periodic structure using the room-temperature-bonding technique, which generates twice the second-harmonic ultraviolet power of a bulk BBO with the same length.

NMB • Quantum Optics I

Kauai Ballroom, Kona
10:30-12:30
Yiwen Chu; Harvard Univ., USA, Presider

NMB1 • 10:30 **Invited**
The Wonderful World of Weak Values, John Howell[1], David J. Starling[1], Paul B. Dixon[1], Andrew Jordan[1]; *[1]Department of Physics and Astronomy, University of Rochester, USA.,* An introduction to weak values will be given along with experimental results in precision beam deflection, signal to noise ratio, phase amplification and precision frequency measurements.

NMB2 • 11:00
Frequency-upconversion Photon-number-resolving Detector for Wavelengths around 1 μm., Kun Huang[1], Xiaorong Gu[1], Min Ren[1], Yi Jian[1], Haifeng Pan[1], Guang Wu[1], E. Wu[1], Heping Zeng[1]; *[1]State Key Laboratory of Precision Spectroscopy, East China Normal University, China.* We demonstrated the photon-number-resolving detection at 1.04 μm by coincidence frequency upconverison. A total detection efficiency of 3.2% was achieved with a quite low background noise probability of 0.0002 per pulse.

NMB3 • 11:15
Efficient Frequency Downconversion at the Single Photon Level from 738 nm to 1557 nm, Sebastian Zaske[1], Andreas Lenhard[1], Christoph Becher[1]; *[1]FR7.2 Experimentalphysik, Universität des Saarlandes, Germany.* We report on quantum frequency downconversion using a ZnO:PPLN ridge waveguide. An internal conversion efficiency of 73% is achieved. We identify Raman scattering to be the dominant noise source in the frequency converter.

NMC • Terahertz

Kauai Ballroom, Halele'a
10:30–12:30
Alfred Leitenstorfer; Univ. of Konstanz, Germany, Presider

NMC1 • 10:30
3.4 THz generation based on DAST-DFG pumped by an all solid-state dual-wavelength Nd:YAG laser, Kouji Nawata[1], Atsushi Sato[2], Kazuhiro Asai[2], Hiromasa Ito[1], Hiroaki Minamide[1]; *[1]RIKEN, Japan; [2]Tohoku institute of technology, Japan.* We developed a compact and efficient THz-wave source based on a DAST-DFG pumped by an all solid-state dual-wavelength Nd:YAG laser. Output energy of the Nd:YAG laser was 9 mJ and 3.4 THz-wave was observed.

NMC2 • 10:45
Efficient THz Emission from the Acoustic Surface Plasmons in InAs Nanowires, Denis Seletskiy[1,4], Michael Hasselbeck[1], Chia-Yeh Li[1], Jeffrey Cederberg[2], Aaron Katzenmeyer[3], Maria Toimil-Molares[3], Francois Leonard[3], Albert Talin[3], Mansoor Sheik-Bahae[1]; *[1]University of New Mexico, USA; [2]Sandia National Laboratories, USA; [3]Sandia National Laboratories, USA; [4]Air Force Research Laboratory, USA.* We observe efficient THz emission from an ensemble of free-standing InAs nanowires. The emitted spectrum is consistent with the presence of low-energy acoustic surface plasmons. The predicted electron concentration agrees with separate transconductance measurements.

NMC3 • 11:00 **Invited**
Wideband terahertz generation using nonlinear optical waveguide, Kodo Kawase[1,2], Takayuki Shibuya[1,2], Koji Suizu[1]; *[1]Nagoya University, Japan; [2]RIKEN, Japan.* We obtained a wideband terahertz generation using a prism-coupled Cherenkov phase-matching method, in which a prism with a suitable refractive index at terahertz frequencies is coupled to a thin nonlinear optical crystal.

NMB • Quantum Optics I (cont.)

NMB4 • 11:30
Quantum input-output formalism for few-photon nonlinear transport in nanophotonic circuits, Shanhui Fan[1], Jung-Tsung Shen[2], Sukru E. Kocabas[1]; [1]*Electrical Engineering, Stanford University, USA;* [2]*Electrical and System Engineering, Washington Unversity St. Louis, USA.* We introduce a quantum input-output formalism, which greatly simplifies the theoretical treatment of nonlinear quantum transport of few-photon Fock state in nanophotonic circuits.

NMB5 • 11:45
Generation, manipulation, and characterization of highly-discrete coherent spectrum, Masayuki Katsuragawa[1]; [1]*University of Electro-Communications, Japan.* We report on a stable generation of a highly-discrete comb-like spectrum and its manipulation and precise characterization of the spectral phase.

NMB6 • 12:00
Lossless Single Photon Shaping via Heralding., Yuping Huang[1], Kahraman Köprülü[1], Geraldo A. Barbosa[1], Prem Kumar[1]; [1]*Center for Photonic Communication and Computing, EECS Department, Northwestern, USA.* Using spontaneous optical parametric down-conversion, we analyze and experimentally demonstrate heralded generation of shaped single photons, whose modes are losslessly tailored via amplitude modulation on the pump field that drives the down-conversion process.

NMB7 • 12:15
Photon Pair Generation and Quantum Walks in Arrays of Quadratic Nonlinear Waveguides, Alexander S. Solntsev[1], Andrey A. Sukhorukov[1], Dragomir N. Neshev[1], Yuri S. Kivshar[1]; [1]*Nonlinear Physics Centre, The Australian National University, Australia.* We study photon pair generation through spontaneous parametric down conversion accompanied by quantum walks in arrays of quadratic nonlinear waveguides and investigate various ways to control output photon correlations.

NMC • Terahertz (cont.)

NMC4 • 11:30
Improving optical-to-THz conversion efficiency using a binary phase mask, Xavier Ropagnol[1], Roberto Morandotti[2], Tsuneyuki Ozaki[3], Matt Reid[4]; [1]*INRS, Canada;* [2]*Universite du Quebec, INRS, Canada;* [3]*INRS, Canada;* [4]*University of Northern British Columbia, Canada.* We demonstrate efficient generation of quasi-single-cycle THz pulses using an interdigitated GaAs Large Area Photoconductive Antenna (LAPCA) with a binary phase mask which allow the generation of a single cycle THz pulse.

NMC5 • 11:45
Optimization of Broadly Tunable BNA-DFG Terahertz-Wave Source, Takashi Notake[1], Yuye Wang[1], Kouji Nawata[1], Hiroshi Kawamata[1], Hiroaki Minamide[1]; [1]*RIKEN, Japan.* Broadly tunable terahertz wave source utilizing difference frequency generation in a organic BNA crystal is developed. By using dual KTP-OPO optimized for phase matching condition, wideband THz-wave generation from sub- to 20 THz is achieved.

NMC6 • 12:00
Withdrawn

NMC7 • 12:15
Towards Generation of mJ-Level Ultrashort THz Pulses by Optical Rectification, Jozsef A. Fülöp[1], Zoltán Ollmann[1], László Pálfalvi[1], Gábor Almási[1], János Hebling[1]; [1]*Department of Experimental Physics, University of Pecs, Hungary.* According to calculations THz pulses energies on the 10-mJ level and peak electric fields of 100 MV/cm can be reached by optimal pump pulse durations with a contact grating, and cooling the LN crystal.

On Your Own, **Free Afternoon, 12:30 – 19:30**

NMD • Nonlinear Absorption and Magnetization

Kauai Ballroom, Kona
19:30–21:30
Wayne Knox; Univ. of Rochester, USA, Presider

NMD1 • 19:30
Few-Photon Switching via Two-Photon Absorption in Rb-Filled Photonic Bandgap Fibers, Vivek Venkataraman[1], Kasturi Saha[1], Pablo Londero[1], Alex Gaeta[1]; *[1]Applied and Engg. Physics, Cornell University, USA.* We show 20% all-optical modulation with less than 2 nW total power via non-degenerate two-photon absorption in Rb vapor confined to a photonic bandgap fiber. This corresponds to about 15 photons of switching energy.

NMD2 • 19:45
Electric Field Induced Quantum Interference in Semiconductors, Steven Cundiff[1,2], Jared Wahlstrand[1], Haipeng Zhang[1,2], Soobong Choi[1], John Sipe[1,3]; *[1]JILA, University of Colorado and National Institute of Standards and Technology, USA; [2]Electrical, Computer and Energy Engineering Department, University of Colorado, USA; [3]Department of Physics, University of Toronto, Canada.* Pump-probe experiments on a biased (100) GaAs sample show that a constant electric field enables quantum interference between one and two photon absorption. This effect can be ascribed to the nonlinear optical Franz-Keldysh effect.

NMD3 • 20:00
Femtosecond-scale pulse compression by the intrinsic nonlinearity of a semiconductor two-photon amplifier, Amir Nevet[1], Alex Hayat[1], Meir Orenstein[1]; *[1]Electrical Engineering, Technion, Israel.* Ultrafast compression of pulses by two-photon gain in an electrically-driven AlGaAs waveguide is measured and analyzed. Dynamic control of pulse width from 240 to 140 fs is achieved by varying the current injection levels.

NMD4 • 20:15
Extremely Nondegenerate Two-Photon Absorption and Detection in Direct Gap Semiconductors, Claudiu Cirloganu[1,2], Dmitry A. Fishman[1], Scott Webster[1], Lazaro A. Padilha[1,3], Morgan Monroe[1], David J. Hagan[1,4], Eric W. Van Stryland[1,4]; *[1]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA; [2]Ctr for Organic Photonics and Electronics, Georgia Inst. of Tech., USA; [3]Los Alamos National Lab., USA; [4]Dept. of Physics, Univ. of Central Florida, USA.* Two-to-Three orders of magnitude enhancement of nondegenerate 2-photon absorption (2PA) compared to degenerate 2PA are observed. Femtosecond gated detection of low power mid-IR radiation using ultraviolet gating pulses using a GaN detector at room temperature is demonstrated.

NME • Lasers and OPOs

Kauai Ballroom, Halele'a
19:30–21:30
Robert Byer; Stanford Univ., USA, Presider

NME1 • 19:30
Lasers Running in Reverse: Optical Refrigeration below NIST-Cryogenics, Mansoor Sheik-Bahae[1], Denis Seletskiy[1]; *[1]Physics, Univ. New Mexico, USA.* We report new milestones in the solid-state laser cooling by demonstrating cooling Yb:YLF below 123K (NIST-defined cryogenic) at the E4-E5 Stark resonance. Furthermore, we show impedance-matched cavity-enhanced cooling geometry truly mimics a laser running in reverse.

NME2 • 19:45
Megawatt Level UV Output from <110> Cr4+:YAG Passively Q-Switched Microchip Laser, Rakesh Bhandari[1], Takunori Taira[1]; *[1]Laser Research Center, Institute for Molecular Science, Japan.* > 2 MW peak power, 260 ps, 100 Hz pulses at 266nm are obtained by fourth harmonic conversion of a linearly polarized Nd:YAG microchip laser passively Q-switched with <110> cut Cr4+:YAG.

NME3 • 20:00
Withdrawn.

NME4 • 20:15
Twin Degenerate OPO for Quantum Random Bit Generation, Alireza Marandi[1], Nick Leindecker[1], Konstantin Vodopyanov[1], Robert Byer[1]; *[1]Stanford University, USA.* We propose a new quantum random bit generator based on degenerate synchronously pumped optical parametric oscillators. The intrinsic randomness is due to the phase of noise photons. The resulting bit sequence satisfies statistical randomness tests.

NMD • Nonlinear Absorption and Magnetization (cont.)

NMD5 • 20:30
3D Knife-edge Characterization of Two-Photon Absorption Volume in Silicon for Integrated Circuit Testing, Kai Shao[1], Vincent Pouget[1], Emeric Faraud[1], Camille Larue[1], Dale McMorrow[2], Dean Lewis[1]; *[1]IMS, University Bordeaux 1, France; [2]Naval Research Laboratory, USA.* We have performed three-dimensional characterization of the TPA effective laser spot size in silicon using an integrated knife-edge sensor. The TPA-induced response of a CMOS integrated circuit is analyzed based on these results.

NMD6 • 20:45
Withdrawn

NMD7 • 21:00
Optical manipulation of magnetization vector in multi-dimensional space, Natsuki Kanda[1], Takuya Higuchi[1], Hirokatsu Shimizu[1], Kuniaki Konishi[1,2], Kosuke Yoshioka[1,3], Makoto Kuwata-Gonokami[1,2]; *[1]Department of Applied Physics, The University of Tokyo and CREST(JST), Japan; [2]Photon Science Center, The University of Tokyo, Japan; [3]Department of Physics, The University of Tokyo, Japan.* We demonstrated arbitrarily polarized magnetization control in an antiferromagnet by stimulated Raman processes with time- and polarization- controlled double pulses. This technique has lead to a new concept of vectorial control of magnetization by light.

NMD8 • 21:15
Selection Rules for Light-Induced Magnetization through Stimulated Raman Process, Takuya Higuchi[1,2], Natsuki Kanda[1,2], Hiroharu Tamaru[1], Makoto Kuwata-Gonokami[1,2]; *[1]Univ. of Tokyo, Japan; [2]CREST-JST, Japan.* We highlight the role of the crystals' symmetry in coherent light-magnetism interaction, in that the rotational analogue of the Umklapp process opens a new route to access magnetization by linearly polarized laser pulses.

NME • Lasers and OPOs (cont.)

NME5 • 20:30
Near-degenerate cw OPO for THz Generation, Markku Vainio[1,2], Lauri Halonen[1]; *[1]Dpt. of Chemistry, University of Helsinki, Finland; [2]Centre for Metrology and Accreditation, Finland.* Single-mode operation of a singly-resonant near-degenerate cw optical parametric oscillator is demonstrated. The signal-idler difference frequency can be tuned from 1 to 4 THz. The total optical output power is 0.8 W.

NME6 • 20:45
Withdrawn

NME7 • 21:00
Longwave-IR Optical Parametric Oscillator in Orientation-Patterned GaAs, Rita Peterson[1], Ryan Feaver[1,2], Peter Powers[2]; *[1]AFRL/RYMWA, Air Force Research Lab, USA; [2]Electro-Optics, University of Dayton, USA.* OPO performance was measured between three different grating periods in five samples and two separate cavity configurations while being pumped by a Q-switched 2micron Tm,Ho:YLF laser. Similar results were obtained between the two cavity configurations while experimental spectra data is confirmed with calculations.

NME8 • 21:15
A 243mJ, Eye-Safe, Injection-Seeded, KTA Ring-Cavity Optical Parametric Oscillator, Robert Foltynowicz[1]; *[1]USURF, USA.* We have demonstrated a 243mJ, 1.535micron, injection-seeded, non-critically phase-matched, singly resonant oscillator, KTA ring-cavity optical parametric oscillator pumped with a single mode Nd:YAG. The conversion efficiency was 27% and a seeding range of 853MHz FWHM.

• Tuesday, 19 July, 2011 •

Kauai Court, **07:30 – 18:00, Registration Open**

NTuA • Plasmons and Solitons

Kauai Ballroom, Kona
08:00–10:00
Demetrios Christodoulides; Univ. Central Florida, Presider

NTuA1 • 08:00 **Invited**
Nonlocal solitons, Stefan Skupin[3], Ole Bang[1], Wieslaw Krolikowski[2]; [1]*DTU Fotonik, Technical University of Denmark, Denmark;* [2]*Australian National University, Australia;* [3]*Max Planck Institute for the Physics of Complex Systems, Germany.* We review recent developments in the physics of wave localization in media with spatially nonlocal nonlinear response. In particular we discuss here the impact of nonlocality on the modulational instability of plane waves, the collapse of finite-size beams, and the formation, stability and interaction of spatial nonlocal solitons.

NTuA2 • 08:30
All-optical and electro-optical active plasmonic telecom components, Sukanya Randhawa[1], Jan Renger[1], Alexey Krasavin[2], Anatoly Zayats[2], Lacheze Sebastien[3], Alex Bouhelier[3], Romain Quidant[1]; [1]*The Insitute of Photnic sciences, Spain;* [2]*Department of physics, King's College, United Kingdom;* [3]*Institut Carnot de Bourgogne, France.* We demonstrate numerically and experimentally nonlinear switching of the SPP transmission at telecom wavelengths. The plasmonic component consists of a compact and highly sensitive ring resonator which has high sensitivity to the refractive index changes

NTuB • Nonlinear Spectroscopy I

Kauai Ballroom, Halele'a
08:00–10:00
Pierre Béjot; Univ. of Geneva, Switzerland, Presider

NTuB1 • 08:00
Coherence Transfer of Time-bin Pulse to a Semiconductor Quantum Dot Ensemble using Photon Echo Technique, Junko Ishi-Hayase[1,2], Kouichi Akahane[3], Naokatsu Yamamoto[3], Kazuhiro Ema[4], Masahide Sasaki[3]; [1]*Keio University, Japan;* [2]*PRESTO, JST, Japan;* [3]*NICT, Japan;* [4]*Sophia University, Japan.* We experimentally demonstrated the coherence transfer/retrieval of time-bin pulse to a semiconductor quantum dot ensemble using a photon-echo technique at the telecommunication wavelength. The interference visibility of the retrieved pulse exceeded 95 percent.

NTuB2 • 08:15
Nonlinear Electronic Excitation Routes in Dissociative Ionization of Ethanol under Intense Femtosecond UV Laser Fields, Fumihiko Kannari[1], Tomoya Ikuta[1], Ryuji Itakura[2], Kouichi Hosaka[2], Hiroshi Akagi[2], Kaoru Yamanouchi[3,2], Atsushi Yokoyama[2]; [1]*Electronics & Electrical Engineering, Keio University, Japan;* [2]*Quantum Beam Science Directorate, Kansai Photon Science Institute, Japan;* [3]*Chemistry, School of Science, Univ. Tokyo, Japan.* Photoelectron-photoion coincidence measurement is performed for investigating electronic excitation of ethanol in intense UV laser fields. It is elucidated that the electronic excitation mechanism varies depending on the laser field intensity.

NTuB3 •08:30
Tailoring the geometry of nanoplasmonic antennas for optimal chip-scale nonlinear infrared spectroscopy, Shawn Sederberg[1], Abdul Elezzabi[1]; [1]*University of Alberta, Canada.* We theoretically investigate many nanoplasmonic antenna geometries and develop empirical rules governing their operation. The application of these antennas to on-chip nonlinear infrared spectroscopy of molecular vibration modes is discussed.

NTuA • Plasmons and Solitons (cont.)

NTuA3 • 08:45

Ultrafast light field control of electric currents in metal-dielectric interfaces, Tim Paasch-Colberg[1], Agustin Schiffrin[1], Daniel Gerster[2], Sascha Mühlbrandt[1], NIcholas Karpowicz[1], Joachim Reichert[2], Johannes Barth[2], Ralph Ernstorfer[3], Reinhard Kienberger[1,2], Ferenc Krausz[1,4]; *[1]Abteilung fürAttosekundenphysik, Max Planck Inst. of Quantum Optics, Germany; [2]Technische Universitaet Muenchen, Germany; [3]Fritz Haber Inst., Germany; [4]Ludwig-Maximilians-Universitaet, Germany.* The fast oscillating electric field of intense few-cycle near-infrared laser pulses with well-defined carrier-envelope phase is exploited to generate charge carriers and control their ultrafast motion within heterogeneous nanoscaled solid-state interfaces.

NTuA4 • 09:00

Nonlinear Response of Metallodielectric Stacks, Nkorni Katte[1], Joseph W. Haus[1], Peter Powers[1], Andrew Sarangan[1], Jian Gao[1], Michael Scalora[2]; *[1]Electro-Optics Program, University of Dayton, USA; [2]U.S. Army Aviation and Missile Command, USA.* We report simulations of third-order response and Z-scan experiments in heterogeneous metallodielectric stacks (MDSs) where nonlinear absorption is dominant. Experimental results on two MDS samples are examined at selected frequencies and correlated with optical features.

NTuA5 • 09:15

Near-infrared dissipative three-dimensional spatial solitons in CS2, Cid B. de Araújo[1], Edilson L. Falcão-Filho[1], Georges Boudebs[2], Hervé Leblond[2], Vladimir Skarka[2]; *[1]Physics, Universidade Federal de Pernambuco, Brazil; [2]Laboratoire de Photoniques d`Angers, Université d`Angers, France.* We demonstrate three-dimensional spatial solitons excited by near-infrared femtosecond pulses in liquid carbon disulfide. Solitons were obtained at 920 nm owing to the presence of the fifth-order susceptibility that prevented catastrophic collapse.

NTuA6 • 09:30

Pulse Delays Through Metallic Aperture Arrays, Kam Sing Wong[1], Huimin Su[1], Zsolt Marcet[1,2], Ho Bun Chan[1,2], Zhi Hong Hang[1], Che Ting Chan[1]; *[1]The Hong Kong Univ. of Science and Technology, Hong Kong; [2]Dept. of Physics, Univ. of Florida, USA.* Pulse propagation delays of 60-100fs through metallic aperture arrays were measured using an up-conversion technique, which are suggested to be originated from the coupling between surface plasmons waves on multiple metal/dielectric interfaces.

NTuA7 • 09:45

Optical Cherenkov radiation by cascaded nonlinear interaction: an efficient source of few-cycle near- to mid-IR pulses, Morten Bache[1], Ole Bang[1], Binbin Zhou[1], Jeffrey Moses[2], Frank Wise[3]; *[1]DTU Fotonik, Dept of Photonics Engineering, Tech. Univ. of Denmark; [2]Optics and Quantum Electronics Group, MIT, USA; [3]Applied and Engineering Physics, Cornell University, USA.* Through cascaded second-harmonic generation, few-cycle solitons can form that resonantly emit strongly red-shifted optical Cherenkov radiation. Numerical simulations show that such dispersive waves can be an efficient source of near- to mid-IR few-cycle broadband pulses.

NTuB • Nonlinear Spectroscopy I

NTuB4 • 08:45 **Invited**

Few-cycle nonlinear optics with electronic charge and spin excitations, Alfred Leitenstorfer[1]; *[1]Department of Physics, University of Konstanz, Germany.* Advanced quantum photonics studies with ultrabroadband femtosecond fiber lasers are presented. First experiments are aiming at few-photon nonlinear optics with single solid-state nanosystems. The new fields of terahertz nonlinear and quantum optics are featured subsequently.

NTuB5 • 09:15

Fingerprinting of Si Surface Bonds Using Nonresonant Optical Second-Harmonic Generation, Robert Ehlert[1], Adrienne Prem[1], Loucas Loumakos[1], Michael C. Downer[1]; *[1]Physics, The University of Texas at austin, USA.* Optical fingerprinting of surface bonds by nonresonant, but rotationally anisotropic, second-harmonic generation (RA-SHG) is achieved by identifying suitable experimental geometries using a bond charge model and accurate knowledge of bond axis orientation.

NTuB6 • 09:30 **Invited**

Coherent spectroscopy and coherent control through spatiotemporal femtosecond pulse shaping, Keith A. Nelson[1]; *[1]MIT, USA.* Spatiotemporal phase/amplitude shaping specifies all beams, pulse delays and phases for high-order spectroscopy. Multiple-quantum exciton and exciton-polariton coherences are observed. High-order THz spectroscopy and control are also realized.

Kauai Court, **Coffee Break & Exhibit Time, 10:00 – 10:30**

NTuC • Solitons

Kauai Ballroom, Kona

10:30–12:30

Wieslaw Krolikowski; Australian Nat. Univ., Australia, Presider

NTuC1 • 10:30 **Invited**

Discrete solitons, Demetrios Christodoulides[1]; [1]*University of Central Florida, USA.* We provide an overview of recent activities in the area of linear and nonlinear interactions in discrete systems like optical arrays and lattices. Both classical and quantum arrangements will be considered in this talk.

NTuC2 • 11:00

Observation of discrete-continuous three-dimensional X-waves, Matthias Heinrich[1], Robert Keil[1], Felix Dreisow[1], Stefan Nolte[1], Alexander Szameit[1]; [1]*Physics, Friedrich-Schiller-Universität, Germany.* We report on the experimental observation of discrete-continuous three-dimensional X-waves. This type of an optical space-time dynamical wave emerges due to the interplay of discrete diffraction, normal dispersion and focusing Kerr nonlinearity.

NTuC3 • 11:15

Disorder-Enhanced Transport in Photonic Lattices, Liad Levi[1], Mikael Rechtsman[1], Barak Freedman[1], Yevgeny Krivolapov[1], Tal Schwartz[1], Ofer Manela[1], Mordechai Segev[1], Shmuel Fishman[1]; [1]*Physics, Technion, Israel.* We demonstrate, experimentally and theoretically, disordered-enhanced transport in photonic quasicrystals, and hyper-transport of light in photonic media with evolving disorder: a new regime of transport in which transport is faster than ballistic.

NTuD • Materials II

Kauai Ballroom, Halele'a

10:30–12:30

Benoît Boulanger; Joseph Fourier Univ., France, Presider

NTuD1 • 10:30

Quartz Revisits Nonlinear Optics: Vacuum-UV Emission in Phase Matching, Sunao Kurimura[1], Masaki Harada[1,2], Ken-ichi Muramatsu[2], Motoi Ueda[2], Muneyuki Adachi[1,3], Tsuyoshi Yamada[3], Tokio Ueno[3]; [1]*Nat'l Inst. for Mat. Sci, Japan;* [2]*Nikon Corp., Japan;* [3]*Nidek Co.,Ltd., Japan.* First material used in optical mixing revisits NLO with cutting-edge polarity-control technology by stress-induced twinning. Periodically twinned quartz with modulated polarity demonstrates QPM SHG emitting vacuum UV light at 193 nm.

NTuD2 • 10:45

Controlling Nonlinearity with Structured Metamaterials, David R. Smith[1], Ekaterina Poutrina[1], Da Huang[1], Alec Rose[1], Stephane Larouche[1]; [1]*Center for Metamaterials and Integrated Plasmonics, Duke University, USA.* Artificially structured media can exhibit a wider range of both linear and nonlinear electromagnetic properties than are supported in conventional media. We discuss the design techniques and impact of these new emerging nonlinear metamaterials.

NTuD3 • 11:00

Angle-Tuned Third-Harmonic Generation in Direct-Bonded Periodically-Poled Congruent Lithium Niobate Crystal, Myoungsik Cha[1], Byoung Joo Kim[1], Hee Joo Choi[1]; [1]*Pusan National University, Republic of Korea.* We demonstrated third-harmonic generation (THG) in direct-bonded periodically-poled congruent lithium niobate. Efficient THG was obtained by cascaded second-harmonic generation and sum-frequency mixing. The two quasi-phase-matching conditions were satisfied simultaneously by angle tuning in xz-plane.

NTuD4 • 11:15 **Invited**

Sub-micrometer Quasi-Phased-Matched Devices, Carlota Canalias[1], Andrius Zukauskas[1], Valdas Pasiskevicius[1], Fredrik Laurell[1]; [1]*Applied Physics, KTH, Sweden.* We present the fabrication of bulk sub-micrometer ferroelectric domain gratings in KTiOPO4 for QPM counter-propagating interactions. We demonstrate that bulk Rb-doped KTiOPO4 is a promising candidate for fine-pitch periodic poling.

NTuC • Solitons (cont.)

NTuC4 • 11:30
Control of soliton collision-induced enhancement of supercontinuum bandwidth in photonic crystal fiber fiber by variation of pump pulse duration, Marco Andreana[1], Alexis Labruyère[1], Alessandro Tonello[1], Stefan Wabnitz[2], Philippe Leproux[1], Vincent Couderc[1], Charles Duterte[3], Andras Cserteg[3], Anthony Bertrand[3], Yves Hernandez[3], Domenico Giannone[3], Stéphane Hilaire[4], Guillaume Huss[4]; *[1]XLIM - Université de Limoges, France; [2]Dipartimento di Ingegneria dell'Informazione, Università di Brescia, Italy; [3]Multitel asbl, Belgium; [4]Leukos, France.* We investigate experimentally and theoretically the impact of input pulse width varying from 500 fs to 10 ps on supercontinuum generation. We show that the spectral broadening is dramatically extended for the longer input pulses.

NTuC5 • 11:45
Non-linear Control of Surface Plasmon Polaritons with Photorefractive Liquid Crystal Cells, Stephen Abbott[1], David C. Smith[1], Keith R. Daly[2], Gaimpaolo D'Alessandro[2], Malgosia Kaczmarek[1]; *[1]School of Physics and Astronomy, University of Southampton, United Kingdom; [2]School of Mathematics, University of Southampton, United Kingdom.* Photorefractive liquid crystal cells with a spatially varying refractive index are used to couple energy between surface plasmon modes. Presented are details on maximising this energy transfer and the behaviour of our liquid crystal cells.

NTuC6 • 12:00
Akhmediev breather evolution in optical fiber for realistic initial conditions, Miro Erkintalo[1], Goëry Genty[1], Benjamin Wetzel[2], John M. Dudley[2]; *[1]Tampere University of Technology, Finland; [2]Université de Franche-Comté, France.* We study numerically Akhmediev breather dynamics in optical fibers under experimentally realistic initial conditions that do not correspond to an ideal infinitesimal modulation on a plane wave field.

NTuC7 • 12:15
Hamiltonian Description of Spatial Solitons, Hanhong Gao[1], Lei Tian[2], Baile Zhang[3], George Barbastathis[2,3]; *[1]Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, USA; [2]Department of Mechanical Engineering, Massachusetts Institute of Technology, USA; [3]Singapore-MIT Alliance for Research and Technology (SMART) Centre, Singapore.* We describe how to apply Hamiltonian equations to a Kerr medium given the nonlinear index profile. Ray tracing of spatial solitons is presented and verified using the Wigner distribution function.

NTuD • Materials II (cont.)

NTuD5 • 11:45
Thermal Management in High Power CW SHG Characterized by PMC, Hwan Hong Lim[1], Toshio Katagai[2], Sunao Kurimura[1], Noriaki Ohmae[3], Norikatsu Mio[3], Takahiro Shimizu[2], Ichiro Shoji[2]; *[1]National institute for material science (NIMS), Japan; [2]Department of Electrical, Electronic, and Communication Engineering, Chuo University, Japan; [3]Department of Advanced Materials Science, University of Tokyo, Japan.* We investigated thermal properties depending on boundary conditions of wavelength conversion crystals. With a tight aperture, we demonstrated 19-W single-pass 532-nm SHG at a conversion efficiency of 26.5% in a 10-mm-long PPMgSLT crystal without saturation.

NTuD6 • 12:00
Efficient Ultra-Wideband Wavelength Converters Based on Double-Pass Cascaded SFG + DFG Using Engineered QPM Gratings, Amirhossein Tehranchi[1], Raman Kashyap[1,2]; *[1]Electrical Engineering Dept., Ecole Polytechnique, University of Montreal, Canada; [2]Engineering Physics Dept., Ecole Polytechnique, University of Montreal, Canada.* Investigating wavelength converters based on double-pass cascaded sum- and difference-frequency generation using engineered QPM gratings, unlike ones using uniform gratings, efficient flattop responses with bandwidths >141 nm for grating lengths <1 cm can be achieved.

NTuD7 • 12:15
Third Harmonic Generation in Silica Microfibres, Timothy Lee[1], Yongmin Jung[1], Christophe Codemard[1], Gilberto Brambilla[1], Neil G. Broderick[2]; *[1]Optoelectronics Research Centre, University of Southampton, United Kingdom; [2]Physics, University of Auckland, New Zealand.* We theoretically and experimentally study third harmonic generation in silica microfibres. Phase matching at critical diameters was achieved by intermodal-coupling with higher order third harmonic modes, which were successfully generated using 4ns 1.55um pump pulses.

On Your Own, **Free Afternoon, 12:30 – 19:30**
Kauai Court, **Evening Registration, 19:00 – 21:00**

NTuE • Waveguides

Kauai Ballroom, Kona
19:30–21:30
Marin Soljacic; MIT, USA, Presider

NTuE1 • 19:30 **Invited**

Highly Nonlinear Chalcogenide Glass Waveguides for All-optical Signal Processing, Barry Luther-Davies[1]; [1]*Laser Physics Centre, Australian National University, Australia.* I describe the development of highly nonlinear chalcogenide glass waveguides for photonics and their application as nonlinear optical devices for high speed processing and monitoring of telecommunications signals.

NTuE2 • 20:00

Efficient CW SHG in AlGaAs/AlOx waveguides, Marc Savanier[1], Aristide Lemaître[2], Christophe Manquest[1], Filippo Ghiglieno[1], Ivan Favero[1], Sara Ducci[1], Giuseppe Leo[1]; [1]*MPQ Laboratory, Paris Diderot University, France;* [2]*LPN, CNRS, France.* We report on Type-I CW SHG in AlGaAs/AlOx waveguides, with pump wavelength around 1.55 μm and 2.8% W-1 conversion efficiency. This result is encouraging toward integrated spontaneous parametric downconversion in the telecom range.

NTuF • Biophotonics, Optomechanics & Optofluidics

Kauai Ballroom, Halele'a
19:30-21:30
Martin Fejer; Stanford Univ., USA, Presider

NTuF1 • 19:30

Exogenous and Endogenous two-photon absorption for Intratissue Refractive Index Shaping (IRIS) in corneal tissue, Lisen Xu[1], Krystel R. Huxlin[2,3], Wayne H. Knox[1,3]; [1]*The Institute of Optics, University of Rochester, USA;* [2]*Flaum Eye Institute, University of Rochester, USA;* [3]*Center for Visual Science, University of Rochester, USA.* Both exogenous and endogenous two-photon absorption were shown to significantly enhance femtosecond laser micromachining in corneal tissue. Comparison with previous results without two-photon enhancement demonstrated a much larger refractive index change up to 0.037.

NTuF2 • 19:45

Spectral Oscillation in Chlorophyll a Revealed by Ultrafast Real-time Vibrational Spectroscopy, Juan Du[1,2], Takahiro Teramoto[1,2], Takayoshi Kobayashi[1,2]; [1]*Advanced Ultrafast Laser Research Center, and Department of Engineering Science, Faculty of Informatics and Engineering, University of Electro-Communications, Japan;* [2]*Core Research for Evolutional Science and Technology (CREST), Japan Science and Technology Agency, Japan.* Broadband real-time vibrational spectroscopy was used to investigate the vibronic dynamics in Chl-a for the first time. Spectral distribution of the vibrational amplitudes was observed and interpreted as energy exchange intermediated by vibrational coherence.

NTuF3 • 20:00

Near IR Nonlinear Optics of an Organic Supermolecule, Steven Flom[1], San-Hui Chi[1], Armand Rosenberg[1], Animesh Nayak[2,3], Timothy V. Duncan[3], Michael J. Therien[3], James J. Butler[4], Steven R. Montgomery[5], Guy Beadie[1], James S. Shirk[1]; [1]*Optical Sciences Division, Naval Research Lab, USA;* [2]*Chemistry, University of Pennsylvania, USA;* [3]*Chemistry, Duke University, USA;* [4]*Physics, Pacific University, USA;* [5]*Physics, US Naval Academy, USA.* Two-photon accessed excited state absorption is shown to be an important mechanism in the near-IR nonlinear response of an organic supermolecule. This mechanism also provides an enhanced nonlinear absorption in an optical waveguide configuration.

NTuE3 • 20:15
Impact of Photoelastic Effect on Phase-Matching Wavelengths in Periodically-Inverted AlGaAs Waveguides, Koji Amazuttsumi[1], Junya Ota[1], Tomonori Matsushita[1], Takashi Kondo[1]; *[1]Department of Materials Engineering, The University of Tokyo, Japan.* We have shown that photoelastic effect alters the phase-matching wavelengths of Type-I and Type-II quasi-phase-matched second-harmonic generation in a periodically-inverted AlGaAs waveguide through the uniaxial strain in the pseudomorphic AlGaAs layers.

NTuE4 • 20:30
Periodic modulation of Al composition in a periodically-inverted AlGaAs waveguide, Tomonori Matsushita[1], Kazuhiro Iwamoto[1], Junya Ota[1], Takashi Kondo[1]; *[1]Department of Materials Engineering, The University of Tokyo, Japan.* We have investigated a periodically-inverted AlGaAs layer in a quasi-phase-matching AlGaAs waveguide using cathodoluminescence spectroscopy, and found that Al-composition modulation is formed by the anisotropic diffusion of Al/Ga atoms during the molecular-beam epitaxy growth process.

NTuE5 • 20:45
Generation and Coherent Detection of Broadband Terahertz Radiation in Phase-Matched Microstrip Waveguides, Amit Agrawal[1], Xiang Shou[1], Ajay Nahata[1]; *[1]Electrical Engineering, Univ. of Utah, USA.* We describe novel waveguide devices that simultaneously allow for single-mode propagation of optical pump and probe beams and broadband THz radiation. We demonstrate generation and coherently detection of broadband THz radiation with <10 mW average optical power.

NTuE6 • 21:00
Transonic flow in an optical analogue of the Laval nozzle, Moshe Elazar[1], Victor Fleurov[1], Shimshon Barad[1]; *[1]School of Physics and Astronomy, Tel Aviv University, Israel.* We study the flow through an optical Laval nozzle by launching a laser beam into a suitably shaped waveguide with Kerr-type defocusing nonlinearity. The experimental design lends itself to laboratory experiments on black hole physics.

NTuE7 • 21:15
Propagation Length Independent Nonlinearity Threshold in Stokes-Wave Suppressed SRS in Chirally-Coupled-Core Fibers, Xiuquan Ma[1], I-Ning Hu[1], Almantas Galvanauskas[1]; *[1]EECS, Univ of Michigan at Ann Arbor, USA.* We show that Stokes-wave suppressed Stimulated Raman Scattering exhibits propagation-length independent threshold and demonstrate how such suppression of nonlinear interactions can be implemented in specially designed fibers.

NTuF4 • 20:15 **Invited**
Laser cooling of a microresonator and Optomechanically Induced Transparency, Samuel Deleglise[1], Stefan Weis[1], Rémi Rivière[1], Albert Schliesser[1,2], Ewold Verhagen[1], Emanuel Gavartin[1], Xiao qing Zhou[1], Pierre Verlot[1], Leonard Neuhaus[1], Tobias J. Kippenberg[1,2]; *[1]Ecole Polytechnique Fédérale de Lausanne, Switzerland; [2]Max Planck Institute fur Quantenoptik, Germany.* A micromechanical oscillator is cooled close to the quantum ground state using a laser tuned to its lower mechanical sideband. This highly coupled system allows to optically control the transmission of a weak probe beam.

NTuF5 • 20:45
Biomedical diagnosis in water concentration of thin biotissues using tunable THz-wave parametric oscillator, Yuye Wang[1], Takashi Notake[1], Kouji Nawata[1], Hiroshi Kawamata[1], Hiromasa Ito[1], Hiroaki Minamide[1]; *[1]Tera-Photonics Laboratory, ASI, Riken, Japan.* A novel method for water volume concentration and distribution measurement in thin fresh biotissue with THz-wave is presented. The reliability of this method is validated. Measurement results using THz-wave are in good agreement with the measurement results based on the quantitative method.

NTuF6 • 21:00
Complex Nonlinear Opto-Fluidics, Mordechai Segev[1]; *[1]Physics, Technion, Israel.* We demonstrate symbiotic dynamics of light and nano-particles suspended in liquid. The light-force varies the local particle-density, modifies the fluid properties (surface-tension, viscosity), inducing flow in the fluid, causing synergetic nonlinear-dynamics of light and fluid.

NTuF7 • 21:15
Tunable Optomechanical Cavities, Michal Lipson[1], Gustavo Wiederhecker[1], Sasikanth Manipatruni[1], Sunwoo Lee[1]; *[1]Cornell, USA.* We demonstrate broadband tuning of a silicon nitride optomechanical microcavity optical resonance by over 32 nm. The relative static mechanical displacement induced by optical gradient forces is estimated to be as large as 60 nm.

• Wednesday, 20 July, 2011 •

Kauai Court, **07:30 – 17:30, Registration Open**

NWA • Symposium Celebrating the 50th Anniversary of Nonlinear Optics I

Kauai Ballroom, Kona,
08:00-10:00
Takunori Taira; Inst. for Molecular Science, Japan, Presider

NWA1 •08:00 Plenary
Long and Short Entangled Photons, Steve Harris[1]; [1]*Stanford University, USA.* We use slow light and electromagnetically induced transparency to make and modulate single photons. Using spread spectrum technology we describe how a single photon may be hidden in an environment of noise photons.

NWA2 • 09:00 Invited
The Birth of Nonlinear Optics, Nicolaas Bloembergen[1]; [1]*Optical Science, Univ. of Arizona, USA.* The first two years of nonlinear optics will be reviewed, starting with the second harmonic generation obtained in 1961 by Franken and coworkers of light with a ruby laser pulse in quartz crystal.

NWA3 • 09:30 Invited
The Beginnings of Quantum Nonlinear Optics and Optical Phase Conjugation; Answers to Communication Challenges, Amnon Yariv[1]; [1]*California Institute of Technology, USA.* The advent of quantum mechanics led early in the 20th century to a rigorous quantitative description of the phenomenon of spontaneous emission from excited atomic states. The fields of nonlinear electronics and nonlinear optics (NLO) have gone through a conceptually similar process. The quantum formulation of the optical parametric amplifier and oscillator led to the prediction and soon afterwards to the demonstration of parametric spontaneous fluorescence (PSF).

Kauai Court, **Coffee Break & Exhibit Time, 10:00 – 10:30**

NWB • Symposium Celebrating the 50th Anniversary of Nonlinear Optics II

Kauai Ballroom, Kona
10:30-12:30
Daniel Gauthier; Duke Univ., USA, Presider

NWB1 • 10:30 Invited
Surface Nonlinear Optics, Y. Ron Shen[1]; [1]*Physics, Univ. California, Berkeley, USA.* Early work on nonlinear optical reflection at surfaces and interfaces has led to the development of surface nonlinear optical spectroscopy as a powerful technique for surface and interface studies.

NWB2 • 11:00 Invited
50 Years of Nonlinear Optics, Tunable sources from OPOs to Coherent X-rays, Robert Byer[1]; [1]*E L Ginzton Lab, Stanford University, USA.* A look back at the early days of the laser and nonlinear interactions will be contrasted to the recent breakthroughs in solid state lasers and the applications to fundamental science of gravitational wave detection, laser acceleration, and laser inertial fusion for energy production.

NWB3 • 11:30 Invited
Nonlinear Optics: from Quartz to Vacuum, Gérard Mourou[1]; [1]*Lab d'Optique Appliquée, Ecole Polytechnique, France.* Optical nonlinearity was demonstrated at the University of Michigan with the generation of the second harmonic of ruby in quartz. It gave birth to nonlinear spectroscopy that deepened our understanding of ponderable materials. A similar experiment will be attempted in vacuum where a 100PW laser will be focused in vacuum to reveal its nonlinearity up to its breakdown in e+e-, with the goal to understand the vacuum texture.

NWB4 • 12:00 Invited
Optical parametric amplifiers : from broadly tunable past to highly powerful future, Algis Piskarskas[1]; [1]*Vilnius Univ., Lithuania.* Abstract not available.

On Your Own, **12:30 – 14:00, Lunch Break**

NWC • Quantum Optics II

Kauai Ballroom, Kona
14:00--15:30
John Howell; Univ. of Rochester, USA, Presider

NWC1 • 14:00 **Invited**
Quantum control of single spins and photons in diamond, Yiwen Chu[1], Emre Togan[1], Mikhail Lukin[1]; *[1]Physics, Harvard University, USA.* The nitrogen-vacancy (NV) color center in diamond shows great promise as an optically addressable solid-state qubit amenable to many quantum-optics applications. Using the NV center, we have demonstrated spin-photon entanglement and manipulation of nuclear spins through coherent population trapping.

NWC2 • 14:30
Applications of Nonlinear Optics in Quantum Imaging and Quantum Communication, Robert Boyd[1,2], Heedeuk Shin[1]; *[1]University of Rochester, USA; [2]University of Ottawa, Canada.* The nonlinear optical process of spontaneous parametric downconversion is a standard procedure for generating entangled photons. Entanglement is a crucial resource for quantum information studies. We describe our recent results including the application of entangled photons to superresolution and to quantum communication.

NWC3 • 14:45
Polarization Entangled Photons at X-Ray Energies, Sharon Shwartz[1], Steve Harris[1]; *[1]Edward L. Ginzton Laboratory, Stanford University, USA.* We propose a technique, based on parametric down conversion, for generating each of the four Bell polarization states at x-ray wavelengths.

NWD • Frequency Comb Generation

Kauai Ballroom, Halele'a
14:00--15:30
Claude Fabre; LKB, ENS Paris, France, Presider

NWD1 • 14:00
New Features in Frequency Combs by Limit Cycle Oscillations in Dispersive Nonlinear Fiber Ring Resonators, Michael Kues[1], Nicoletta Brauckmann[1], Petra Gross[1], Carsten Fallnich[1]; *[1]Institute of Applied Physics, Westhälische Wilhelms-Universität Münster, Germany.* We reveal that in dispersive nonlinear ring resonators pulse delay in combination with anomalous dispersion are basic prerequisites for the occurrence of limit cycle oscillations. These oscillations accomplish tunable sidebands within the generated frequency comb.

NWD2 • 14:15
Group Velocity Dispersion and Stability of Resonant Hyper-Parametric Oscillations, Andrey Matsko[1], Anatoliy Savchenkov[1], Wei Liang[1], Vladimir Ilchenko[1], David Seidel[1], Lute Maleki[1]; *[1]OEwaves Inc, USA.* We theoretically study the stability conditions of hyper-parametric oscillation in continuously pumped nonlinear optical resonators. We show that the oscillation can be stable irrespective of the sign of group velocity dispersion of the resonator, if the frequency of the external optical pump is properly selected.

NWD3 • 14:30 **Invited**
Frequency Divide-and-Conquer Approach to Creating Ultra-broadband Optical Frequency, Konstantin Vodopyanov[1]; *[1]Appl Phys, Stanford University, USA.* Octave-wide phase- and frequency-locked combs in the mid-infrared can be generated using a degenerate OPO which downconverts the spectrum of a pump frequency comb to its subfrequency and has intriguing coherence properties studied by interferometry

NWC • Quantum Optics II (cont.)

NWC4 • 15:00
Preservation of High-Order Photon Correlations Following Frequency Up-conversion, Lijun Ma[1], Matthew Rakher[1], Martin Stevens[2], Oliver Slattery[1], Kartik Srinivasan[1], Xiao Tang[1]; *[1]NIST, USA; [2]NIST, USA.* We demonstrate an efficient approach to measure temporal correlations for near-infrared photons using frequency up-conversion and observe that photon statistics are preserved during this process. The influence of noise photons on the measurement is studied.

NWC5 • 15:15
Fast quantum dot single photon source triggered at telecommunications wavelength, Kelley Rivoire[1], Sonia Buckley[1], Arka Majumdar[1], Hyochul Kim[2], Pierre Petroff[2], Jelena Vuckovic[1]; *[1]Stanford, USA; [2]University of California Santa Barbara, USA.* We demonstrate a 100 MHz quantum dot single photon source at 900 nm triggered by a telecommunications wavelength laser. The quantum dot is excited by on-chip-generated second harmonic radiation, resonantly enhanced by a photonic nanocavity.

NWD • Frequency Comb Generation (cont.)

NWD4 • 15:00 **Invited**
Control and characterization of picosecond pulse trains from a microresonator frequency comb, Scott Papp[1], Scott Diddams[1]; *[1]Time and Frequency, NIST, USA.* Using disk-like quartz microresonators we generate an optical frequency comb with 36 GHz mode spacing at 1560 nm. By addressing the amplitude and phase of comb lines we observe near transform-limited 2.5 ps pulses.

NWE • NLO Poster Session

Puna Ballroom
Wednesday, 20 July, 2011
15:30-17:30

NWE1
Fredkin Gates in $\chi(2)$ Microdisks via Quantum Zeno Blockade, Yuping Huang[1], Prem Kumar[1]; [1]*Center for Photonic Communication and Computing, EECS Department, Northwestern, USA.* Using the quantum Zeno effect, we present a quantum optical Fredkin gate in LiNbO3 microdisks for telecom applications. Such gates can operate with sub-femtojoule pumps and, in the ideal limit, without any energy dissipation.

NWE2
Enhancement of coherent magnetic dipole radiation by cavity effect in the terahertz regime, Jia Li[1], Takuya Higuchi[1], Natsuki Kanda[1], Kuniaki Konishi[1], Makoto Kuwata-Gonokami[1]; [1]*The University of Tokyo and Core Research for Evolutional Science and Technology, Japan.* We demonstrated strong enhancement of coherent magnetic dipole radiation by a factor of up to ~9 in antiferromagnetic NiO with the direct phase manipulation by cavity effect. The results are reproduced well by FDTD calculation.

NWE3
Generation and measurement of polarization shaped pulse trains in the ultraviolet, Marco T. Seidel[1], Zhengyang Zhang[1], Suxia Yan[1], Howe-Siang Tan[1]; [1]*School of Physical & Mathematical Sciences, Division of Chemistry & Biological Chemistry, Nanyang Technological University, Singapore.* We demonstrate the generation and measurement of amplitude, phase and polarization shaped pulse trains tunable in the ultraviolet (UV) by means of sum-frequency generation and with interferometric phase stability.

NWE4
Dark Solitons in Nematic Liquid Crystals, Armando Piccardi[1], Alessandro Alberucci[1], Gaetano Assanto[1], Nelson Tabiryan[2]; [1]*Electronics Engineering, University of Rome ROMA TRE, Italy;* [2]*Beam Engineering for Advanced Measurements Company, USA.* We demonstrate the formation of dark spatial solitons in nematic liquid crystals, with an azo-dye dopant providing the self-defocusing response. A collinear copolarized beam is used to probe the guiding properties of the soliton.

NWE5
Second-Order Nonlinear Optical Properties of Fibrillar Proteins, Adam E. Tuer[1,2], Nicole Prent[1,2], Richard Cisek[1,2], Daaf Sandkuijl[1,2], Brian Wilson[3], Virginijus Barzda[1,2]; [1]*Physics and Institute for Optical Sciences, University of Toronto, Canada;* [2]*Chemical and Physical Sciences, University of Toronto Mississauga, Canada;* [3]*Medical Biophysics, University of Toronto, Canada.* Quantum mechanical calculation of collagen-like protein model's first hyperpolarizability aided in predicting the second-order nonlinear optical properties of collagen in tissue. Polarization dependent second harmonic generation microscopy experiments confirmed the model's predictions.

NWE6
Femtosecond scale photon-triplet counting and third order autocorrelations in a photomultiplier tube, Amir Nevet[1], Alex Hayat[1], Meir Orenstein[1]; [1]*Electrical Engineering, Technion, Israel.* Three-photon counting at ultrashort timescale by ultrasensitive three-photon absorption is demonstrated experimentally. This is a unique tool for ultrafast quantum state characterization as well as for complete determination of temporal photon-shapes.

NWE7
Spatial Solitons in a Self-focusing Medium with Tunable Nonlinearity, Malgosia Kaczmarek[1], Gaetano Assanto[2], Armando Piccardi[2], Alessandro Alberucci[2]; [1]*University of Southampton, United Kingdom;* [2]*CNISM and University "Roma Tre", Italy.* We employ a suitably designed planar cell with inter-digitated electrodes and nematic liquid crystals to investigate the role of nonlinearity in generation and propagation of spatial solitons.

NWE8
Ultra-bright Backward Wave Biphoton Source, Chih-Sung Chuu[1], Steve Harris[1]; [1]*Edward L. Ginzton Laboratory, Stanford University, USA.* We calculate the propoerties of a novel biphoton source based on resonant backward wave spontaneous parametric down-conversion. We show that the biphotons are generated in a single longitudinal mode having a subnatural linewidth and a correlation time exceeding 65 ns.

NWE9
Five-order SRSs and supercontinuum generation by a tapered tellurite microstructured fiber, Meisong Liao[1], Xin Yan[1], Weiqing Gao[1], Zhongchao Duan[1], Takenobu Suzuki[1], Yasutake Ohishi[1]; *[1]Toyota Technological Institute, Japan.* For the first time five-order SRSs, and more than one octave stable supercontinuum are observed from a tapered tellurite microstructured fiber. The tapered segment increases the nonlinearity, and mitigates the walk-off of SRS peaks.

NWE10
Over 10% conversion efficiency, single-crystal third-harmonic generation in BIBO, Kentaro Miyata[1,2], Valentin Petrov[1], Frank Noack[1]; *[1]Max-Born Institute, Germany; [2]Megaopto co., ltd., Japan.* Third-harmonic generation with a maximum conversion efficiency larger than 10% has been demonstrated in a single-crystal of BIBO (BiB3O6) by using high-energy femtosecond pulses from a Ti:Sapphire laser pumped noncollinear optical parametric amplifier system.

NWE11
Multiply Resonant High Quality Photonic Crystal Nanocavities, Sonia Buckley[1], Kelley Rivoire[2], Jelena Vuckovic[3]; *[1]Stanford University, USA; [2]Stanford University, USA; [3]Stanford University, USA.* A photonic crystal cavity allowing at least two separately tunable resonances is designed. Both frequency degenerate structures and structures with frequency separations of up to 506 nm are experimentally demonstrated.

NWE12
Pulsewidth and Wavelength Dependent Optical Nonlinearities of Carbon Disulfide, Honghua Hu[1], Dmitry A. Fishman[1], Scott Webster[1], Marcus Seidel[1], Lazaro A. Padilha[1,2], David J. Hagan[1,3], Eric W. Van Stryland[1,3]; *[1]CREOL, College of Optics and Photonics, University of Central Florida, USA; [2]Los Alamos National Laboratory, USA; [3]Department of Physics, University of Central Florida, USA.* The dispersion of the nonlinear refractive index, "n2", of carbon disulfide by femto-, pico-, and nano-second pulses, and its two-photon absorption spectrum are measured. The pulsewidth dependence of "n2" is also determined.

NWE13
Characteristics of Amplitude-Equalized Rational Harmonic Mode-Locked Short-Cavity Fiber Ring Laser Using a Bismuth-Oxide-Based Erbium-Doped Fiber and a Bismuth-Oxide-Based Highly Nonlinear Fiber, Yutaka Fukuchi[1], Joji Maeda[1]; *[1]Department of Electrical Engineering, Tokyo University of Science, Japan.* We demonstrate an amplitude-equalized rational harmonic mode-locked short-cavity laser employing a bismuth-based erbium-doped fiber and a bismuth-based nonlinear fiber. Stable short pulses up to 40GHz are obtained over the wavelength tuning range covering the CL-band.

NWE14
Numerical study of Maker's fringe effects in high numerical aperture nonlinear microscopy, Daaf Sandkuijl[1,3], Danielle Tokarz[1,4], Virginijus Barzda[1,2]; *[1]Department of Chemical and Physical Sciences, University of Toronto Mississauga, Canada; [2]Institute for Optical Sciences, Canada; [3]Department of Physics, University of Toronto, Canada; [4]Department of Chemistry, University of Toronto, Canada.* We calculate third harmonic generation from a glass wedge structure filled with benzene imaged with high numerical aperture, which confirms Maker's fringes and coherent enhancement of the third harmonic signal at a specific wedge spacing.

NWE15
Absolute measurement of the quadratic nonlinear susceptibility of lithium niobate in waveguides, Roland Schiek[1]; *[1]Electrical and Information Engineering, FH Regensburg, Germany.* The quadratic nonlinear susceptibility of lithium niobate is measured with absolutely scaled SHG experiments in titanium-indiffused waveguides with QPM gratings for phase matching at 1520 nm.

NWE16
Influence of Two Photon Absorption on Soliton Self-Frequency Shift, Henrik Steffensen[1], Karsten Rottwitt[1], Peter U. Jepsen[1], Ole Bang[1]; *[1]DTU Fotonik, Denmark.* The creation of mid-infrared supercontinua necessitates the use of soft-glass fibers. However, some materials, like chalcogenide, have a substantial two photon absorption. We introduce a model for soliton self-frequency shift that successfully includes this effect.

NWE17
Discrete solitons with competing second harmonic components in lithium niobate waveguide arrays, Frank Setzpfandt[1], Andrey A. Sukhorukov[2], Thomas Pertsch[1]; *[1]Institute of Applied Physics, Friedrich-Schiller-Universität Jena, Germany; [2]Nonlinear Physics Center, Australian National University, Australia.* We describe soliton families in waveguide arrays supported by quadratic nonlinear interactions between one fundamental and two second-harmonic modes, and apply our results to explain experimentally observed nonlinear propagation effect.

NWE18
Second-order NLO of non-electrically-poled choromophore-doped amorphous ferroelectric polymers, Atsushi Sugita[1], Masashi Morimoto[1], Yasuaki Tamaki[1], Nobuyuki Mase[1], Kawata Yoshimasa[1], Shigeru Tasaka[1]; *[1]Shizuoka Unviersity, Japan.* We succeed in obtaining second-order NLO susceptibilities in host-guest NLO polymers with thickness as wide as a few ten micrometer with by non-electrical poling method, taking advantage of polarization self-organization properties of amorphous ferroelectric polymers.

NWE19
Strong Nonlinear Optical Absorption of Diphenylphosphino-Substituted Bithiophenes in the Violet-Blue Spectral Region, Jianwei Wang[1], Yuanli Zhang[1], Qun Zhao[2], Gary M. Gray[2], Christopher M. Lawson[1]; *[1]Physics, University of Alabama at Birmingham, USA; [2]Chemistry, University of Alabama at Birmingham, USA.* Diphenylphosphine-substituted bithiophenes exhibit strong NLO absorption for picosecond laser pulses at 430 nm but are transparent in the violet-blue spectral region. The solubilities and NLO absorptions depend on the number and type of diphenylphosphine substituents.

NWE20
Laser oscillator with nonlinear saturable absorber: A pump to signal noise transfer function model, Parviz Elahi[1], Ibrahim Levent Budunoglu[1], Kutan Gürel[1], Fatih Ilday[1]; *[1]Physics, Bilkent University, Turkey.* We report a model to describe the characterization of pump noise transfer in an laser oscillator consist of nonlinear saturable absorber. At the first, we obtained a linear superposition relation for modulation transfer function of amplifier part. By using the nonlinear characteristics of saturable absorber, a nonlinear quadratic equation for MTF of laser oscillator obtained . The theory then validate with experiment and good consistency observed.

NWE21
Optimization of Z-scan technique inside a 4f system, Georges Boudebs[1], Kamil Fedus[1]; *[1]Universite d'Angers, France.* Signal optimization is performed using Z-scan or EZ-scan techniques inside a 4-f system. Third-order nonlinear optical measurements are based on simple expressions obtained by simulation using Helmholtz wave equation through the imaging system.

NWE22
A Reduced Dimensional Model for the Multi-Pulsing Transition in a Waveguide Array Mode-Locked Laser, Matthew Williams[1], Eli Shlizerman[1], J. Nathan Kutz[1]; *[1]Department of Applied Mathematics, University of Washington, USA.*The onset of multi-pulsing is studied using a reduced-order model based on the proper orthogonal decomposition. This model completely characterizes the transition and agrees qualitatively with previous numerical studies and experimental results.

NWE23
High-power, Single-longitudinal-mode Terahertz-wave Generation Pumped by a Microchip Nd:YAG Laser, Shin'ichiro Hayashi[1], Hiroshi Sakai[2], Takunori Taira[3], Hiroaki Minamide[1], Kodo Kawase[4,1]; *[1]RIKEN ASI, Japan; [2]Hamamatsu Photonics K. K., Japan; [3]Institute for Molecular Science, Japan; [4]Nagoya University, Japan.* We have developed injection-seeded terahertz-wave parametric generator pumped by a microchip Nd:YAG laser. This generated high peak power, tunable, narrow-linewidth terahertz wave with injection seeding by an external cavity diode laser. We observed terahertz wave, peak power of more than 30 W, tunable range from 0.9 to 3.1 THz, linewidth of less than 10 GHz.

NWE24
Cleaning of femtosecond pulses by a self-diffraction process in a Kerr bulk medium, Jun Liu[1]; *[1]University of Electro-communication, Japan.* We cleaned and improved the temporal contrast of a femtosecond pulse by more than four orders magnitude using self-diffraction process in a 0.5-mm-thick glass plate. The energy transform efficiency is about 12%.

Luau Gardens (Rain back-up: Ka Mala), **18:00 – 21:00, Luau**

• Thursday, 21 July, 2011 •

Kauai Court, **07:30 – 12:30, Morning Registration**

NThA • High Intensities

Kauai Ballroom, Kona
08:00–10:00
Gerard Mourou; ENSTA/Ecole Polytechnique France, Presider

NThA1 • 08:00 Plenary
Nonlinear Optics at the Timescale of the Electron - Ultra Broadband Coherent X-Rays and Applications, Tenio Popmintchev[1], Andrius Baltuška[1], Margaret Murnane[1], Henry C. Kapteyn[1]; [1]*JILA/Univ. of Colorado, USA.* We demonstrate bright coherent X-ray supercontinua at photon energies >1.6keV (<7.8Å) on a tabletop. Full phase matching of high harmonic generation up to the 5031st order is possible using mid-IR driving lasers, supporting attosecond-to-zeptosecond pulses.

NThA2 • 08:45 Invited
Frequency doubling and tripling for future fusion drivers, Gabriel Mennerat[1], O. Bonville[1], B. Le Garrec[1], Ph. Villeval[1], S. Durst[1], D. Lupinski[1], A. Kokh[1], N. Kononova[1], V. Vlezko[1], K. Kokh[1]; [1]*Commissariat a l Energie Atomique, France.* Very-high average power frequency conversion is a key issue regarding laser driven inertial confinement fusion reactors. The merits of common non-linear crystals are discussed. The potential of lithium triborate is demonstrated by frequency doubling 235 J of infrared radiation at 1053 nm with 92% conversion efficiency. We also report on third harmonic generation of 360 J of ultraviolet at 351 nm with 80% efficiency.

NThA3 •09:15 Invited
Attosecond Nonlinear Optics, Katsumi Midorikawa[1]; [1]*RIKEN, Japan.* XUV nonlinear multiphoton processes in atoms and molecules by high-order harmonic radiation and its application to attosecond nonlinear spectroscopy are reported.

NThA4 • 09:45
Ultrahigh Resolution EUV imaging using a Tabletop High Harmonic Light Source, Matthew D. Seaberg[1], Daniel E. Adams[1], Chien-Chun Chen[2], Jianwei Miao[2], William F. Schlotter[3], Yanwei Liu[4], Carmen Menoni[5], Margaret Murnane[1], Henry C. Kapteyn[1]; [1]*Department of Physics and JILA, University of Colorado, USA;* [2]*Department of Physics, University of California, USA;* [3]*SLAC National Accelerator Laboratory, USA;* [4]*Center for X-ray Optics, Lawrence Berkeley National Laboratory, USA;* [5]*Department of Electrical Engineering, Colorado State University, USA.* Using a tabletop setup employing high-order harmonic generation of ultrafast laser pulses, we implement Coherent Diffractive Imaging (CDI) with near-wavelength limited ~20 nm resolution using coherent light at 13nm.

Kauai Court, **10:00 – 10:30, Coffee Break & Exhibit Time**

NThB • Photonic Crystal and Waveguides Arrays

Kauai Ballroom, Kona
10:30--12:30
Demetrios Christodoulides; Univ. Central Florida, USA, Presider

NThB1 • 10:30 **Invited**
Nonlinear optical processes in group III-V and silicon planar photonic crystal membrane structures, Jeff Young[1], Haijun Qiao[1], Keith A. Abel[2], Andras G. Pattantyus-Abraham[1], Murray W. McCutcheon[1], Georg W. Reiger[1], Charles Foell[1], Ellen Schelew[1], Frank van Veggel[2]; [1]*Department of Physics and Astronomy, University of British Columbia, Canada;* [2]*Chemistry, University of Victoria, Canada.* High-index-contrast, wavelength scale texture in thin semiconductor membranes can be used to resonantly enhance a variety of nonlinear optical processes. Several experimental demonstrations in III-V, and silicon membranes incorporating PbSe nanocrystals will be described.

NThB2 • 11:00
Broadband time-reversal of optical pulses using a switchable photonic-crystal mirror, Yonatan Sivan[1], John B. Pendry[1]; [1]*Imperial College London, United Kingdom.* We propose a new time-reversal scheme for optical pulses which overcomes the limitations of exisitng schems. We demonstrate highly efficient and broadband reversal of pulses of 100 fs and 10 ps duration.

NThB3 • 11:15
Plasmonic Quantum Dots for Nonlinear Optical Applications, Mike Klopfer[1], L. Wang[1], R. K. Jain[1]; [1]*University of New Mexico, USA.* This presentation describes the design of novel plasmonic quantum dots for nonlinear applications, including labels for TPAF-based biomedical imaging, with projected fluorescence intensities >1000X higher than currently-used fluorescent labels.

NThB4 • 11:30
Slow-Light Enhanced Optical Forces between Shifted Photonic-Crystal Nanowire Waveguides, Yue Sun[1,2], Thomas P. White[1,2], Andrey A. Sukhorukov[1]; [1]*Nonlinear Physics Centre, RSPE, Australian National University, Australia;* [2]*Laser Physics Centre, RSPE, Australian National University, Australia.* We reveal that slow-light enhanced optical forces between side-coupled photonic-crystal waveguides strongly depend on a longitudinal shift, facilitating transverse force tuning from repulsive to attractive and enabling longitudinal force which is absent in unshifted structures.

NThC • Modelocked Lasers and Continuum Generation

Kauai Ballroom, Halele'a
10:30-12:30
Andrew Weiner; Purdue University, USA, Presider

NThC1 • 10:30
Femtosecond operation and self-doubling of Cr:ZnS laser, Evgeni Sorokin[1], Nikolai Tolstik[2], Irina T. Sorokina[2]; [1]*Vienna University of Technology, Austria;* [2]*Physics Department, Norwegian University of Science and Technology, Norway.* Prismless dispersion-controlled Cr:ZnS laser generates first femtosecond (110 fs) pulses at 180 MHz repetition rate around 2400 nm with average power 200 mW. Co-propagating second-harmonic pulse at 1200 nm is simultaneously generated in ceramic sample.

NThC2 • 10:45
Semi-Analytic Theory of Similariton Amplifiers and Laser Oscillators Using a Shape-Adaptive Model Pulse, Christian Jirauschek[1], Fatih Ilday[2]; [1]*Institute for Nanoelectronics, TU Muenchen, Germany;* [2]*Department of Physics, Bilkent University, Turkey.* A semi-analytic theory for similariton lasers and amplifiers is presented. The key is a shape-adaptive model pulse which can be continuously tuned to represent pulse shapes ranging from parabolic to Gaussian to sech-squared intensity profiles.

NThC3 • 11:00
Energy Enhancement of Mode-Locked Fiber Lasers with Sinusoidal Transmission,
J. Nathan Kutz[1], Edwin Ding[1]; [1]*Applied Mathematics, University of Washington, USA.* A generalized master mode-locking model is shown to support high-energy pulses that are not predicted by the master mode-locking theory, thus providing a platform for optimizing high-energy laser performance.

NThC4 • 11:15 **Invited**
Dissipative Soliton Fiber Lasers, Frank Wise[1]; [1]*Applied Physics, Cornell University, USA.* Short-pulse fiber lasers based on dissipative-soliton formation offer major performance and practical advantages over prior fiber lasers. Recent developments will be reviewed.

NThB • Photonic Crystal and Waveguides Arrays (cont.)

NThB5 • 11:45
Nonlinear Optical Properties of ZnSe Nanowires Investigated with SHG Polarization Microscopy, Richard Cisek[1], Nehad Hirmiz[1], Ankur Saxena[2], Alexander Shik[2], Harry Ruda[2], Virginijus Barzda[1]; *[1]Department of Chemical and Physical Sciences, University of Toronto, Canada; [2]Centre for Advanced Nanotechnology, University of Toronto, Canada.* The SHG polarization microscopy differentiates crystal lattice structures in ZnSe nanowires. The crystal lattice orientation and structural heterogeneities are visualized along single nanowires demonstrating a convenient method to study organization in various nanostructures.

NThB6 • 12:00
Superluminally Decaying Light Bullets in Periodic Media, Falk Eilenberger[1], Stefano Minardi[1], Frank Setzpfandt[1], Thomas Pertsch[1]; *[1]Institute of Applied Physics, Friedrich Schiller University, Germany.* We investigate the wavelength-depending, discrete diffraction's impact on the dynamics of Light Bullets in a periodic medium leading to spatiotemporal coupling. This leads to acceleration during decay which we investigate analytically and in experiment.

NThB7 • 12:15
Nonlinear evolution of laser pulses in lithium niobate waveguide arrays, Frank Setzpfandt[1], Andrey A. Sukhorukov[2], Dragomir N. Neshev[2], Roland Schiek[3], Alexander S. Solntsev[2], Falk Eilenberger[1], Stefano Minardi[1], Raimund Ricken[4], Yoohong Min[4], Wolfgang Sohler[4], Yuri S. Kivshar[2], Thomas Pertsch[1]; *[1]Friedrich-Schiller-Universität Jena, Germany; [2]Nonlinear Physics Center, RSPE, Australian National University, Australia; [3]University of Applied Sciences Regensburg, Germany; [4]Applied Physics, Universität Paderborn, Germany.* We study experimentally and numerically the spatiotemporal evolution of short pulses in quadratic nonlinear waveguide arrays with coupled second-harmonic modes, revealing complex spectral transformations involving generation of new frequency components at the Brillouin zone edge.

NThC • Modelocked Lasers and Continuum Generation (cont.)

NThC5 • 11:45
Parametric Kerr-lens mode-locking of a 888 nm pumped Nd:YVO4 laser using cascaded second order nonlinearities, Christoph Schäfer[1], Christian Fries[1], Johannes A. L'huillier[1]; *[1]Photonik-Zentrum Kaiserslautern e.V., Germany.* We report on a parametric Kerr-lens mode-locked Nd:YVO4 laser using cascaded second order nonlinearities. Pulses as short as 5.7 ps and average output powers as high as 15.4 W @ 1064 nm have been achieved.

NThC6 • 12:00
Seeded Supercontinuum Generation in Gases and Condensed Matter, Trenton R. Ensley[1], Dmitry A. Fishman[1], Scott Webster[1], David J. Hagan[1,2], Eric W. Van Stryland[1,2]; *[1]CREOL & FPCE: The College of Optics & Photonics, University of Central Florida, USA; [2]Department of Physics, University of Central Florida, USA.* We measure a fourfold increase in femtosecond supercontinuum integrated spectral irradiance using extremely weak seeding (~10^-3) in Kr gas. We present data on the effect of seeding on supercontinuum in other gases, liquids, and solids.

NThC7 • 12:15
A minute-continuous-wave-stabilized picosecond supercontinuum source for ultrafast serial time-encoded amplified microscopy (STEAM), Chi Zhang[1], Yi Qiu[1], Jianbing Xu[1], Kenneth K. Y. Wong[1], Kevin K. Tsia[1]; *[1]Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong.* A stabilized picosecond supercontinuum source, by a minute continuous-wave trigger, is utilized to improve the ultrafast imaging quality of serial time-encoded amplified microscopy (STEAM) with a frame rate of 4.9 MHz.

On Your Own, **12:30 – 19:30, Free Afternoon**
Kauai Court, **19:00 – 21:00, Evening Registration Open**

NThD • Nanophotonics

Kauai Ballroom, Kona
19:30–21:30
Jeff Young; Univ. of British Columbia, Vancouver, Canada, Presider

NThD1 •19:30 Invited
Silicon-Based Sources from the Visible to Mid-Infrared, Alex Gaeta[1]; [1]*Cornell University, USA.* We describe our recent work in which we use harmonic generation and parametric four-wave mixing in silicon-based nanostructures to generate light from the visible to mid-infrared regimes.

NThD2 • 20:00 Invited
Novel nonlinear nanophotonic phenomena, Marin Soljacic[1]; [1]*MIT, USA.* We present our theoretical and experimental work on one-way waveguides, analogous to quantum-Hall edge states. We also discuss some possible applications, as well as the possibility of breaking time-reversal symmetry using active meta-materials.

NThD3 • 20:30 Invited
Ultrafast and Strong Fields in Nanooptics, Mark Stockman[1]; [1]*Georgia State Univ., USA.* Abstract Not Available

NThD4 • 21:00
Optical Nonlinear Properties of Light-tunneling Heterostructures, Hong Chen[1]; [1]*Pohl Institute of Solid State Physics, Tongji University, China.* We report our experimental demonstrations on enhanced nonlinear optical response of light-tunneling heterostructures, and review recent theoretical investigations on exploiting their nonlinear optical properties and applications including resonance-enhanced excitation of surface plasmon polaritons, nonlinear nonreciprocal transmission and all-optical diode action.

NThD5 • 21:15
Highly Efficient Optical Gain Media Based on Thick-Shell CdSe/CdS Nanocrystals with Suppressed Auger Recombination, Victor I. Klimov[1]; [1]*Chemistry, Los Alamos National Laboratory, USA.* Significant suppression of Auger recombination in thick-shell CdSe/CdS nanocrystal quantum dots derives primarily from "smoothing" of the confinement potential. These nanocrystals show strong optical gain due to involvement of multiexcitons of very high orders.

• Friday, 22 July, 2011 •

Kauai Court, **07:30 – 12:00, Morning Registration Open**

NFA • Frequency Combs and Waveform Synthesis

Kauai Ballroom, Kona
08:00-10:00
Steven Cundiff; JILA, USA, Presider

NFA1 • 08:00 Invited
Quantum frequency combs, Claude Fabre[1], Nicolas Treps[1], Beniot Chalopin[1], German J. de Valcarcel[1], Jinxia Feng[1], Renne Medeiros[1], G. Patera[1], O. Pinel[1], Pu Jian[1]; [1]*Laboratoire Kastler Brossel, University P.M. Curie, France.* Frequency combs generated by Synchronously Pumped Parametric Oscillators exhibit nonclassical features such as multimode squeezing and multipartite entanglement that we have investigated experimentally and which can be used to improve time measurements beyond the shot noise limit.

NFA2 • 08:30 Invited
High Repetition Rate Optical Frequency Combs - Generation and Applications, Andrew Weiner[1]; [1]*Electrical and Computer Engineering, Purdue University, USA.* High repetition rate optical frequency combs are generated by electro-optic modulation and nonlinear optical wave mixing and applied to radio-frequency photonic filtering. In addition, line-by-line shaping of Kerr combs generated in microresonators is demonstrated.

NFA3 • 09:00 Invited
Coherent frequency combs and spectroscopy - from IR to XUV, Jun Ye[1]; [1]*JILA, JILA/Univ. of Colorado, USA.* I will present our effort in producing coherent frequency combs in the infrared and extreme ultraviolet and use them for novel spectroscopy with powerful applications.

NFA4 • 09:30
Synthesis and Characterization of Optical Field Waveform, Andy Kung[1,2], Han-Sung Chan[1,2], Zhi-Ming Hsieh[2], Wei-Hong Liang[2], Chien-Jen Lai[5], Chao-Kuei Lee[6], Ru-Pin Pan[3], Lung-Han Peng[4]; [1]*Institute of Photonics Technologies, National Tsing Hua University, Taiwan;* [2]*Institute of Atomic and Molecuar Sciences, Academia Sinica, Taiwan;* [3]*Electro-Physics, National Chiao Tung University, Taiwan;* [4]*Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taiwan;* [5]*EECS, MIT, USA;* [6]*Photonics, National Sun Yat Sen University, Taiwan.* Periodic optical fields in the shapes of sawtooth, square, single-cycle sine and cosine are synthesized from laser harmonics generated by molecular modulation and measured using shaper-assisted cross-correlation.

NFA5 • 09:45
Pulse-shaper-assisted phase optimization of an ultrabroadband spectral comb, Miaochan Zhi[1], Kai Wang[1], Xia Hua[1], Alexei Sokolov[1]; [1]*Physics, Texas A&M University, USA.* We investigate pulse-shaper-assisted phase optimization of an ultrabroadband spectrum aiming to synthesize non-sinusoidal waveforms. A linear phase across 5 frequency-separated sidebands is achieved, which implies generation of 2 to 3 optical-cycle pulses.

Kauai Court, **10:00 – 10:30, Coffee Break & Exhibit Time**

NFB • Nonlinear Spectroscopy II

Kauai Ballroom, Kona
10:30--12:30
Keith Nelson; MIT, USA, Presider

NFB1 • 10:30 Invited
Atmospheric Nonlinear Optics, Pierre Béjot[1]; [1]*Univ. Of Geneva, Switzerland.* Abstract not available.

NFB2 • 11:00 Invited
Observation of the Relativistic Response of an Electron-Hole Plasma in Graphene on Femtosecond Timescales, Dani M. Keshav[1], Jinho Lee[1], Sharma Rishi[2], Aditya D. Mohite[1], Charudatta C. Galande[3], Pulickel M. Ajayan[3], Andrew M. Dattelbaum[1], Han Htoon[1], Antoinette J. Taylor[1], Rohit P. Prasankumar[1]; [1]*Center for Integrated Nanotechnologies, , USA;* [2]*Theoretical Division, Los Alamos National Laboratory, USA;* [3]*Department of Mechanical Engineering and Materials Science, Rice University, USA.* Visible pump-probe spectroscopy is used to isolate the femtosecond Drude response of a photogenerated electron-hole plasma in a graphene monolayer. The observed sub-linear dependence on carrier density reveals the relativistic nature of the electron-hole plasma.

NFB3 • 11:30
The Off-resonance and Non-resonant Dispersion of the Nonlinear Index of Linear Symmetric Molecules, George Stegeman[1,2], Dimitris Papazoglou[3], Stelios Tzortakis[3], Mark Kuzyk[4]; [1]*College of Engineering, King Fad University of Petroleum and Minerals, Saudi Arabia;* [2]*College of Optics and Photonics, University of Central Florida, USA;* [3]*Institute of Electronic Structure and Laser, Greece;* [4]*Dept. Physics, Washington State University, USA.* Using the sum-over-states model for linear symmetric molecules we derive expressions for the frequency dispersion of n_2 of air molecules. The measured sign of non-resonant n_2 shows the recently published extended Miller formula is incorrect.

NFB4 • 11:45
Resonance tuning of coherent population trapping with intracavity pulse shaping, Koji Masuda[2], Ladan Arissian[1]; [1]*Electrical and Computer Engineering Department, University of New Mexico, USA;* [2]*Physics & Astronomy, University of New Mexico, USA.* Atomic resonances had long been used as a frequency reference. We present resonant tuning of coherent population trapping in 87Rb with an intracavity Fabry-Perot etalon in a mode-locked laser.

NFB5 • 12:00
Coherent Control in 2D Fourier Transform Optical Spectroscopy, Jaewook Ahn[1], Jongseok Lim[1], Jae-uk Kim[1], Han-gyeol Lee[1]; [1]*Physics, KAIST, Republic of Korea.* Using individually shaped three pulses in 2D Fourier transform optical spectroscopy, we coherently control the amplitude and phase of the two-photon transition between 5P1/2 and 5P3/2 levels in atomic Rb V-type energy system.

NFB6 • 12:15
Second-harmonic generation spectroscopic study of silicon nanocrystals embedded in SiO2, Junwei Wei[1]; [1]*Physics, the University of Texas at Austin, USA.* Cross-polarized 2-beam second-harmonic generation, with enhanced signal from both the nano-interface and nanocrystal bulk, supplemented with spectroscopic ellipsometry and Raman spectroscopy, has been applied spectroscopically to study the embedded Si NCs of different sizes.

Joint International Symposium on Optical Memory & Optical Data Storage (ISOM/ODS) Abstracts

• Sunday, 17 July, 2011 •

Kauai Court, Registration Open, 14:00 – 18:00

• Monday, 18 July, 2011•

Kauai Ballroom, Ko'olau, Welcome Remarks, 08:00 – 08:15

OMA • Keynote/Nano-photonics

Kauai Ballroom, Ko'olau
08:15--10:15
Robert McLeod; Dept. of Electrical and Computer Eng, Univ. of Colorado at Boulder United States;
Yoshimasa Kawata; Shizuoka University Japan; Presiders

OMA1 • 08:15 Invited
Fundamental Understanding of Near Field Transducers, Lambertus Hesselink[1]; [1]*Department of Electrical Engineering, Stanford University, USA.* In this keynote presentation I will address fundamental principles underlying the operation of near field transducers. In particular emphasis will be placed on using vector field topology for improved understanding. Selected examples of near field transducers will be presented related to IT applications.

OMA2 • 08:45 Invited
The role of nanotechnology in data storage devices and systems, Masud Mansuripur[1]; [1]*College of Optical Sciences, The University of Arizona, USA.* As data storage technologies evolve, the balance among electronic, magnetic, and optical modes of storage shifts in unpredictable ways. Commercial success is tied to the ability to continually shrink the individual bit's spatial dimensions.

OMA3 • 09:15 Invited
High-speed Near Field Optical recording Using Plasmonic Flying Head, Liang Pan[1,2], Insik Park[1], Erick Ulin-Avila[1], Yi Xiong[1], Li Zeng[1], Cheng Sun[1,3], David Bogy[1,2], Xiang Zhang[1]; [1]*NSF Nano-scale Science and Engineering Center (NSEC), University of California Berkeley, USA;* [2]*Mechanical Engineering, Computer Mechanics Laboratory, Department of Mechanical Engineering, University of California, USA;* [3]*Mechanical Engineering, Northwestern University, USA.* We demonstrated the parallel maskless plasmonic nanolithography at 10 meter/second. This is a low-cost high-throughput nano-fabrication scheme which has the potential of a few orders of magnitude higher throughput than current maskless techniques.

OMA4 • 09:45 Invited
Plasmonic coupling of near-field optical disk, Din Ping Tsai[1,2]; [1]*Department of Physics, National Taiwan University, Taiwan;* [2]*National Instrument Technology Research Center, Taiwan.* We investigate surface plasmon polariton coupling between two nano-recording marks. The different coupling characteristics and the read-out reflection signal of disk- and ring-shapes recording marks will be discussed.

OMB • Holographic Memory

Kauai Ballroom, Ko'olau
10:45 -- 12:30
Yuzuru Takashima, Stanford Univ., USA;
Tsutomu Shimura; Univ. of Tokyo; Presiders

OMB1 • 10:45 Invited
Wavefront compensation for holographic data storage, Norihiko Ishii[1], Tetsuhiko Muroi[1], Nobuhiro Kinoshita[1], Koji Kamijo[1], Hiroshi Kikuchi[1], Naoki Shimidzu[1]; [1]*Science & Technology Research Laboratories, NHK (Japan Broadcasting Corporation), Japan.* We have been studying adaptive optics to compensate for hologram distortion optically and improve bit-error-rate of the reproduced data. This method is effective when photopolymer recording media, whose volume is changed by photopolymerization, is used.

OMB2 • 11:15
Fabrication of PDLC Diffuser Using Applied Magnetic Field and Holographic Multiplexing Technique, Satoshi Honma[1], Tatsuya Hasegawa[1], Yuta Ishihara[1], Toru Sekiguchi[1]; [1]*. Yamanashi Univ. Japan.* We propose a new fabrication method of PDLC diffuser for speckle-multiplexing holographic memories. Six random phase codes are generated by applying electric field to the filter. It increases recording density of the holographic memories dramatically.

OMB3 • 11:30
Holographic Diversity Detection of Spatial Quadrature Amplitude Modulation Signal for Dual-Stage Holographic Memory, Keisuke Kunori[1], Atsushi Okamoto[1], Akihisa Tomita[1], Masanori Takabayashi[1]; [1]*Hokkaido University, Japan.* We propose a new method to detect multi-level phase signals by generating 4-pieces of digital hologram by single shot hologram reading without using the reference light of a resolution higher than the signal page data.

OMB4 • 11:45
Self-Referential Holographic Data Storage by Phase-Modulation Technique, Masanori Takabayashi[1], Atsushi Okamoto[1]; [1]*. Hokkaido University, Japan.* A self-referential holographic recording geometry, in which signal beam works as reference beam for recording of itself, having many attractive advantages is newly proposed. The purely one-beam holographic operation is performed by simulation and experiment.

OMB5 • 12:00
High-Density Recording Method with RLL Coding for Holographic Memory System, Yusuke Nakamura[1], Ken-ichi Shimada[1], Toshiki Ishii[1], Hajime Ishihara[1], Makoto Hosaka[1], Taku Hoshizawa[1]; [1]*Yokohama Research Laboratory, Hitachi, Ltd., Japan.* A high-density recoding method with RLL coding and smaller Fourier plane filter has been developed. With this method, we confirmed a holographic drive system with 667GB capacity feasible.

OMB6 • 12:15
Region-Divided Adaptive Equalization for Holographic Memory, Makoto Hosaka[1], Toshiki Ishii[1], Taku Hoshizawa[1]; [1]*Yokohama Research Laboratory, Hitachi, Ltd., Japan.* Holographic memory channels suffer from disturbances. We revealed inter-pixel interferences vary even in the same page by the disturbances. Using the newly developed region divided adaptive equalization, we can improve SNR by 3.5 dB.

OMC • Components

Kauai Ballroom, Ko'olau
14:00 -- 15:45
Koichi Watanabe; Japan;
Ryuichi Katayama; Fukuoka Institute of Technology Japan; Presiders

OMC1 • 14:00 Invited
All-Semiconductor-Laser Light Sources Generating High-Peak-Power Picosecond Optical Pulses, Masaru Kuramoto[1,2], Masao Ikeda[1,2], Hiroyuki Yokoyama[2]; [1]*Advanced materials laboratory, Sony corporation, Japan;* [2]*New Industry Creation Hatchery Center, Tohoku University, Japan.* We have developed highly functional all-semiconductor-laser light sources at the wavelength of 400 and 800 nm. These light sources have been successfully applied for three-dimensional optical data storage as well as for two-photon fluorescence bioimaging.

OMC2 • 14:30 Invited
Development and Application of Highly Functional Ultrashort Pulse Fiber Lasers, Norihiko Nishizawa[1]; [1]*Electrical Engineering and Computer Science, Nagoya University, Japan.* We have demonstrated generation of wideband, ultrafast wavelength tunable ultrashort pulses and high quality super continuum based on ultrashort pulse fiber lasers. Their applications for ultrahigh resolution optical coherence tomography and NIR spectroscopy are described.

OMC3 • 15:00
Ultra-Compact Optical Module of Homodyne Detection, Hideharu Mikami[1], Takahiro Kurokawa[1], Koichi Watanabe[1]; [1]*Hitachi, Ltd., Central Research Laboratory, Japan.* We demonstrated ultra-compact and low-cost implementation of homodyne detection. The assembled module size was 10 x 30 mm2. Jitter of the attenuated BD-R readout signals was improved from 15% to 7.8% by applying the module.

OMC4 • 15:15
Experimental Demonstration of Reducing Interlayer Crosstalk of Multilayer Disc in a Three Beam Optical Disc Tester Using Polarizing Device, Eriko Tatsu[1], Shigeharu Kimura[1], Tatsuro Ide[1], Takahiro Kurokawa[1], Koichi Watanabe[1]; [1]*. Hitachi, Japan.* We demonstrated interlayer crosstalk reduction of multilayer disc by using a polarizing device in a three-beam optical disc tester experimentally. Application of the device to a dual-layer BD with 5 μm layer spacing showed satisfactory effect, roughly halving DPP signal fluctuation.

OMC5 • 15:30
Subwavelength Focusing Technique using a Plasmonic Lens, Minoru Takeda[1], Suguru Nakatani[1]; [1]*Kyoto Institute of Technology, Japan.* We fabricated a plasmonic lens with only a several micron diameter ring slit and confirmed that it can produces a subwavelength focusing spot not only in the near-field, but also in the quasi far-field region.

Kauai Court, Coffee Break, 15:45 – 16:15

OMD • ISOM/ODS Poster Session I

Puna Ballroom
15:45 --17:15

OMD1
Müller Matrix Characterisation of μ-SIL, Carlos Macias-Romero[1], Peter Török[1], Matthew R. Foreman[1]; [1].We report on the response of a micrometric solid immersion lens to different states of polarisation by means of confocal Müller matrix polarimetry.

OMD2
Why is My Grating Blue? Donald A. Chernoff[1], David L. Burkhead[1]; [1]. We describe practical manufacturing tolerances for optical and magnetic data patterns and how to measure accurately. Designers of nanophotonic devices should consider whether real-world performance will be degraded by normal variations in feature position, size or shape.

OMD3
Error Correcting Capable 2/4 Modulation Code Using the Trellis Coded Modulation in Holographic Data Storage, Yong-ok Kim[1], Gyuyeol Kong[1], Sooyong Choi[1]; [1].We propose error correcting capable 2/4 modulation code using the trellis coded modulation without data rate loss. We make a new symbol set for 2/4 modulation code and define distances between symbols.

OMD4
Fuzzy based Intelligence Method for Image Processing System in Holographic Data Storage System, Jang Hyun Kim[1]; [1]*Yonsei University, Republic of Korea.* A holographic data storage system has the advantages of a high data rate, rapid access and a multiplexing method. In this paper, we propose image processing method by fuzzy system and wavelet transform algorithm. It is intelligence algorithm in holographic data storage system.

OMD5
Estimating Facial Angle for Face Recognition System with Holographic Memory and Stereo-Vision Technology, Satoshi Honma[1], Yasuaki Yagisawa[1], Hidetomo Momose[1], Toru Sekiguchi[1]; [1].We have proposed facial recognition system FARSAHS. This system makes CG facial image reorientated to front of the virtual camera. This function maintain high recognition rate when the facial direction to camera changes.

OMD6
Optical Data Storage Induced by a Radially Polarized Beam, Xiangping Li[1], Min Gu[1]; [1]. In this paper we report on the application of a radially polarized beam in three-dimensional optical data storage. Super-resolution recording by employing an annual objective has been demonstrated.

OMD7
Shock Isolation of Optical Pickup in Optical Disk Drive, Wonseok Oh[1], Seungho Lim[1], Kyoung-Su Park[1], No-Cheol Park[1], Young-Pil Park[1], Jae-Sung Lee[2], Han-Baek Lee[2]; [1]*Center for Information Storage Device, Republic of Korea;* [2]*Hitachi-LG Data Storage, Republic of Korea.* This research investigates to analysis and to design the shock isolator to protect the pickup from the external shock during shipping.

OMD8
Optical Disc Drives: A Study of Variation, Guilin Jiang[1], Barry M. Lunt[1], Travis Niederhauser[2], Matthew Linford[1]; [1]*Brigham Young University, USA;* [2]*Millenniata, Inc., USA.* Optical disc drives vary significantly in their performance. Here we report a principal components analysis performed on data from new drives, which separates out the better performing drives and finds correlations among drive test variables.

OMD9
Iterative Decoding Method Using Two-Dimensional Single Parity Code for Holographic Data Storage, Taehyung Kim[1], Gyuyeol Kong[1], Sooyong Choi[1]; [1]*Yonsei University, Republic of Korea.* Iterative decoding method using two-dimensional single parity code which ensures high code rate and low complexity compared to its performance gain is proposed. The proposed scheme gives the error correction capability to constant weight block code.

OMD10

Optical Disc Life Expectancy: A Field Report, Barry M. Lunt[1], Douglas Hansen[2], Matthew Linford[1]; *[1]Information Technology, Brigham Young University, USA; [2].* The lifetime expectancy (LE) of optical discs has often been determined with accelerated testing. This paper reports on the LE of discs subjected only to normal controlled conditions of temperature, humidity and light.

OMD11

Iterative Two-dimensional Partial Response Maximum Likelihood Detection Method with Constant-Weight Constraint Code for Holographic Data Storage Systems, Gyuyeol Kong[1], Sooyong Choi[1]; *[1]School of Electrical and Electronic Engineering, Yonsei university, Republic of Korea.* We propose an iterative 2D PRML detector. Two reduction schemes, reduced-state trellis and constant-weight constraint, are used to make detector structure simple. The proposed 2D PRML detector uses iterative detection to prevent the performance degradation.

OMD12

High Density Recording with Guided-Layer Media, In-Gu Han[1]; *[1].*The possibility of a guided-layer recording system is confirmed with recording test using the two 405nm LDs. Recordable guided-media is fabricated with a recording layer and a guide layer. Recording capacity of 25 GB could be recorded on a flat recording layer.

OMD13

Simplified Decoding of Trellis-Based Error-Correcting Modulation Codes Using M-Algorithm for Holographic Data Storage, Jinyoung Kim[1], Jaejin Lee[1]; *[1].* We investigate the simplified decoding of the trellis-based error-correcting modulation codes using M-algorithm for holographic data storage. When the M-algorithm is used in trellis-based error-correcting modulation codes, the delay and complexity problem can be reduced.

OMD14

A Simple Decoding Scheme for the Balanced 6/8 Modulation Code, Gukhui Kim[1], Jinyoung Kim[1], Jaejin Lee[1]; *[1].*
We propose the demodulation algorithm, which uses hard decision demodulation and has the same performance as when demodulation algorithm is soft decision.

OMD15

InGeSbSnTe Phase Change Thin Film for Blu-Ray Rewritable Optical Recording, Sin-Liang Ou[1], Po-Cheng Kuo[1], Han-Feng Chang[2], Chin-Yen Yeh[2], Chao-Te Lee[3], Donyau Chiang[3]; *[1]Institute of Materials Science and Engineering, National Taiwan University, Taiwan; [2]CMC Magnetics Corporation, Taiwan; [3]Instrument Technology Research Center, National Applied Research Laboratories, Taiwan.* The crystallization temperature of the In10GexSb52-xSn23Te15 films (x = 2, 5, and 9) film is increased with increasing Ge content. The optimum jitter value of the film with 4X recording speed is 6.6%.

OMD16

Evaluation of the Performance in Multilayer Collinear Holographic Memory with Movable Random Phase Mask, Atsushi Shibukawa[1], Atsushi Okamoto[1], Akihisa Tomita[1], Masanori Takabayashi[1], Kunihiro Sato[2], Masatoshi Bunsen[3]; *[1]Hokkaido University, Japan; [2]Hokkai-Gakuen University, Japan; [3]Fukuoka University, Japan.* We demonstrated that introducing multi-layered technique into collinear holographic memory can realize higher quality holographic recording/reading and expand the storage density by a factor of 2 through homogeneous utilization of the recording medium.

OMD17

Nonlinear Equalization of the Super-RENS Read-out Signal Using the AANGD Algorithm with a Non-causal Structure, Seokhun Jeon[1], Sungbin Im[1]; *[1].* To mitigate the nonlinearity in a super-RENS read-out signal we carry out equalization with the AANGD algorithm. The experimental result demonstrates that the AANGD algorithm can effectively reduce the nonlinearity while maintaining lower computational complexity.

OMD18

Real-Time Optimization Method of Write Strategy for Optical Discs, Nobuo Takeshita[1], Tomo Kishigami[1], Koichi Ikuta[2]; *[1]Advanced Technology R&D Center, Mitsubishi Electric Corporation, Japan; [2]Advanced Technology R&D Center, Mitsubishi Electric Corporation, Japan.* Real-time write strategy optimization method for optical discs is proposed. Write strategy is continuously optimized during recording against the variation of recording characteristics and environments. Effectiveness is experimentally confirmed with BD and DVD discs.

OMD19
Withdrawn

OMD20
CuSi thin film for write-once blue laser optical recording, Sin-Liang Ou[1], Po-Cheng Kuo[1], Han-Feng Chang[2], Chin-Yen Yeh[2], Chao-Te Lee[3], Donyau Chiang[3]; *[1]Institute of Materials Science and Engineering, National Taiwan University, Taiwan; [2]CMC Magnetics Corporation, Taiwan; [3]Instrument Technology Research Center, National Applied Research Laboratories, Taiwan.*
The thermal property, optical property and recording characteristics of the CuSi (16 nm) film were investigated. The optimum jitter value of the film with 1X recording speed is 7.5% at 6 mW.

OMD21
Thermal mode photo-resistor process discussion and applications, Hsiu-Wen Wu[1]; *[1]Department Opto-Electric engineering, National Dong Hwa University, Taiwan.* In this study, we report on use the thermal lithography technology to prepare the submicron structure for antireflection application.

OMD22
High-Speed Full Motion Analysis Based on FFT-BPM for Collinear Holographic Memory, Hisatoshi Funakoshi[1], Atsushi Okamoto[2], Masanori Takabayashi[2], Yuta Wakayama[2], Atsushi Shibukawa[2]; *[1]Faculty of Education, Gifu University, Japan; [2]Graduate School of Information Science and Technology, Hokkaido University, Japan.* Our new analysis tool can be capable of calculations more than 30 times faster than the previous method and enables to estimate practical memory densities including not only recording and reconstruction process but also error correction process.

OMD23
Modified 2D SOVA with 2D PR target for Holographic Data Storage, Keunhwi Koo[1], Soo-Yong Kim[2,1], Jae Jin Jeung[1], Sang Woo Kim[1]; *[1]Electrical Engineering, POSTECH, Republic of Korea; [2]Emerging SOC Group, Semiconductor Division, Samsung Electronics, Republic of Korea.* Existing modified Two Dimensional Soft Output Viterbi Algorithm (2D SOVA) for Holographic Data Storage (HDS) uses a 1D SOVA about two different 1D PR targets (vertical and horizontal directions) and changed cost function of the 1D SOVA. In this paper, we propose modified 2D SOVA with 2D PR target and new cost function of the 1D SOVA. For this cost function is structurally modified from the 2D PR target form, the proposed method has a better performance of Bit Error Rate (BER) than the existing method.

OME • Media/Fabrication

Kauai Ballroom, Ko'olau
17:15 -- 18:45
Atsushi Nakamura; Panasonic Corp. Japan;
Adam Urness; United States; Presiders

OME1 • 17:15 Invited
Identification of Vacancy Ratio in Crystalline GeTe Films, Fei Tong[1], Xiangshui Miao[1]; *[1].*
XRD, XPS, SQUID and magnetism calculation based on spin-polarized DFT of GeTe crystalline films with different Co-doping have been studied to identify the vacancies in GeTe. The results show that Co occupies Ge vacancy and forms Co-Te bond, and confirm 8% vacancy ratio in GeTe.

OME2 • 17:45
Lithographic Fabrication of Multi-Layered Optical Data Storage, Adam Urness[1]; *[1]University of Colorado, USA.*
We present a new fabrication method for multi-layer ROM. Individual layers of an initially-liquid holographic photopolymer are photo-patterned via mask projection and post-cured to a solid. The process is repeated to efficiently print high-density disks

OME3 • 18:00
An Approach for Measurements of Optical Constants for Molten Sb2Te3 by Spectroscopic Ellipsometer, Masashi Kuwahara[1], Rie Endo[2], Kouichi Tsutsumi[3], Fukuyoshi Morikasa[4], Tishio Fukaya[1], Masahiro Susa[2], Michio Suzuki[3], Tomoyoshi Endo[4]; *[1]; [2]Tokyo Institute of Technology, Japan; [3]J. A. Woollam Japan Co., Japan; [4]Thermo Riko Co., LTD., Japan.* We have succeeded in measuring optical constants from 350 nm to 1000 nm in wavelength for molten Sb2Te3 using a novel system consisting of a spectroscopic ellipsometer and an infrared heating system.

OME4 • 18:15
Improvement of Reconstructed Absorption Distribution in Data Storage Medium using Absorbers Embedded in Artificial Scattering Medium, Masaya Nonaka[1], Kouichi Nitta[1], Osamu Matoba[1]; *[1].* We presented an improvement method of reconstructed absorption distribution in data storage medium with absorbers embedded in artificial scattering medium. Numerical results showed that thresholding operation reduced dramatically the size of the reconstructed absorption width.

OME5 • 18:30
Evaluation of Data Stability and Analysis of Degradation Factors for Archival Application of DVD+R Media, Kwan-Yong Lee[1]; *[1]Center for information Storage Device, Yonsei University, Republic of Korea.* For the archival application of optical disks, the degradation factors and mechanism of DVD+R were studied through the observation of microstructure and chemical composition change at recording marks and reflective layer after the acceleration test.

• Tuesday, 19 July, 2011 •

OTuA • Near-field/Plasmonics

Kauai Ballroom, Ko'olau
08:00 -- 10:00
Din Ping Tsai; Department of Physics, National Taiwan University Taiwan; Presiders

OTuA1 • 08:00 Invited
Nanophotonic Polishing of Substrate for Application to Hard-Disk and Optical-Disk Processing, Takashi Yatsui[1], Wataru Nomura[1], Motoichi Ohtsu[1]; [1]*Univ of Tokyo, University of Tokyo, Japan.* We report that nanophotonic polishing of a silica substrate using a phonon-assisted photochemical reaction drastically reduced the average surface roughness for application to hard-disk and optical-disk processing.

OTuA2 • 08:30 Invited
Application of SIL based Near Field Recording Technology to High Speed Nano Patterning, No-Cheol Park[1], Byung-Kwon Min[2], Young-Pil Park[1], Hyunseok Yang[1], Kyoung-Su Park[1], Sung-Mook Kang[1]; [1]*Center for Information Storage Device, Republic of Korea;* [2]*Department of Mechanical Engineering, Yonsei University, Republic of Korea.* In this paper, we present a low-cost and high-throughput approach to maskless nanolithography that uses a plasmonic solid immersion lens (SIL) optical head which consists of a SIL and a sharp-ridge nanoaperture for a high strong nanometer-size optical spot.

OTuA3 • 09:00
High-Speed and Precise Gap Servo System for Near-Field Optical Recording, Daiichi Koide[1], Takeshi Kajiyama[1], Haruki Tokumaru[1], Yoshimichi Takano[2], Yuta Nabata[3], Tokoku Ogata[3], Toshimasa Miyazaki[3], Kiyoshi Ohishi[3]; [1]*NHK (Japan Broadcasting Corp.), Japan;* [2]*NHK Engineering Service, Japan;* [3]*Nagaoka University of Tehcnology, Japan.* We propose a high-speed and precise gap servo of reducing harmonics of axial run-out disturbance-feed-forward control for near-field recording. We could perform gap servo at 11000 rpm applying RHD-FFC using SIL head and 100GB disk.

OTuA4 • 09:15
Trans-ABS Power Coupling Efficiency of Near Field Transducers for HAMR Calculated with Finite Element Modeling, Matt Chabalko[1], Tuviah E. Schlesinger[1], Daniel D. Stancil[1], Yi Luo[1], James A. Bain[1]; [1]*Electrical and Computer Engineering, Carnegie Mellon University, USA.* We compute the efficiency of coupling between the end of various small plasmonic waveguide NFTs and magnetic media for HAMR. Coupling ranges from 10-80% and is a strong function of geometry and material properties.

OTuA5 • 09:30
Withdrawn

OTuA6 • 09:45
Shift and Polarization Multiplexing for SIL based Near-Field Holographic Recording, Cheol-Ki Min[1], Do-Hyung Kim[2], Janghyun Cho[2], No-Cheol Park[1], Kyoung-Su Park[1], Hyunseok Yang[1], Young-Pil Park[1]; [1]*Department of Mechanical Engineering, Yonsei University, Republic of Korea;* [2]*Center for Information Storage Device, Yonsei University, Republic of Korea.* In this paper, we investigate a SIL based near-field holographic recording that combines the advantages of two systems, such as tightly focused spot of SIL in NFR and two multiplexing methods of holographic storage.

OTuB • Femtosecond Applications/Phase-change

Kauai Ballroom, Ko'olau
10:30—12:30
Masud Mansuripur; College of Optical Sciences, The University of Arizona United States; Takashi Kikukawa; TDK Corp Japan; Presiders

OTuB1 • 10:30 Invited
Ultrafast Coherent Switching of Phase-Change in Rewritable Optical Media, Muneaki Hase[1], Kotaro Makino[1], Junji Tominaga[2]; *[1]Institute of Applied Physics, University of Tsukuba, Japan; [2]Nanodevice Innovation Research Center, National Institute of Advanced Industrial Science and Technology, Japan.* We demonstrate in Ge2Sb2Te5 superlattice that the phase change from amorphous into crystalline states can be manipulated within ~ 1 picosecond by coherent excitation of the local lattice vibration using a pair of femtosecond laser pulses.

OTuB2 • 11:00 Invited
Femtosecond nanoscale phase-change dynamics in GeSbTe thin films,T. Hira[1], Y. Hongo[1], K. Tajima[1], N. Kitamura[1], T. Homma[1], Toshiharu Saiki[1]; *[1]Department of Electronics and Electrical Engineering, Keio University, Japan.* Sub-picosecond nonthermal amorphization of a GeSbTe thin film with femtosecond laser pulse excitation and complete switching of the surface plasmon resonance of a single Au nanoparticle that accompanies an ultrafast phase change were demonstrated.

OTuB3 • 11:30 Invited
Femtosecond Laser Based Polarization Multilevel Storage, Wenhao Huang[1], Yanlei Hu[1]; *[1].* We summarize femtosecond laser based high-density data storage achieved by various photochemical mechanisms, including photochromism, photobleaching and microexplosion, and focus on rewritable polarization-multiplexed and multilevel storage in photoisomeric material.

OTuB4 • 12:00 Invited
Nano Phase Change for Data Storage and Beyond, Luping Shi[1]; *[1]Data Storage Institute, A*star, Singapore.*
This work has systemically investigated the nano-phase change in terms of the materials' different properties against the dimension. The future development trend after reaching scaling limitation is discussed.

OTuC • Drive Technologies/Signal Processing

Kauai Ballroom, Ko'olau
14:00—15:30
Hajime Ishihara; Hitachi, Ltd. Japan;
Satoru Higashino; Sony Corp. Japan; Presiders

OTuC1 • 14:00
A Robust Adjacent Track Servo System with Linear Positioning Method, Yoshiyuki Urakawa[1], Yoshihiko Deoka[1], Yuichi Suzuki[1], Tomoharu Mukasa[1], Junichi Horigome[1]; *[1]Core Device Development Group, Sony Corporation, Japan.* A multi-layer disk without guide groove enables a large capacity and price competitive optical disk. We propose a novel tracking servo system which is robust and accurate for disks without groove.

OTuC2 • 14:15
Read Data Transfer Rate Estimation on Optical Phase Multilevel Recording, Atsushi Kikukawa[1], Hideharu Mikami[1], Tatsuro Ide[1], Kentaro Osawa[1], Koichi Watanabe[1]; *[1].* The inter-symbol interference in optical phase multilevel recording was solved by using multilevel PRML and it was estimated that the read data transfer rate can be at least doubled provided that signal-to-noise ratio is equivalent to current optical drives.

OTuC3 • 14:30
Inter-track Crosstalk Canceling PRML Decoder for High Density Optical Disc, Hajime Ishihara[1], Yusuke Nakamura[1], Taku Hoshizawa[1]; *[1]Yokohama Research Laboratory, Hitachi, Ltd., Japan.* To correspond to density growth by applying narrower track pitch, we developed an inter-track crosstalk canceling PRML decoder. As the result, we confirmed the feasibility of 44GB capacity a layer on a simulation model.

OTuC4 • 14:45
High Precision Feedforward Tracking Control System for Next Generation Optical Disks, Tokoku Ogata[1], Yuta Nabata[1], Tatsuya Nakazaki[1], Kiyoshi Ohishi[1], Toshimasa Miyazaki[1], Masaki Sazawa[1], Daiichi Koide[2], Yoshimichi Takano[2], Haruki Tokumaru[2];*[1]Nagaoka University of Technology, Japan; [2]Science and Technology Research Laboratories, Japan Broadcasting Corp., Japan.* This paper proposes a new high-precision feedforward tracking control system in single-rate sampling. The experimental results confirm that the proposed system well suppresses the tracking error on condition of disk rotation speed 7200[rpm] DVD. Therefore, the proposed system realizes high-precision tracking control.

OTuC5 • 15:00
Dynamic Characteristics of Optical Disk over 15,000 rpm Close to a Rigid Wall, Seungho Lim[1], Wonseok Oh[1], Byunghan Ko[1], Ungrae Cho[2], Kyoung-Su Park[1], No-Cheol Park[1], Young-Pil Park[1], Han-Baek Han[3]; *[1]Center for Information Storage Device, Republic of Korea; [2]LIG Nex1 Co. Ltd., Republic of Korea; [3]Hitachi-LG Data Storage Korea, Inc., Republic of Korea.* In this research, the dynamic characteristics of optical disk in slim drive over 15,000 rpm are identified considering the aerodynamic effect using CFD, FEM, and analytical method.

OTuC6 • 15:15
System Identification Using Embedded Dynamic Signal Analyzer, Soo-Yong Kim[1,2], Xuezhen Mao[1], Junho Huh[1], Keunhwi Koo[2], Sang Woo Kim[2]; *[1]Emerging SOC Development, Samsung Electronics Co., Republic of Korea; [2]Eletrical Engineering, Pohang University of Science and Technology, Republic of Korea.* To identify system dynamics of a control system, proposed embedded dynamic signal analyzer (EDSA) enables system to sense stability criterion. The EDSA consists of a digital resonator and a signal processing block.

Kauai Court, Coffee Break, 15:30 – 16:00

OTuD • ISOM/ODS Poster Session II

Puna Ballroom
15:30—17:00

OTuD1
Soft-Decision Viterbi Decoding Scheme and A New Reliability Metric for 4/6 Modulation Code in Holographic Data Storage, Yong-ok Kim[1], Gyuyeol Kong[1], Sooyong Choi[1]; *[1].* We propose the soft-decision Viterbi decoding with higher data rate for 4/6 modulation code. In order to define the branch metric on trellis, we introduce a new reliability for 4/6 modulation code.

OTuD2
Nonlinear Equalizer for Signal Improvement of Holographic Data Storage, Yasuyuki Yamagishi[1]; *[1].* In this paper, we applied Volterra equalizer and QMMSE equalizer to reconstructed images suffered from ISI due to aberration from the optical systems for the improvement of signal quality.

OTuD3
Line Tracking Applied Data Acquisition Method for Holographic Data Storage System, Jae-Seong Lee[1]; *[1].* The virtual detector is used which follows rows of image such as track of CD, acquiring pixel value in such location. The suggested method could compensate the image distortion without any data density loss.

OTuD4
Simplified Two-Dimensional Partial Response Maximum Likelihood Detection Method Using a Priori Information for Holographic Data Storage Systems, Gyuyeol Kong[1], Sooyong Choi[1]; *[1]School of Electrical and Electronic Engineering, Yonsei university, Republic of Korea.* We propose a simplified 2D PRML detector. Two types of the simplification, reduced-state trellis and PR target selection, are used. To overcome the performance degradation owing to the reduced-state trellis, we use a priori information.

OTuD5
Degradation Headroom: Another Issue for Archival Optical Discs, Barry M. Lunt[1], Erin Bourgeous[1], Bradley M. Lunt[1]; *[1].* Degradation headroom is the difference between the as-recorded quality of the written data, and the degree to which the written data can degrade and still be read. This is important for permanent recordable optical discs.

OTuD6
Super-Resolution Photonics for Advanced Storage Systems (SURPASS), Peter Török[1]; *[1]Imperial College London, United Kingdom.* SURPASS aims to develop and combine two superresolution technologies, namely near field detection with μSILs and "active" material layers with a view to applications in data storage and microscopy. We report on current progress.

OTuD7
Manipulation of Multi-Dimensional Plasmonic Spectra for Information Storage, Wei Ting Chen[1], Pin Chieh Wu[1], Chen Jung Chen[1], Chun-Jen Weng[2], Hsin-Chen Lee[3], Ta-Jen Yen[3], Chieh-Hsiung Kuan[4], Masud Mansuripur[5], Din Ping Tsai[1,2]; *[1]Department of Physics, National Taiwan University, Taiwan; [2]Instrument Technology Research Center, National Applied Research Laboratory, Taiwan; [3]Department of Materials Science and Engineering, National Tsing Hua University, Taiwan; [4]Department of Electrical Engineering, National Taiwan University, Taiwan; [5]College of Optical Sciences, The University of Arizona, USA.* We demonstrate a concept to enhance the capacity of optical data storage through plasmonic resonances of metallic nano-structures. Metallic nano-structures exhibit strong variations in their optical spectra due to surface plasmon resonances. It should be possible to store and retrieve data from each plasmonic spectra.

OTuD8
Turbo equalization between Partial Response Maximum Likelihood Detector and Viterbi decoder for 2/4 Modulation Code in Holographic Data Storage Systems, Gyuyeol Kong[1], Sooyong Choi[1]; *[1]School of Electrical and Electronic Engineering, Yonsei university, Republic of Korea.* We propose the turbo equalization between the PRML detector and joint Viterbi decoder combined by 2/4 modulation and convolutional decoder. By iterative process, we obtain better BER performance compared with the conventional 1D PRML detector.

OTuD9
Two-Dimensional Equalization Using Bilinear Recursive Polynomial Model for Holographic Data Storage Systems, Taehyung Kim[1], Gyuyeol Kong[1], Sooyong Choi[1]; *[1].* In order to improve the performance of equalization in quadratic holographic channel, an equalizer using two-dimensional binary recursive polynomial (BRP) model and its modified form of equalizer using BRP with decision feedback (BRPDFE) are proposed.

OTuD10
A Dual Layer Blu-ray Recordable Disc with Improved Archive Lifetime, Kun-Long Li[1], Ying-Yen Huang[1], Yung-Hui Hung[1], Cheng-Pi Li[1], Min-Hao Pan[1]; *[1]CMC Magnetics Corporation, Taiwan.* A dual layer BD-R disc with improved archive lifetime is introduced. After hundreds hours high temperature chamber test, measured jitter value remains within Specification. Arrhenius plot shows the theoretical archive lifetime more than 50 years in this dual layer BD-R disc.

OTuD11
Soft-Encoding Scheme of 3/4 Tone-Controllable Code for Channel Iteration of LDPC Code on the Holographic Data Storage, Donghyuk Park[1], Jaejin Lee[1]; *[1].* In holographic data storage system, if we use the LDPC code as an error correction code then we need the soft-encoding scheme for channel iteration. So, we proposed the soft encoder of 3/4 tone-controllable code.

OTuD12
Double-Referential Collinear Holographic Memory and Spatial Quadrature Amplitude Modulation, Keisuke Zukeran[1], Atsushi Okamoto[1], Atsushi Shibukawa[1], Masanori Takabayashi[1]; [1].A double-referential method, in which the reference light necessary for phase detection can be generated as diffraction light of the optical hologram automatically, is newly proposed. 16-SQAM signals can be reconstructed through dual-stage holography.

OTuD13
Hyper Numerical Aperture Blu-ray Disc Recording,Youngsik Kim[1], Tom D. Milster[1]; [1]*College of Optical Sciences, University of Arizona, USA.* We develop a hyper numerical aperture Blu-ray disc(HBD) recording system with a solid immersion lens(SIL). We use a phase change recording media with a 100μm cover-layer. The HBD pick-up consists of a SIL with a numerical aperture of 1.41 and a laser of 408nm.

OTuD14
Increasing Storage Density of Page-based Holographic Data Storage System by Image Restoration using PSF of Nyquist Aperture, Sang-Hyuck Lee[1], Sung-Yong Lim[2], Nakyeong KIm[2], No-Cheol Park[1], Hyunseok Yang[2], Kyoung-Su Park[1], Young-Pil Park[1]; [1]; [2]*Yonsei University, Republic of Korea.* The Nyquist aperture is used to increase the storage density. To reduce the bit errors caused by the Nyquist aperture, we applied an image restoration method which restores the degraded image in the enhanced spatial frequency domain using its PSF as a restoration filter.

OTuD15
Measurements of Nonlinear Mark Edge Shift for Phase Change Optical Disk Systems, Takaya Tanabe[1], Kohei Okubo[1], Tsutomu Ansai[1]; [1]*Ibaraki National College of Technology, Japan.* A method for evaluating the nonlinear mark edge shift of the phase change optical disk using auto-correlations of readout signals was presented and verified.

OTuD16
Nondestructive Readout of Photochromic Memory using Photocurrent Switching, Tsuyoshi Tsujioka[1]; [1]*Osaka Kyoiku University, Japan.* The photoisomerization of diarylethene (DAE) molecules switched the photocurrent. The switching is based on an ionization potential change of the DAE molecules. Excellent ON-OFF ratio and more than 800x10^3 readout cycles was demonstrated.

OTuD17
Super-resolution photoinduction-inhibition nanoscopy enabled three-dimensional optical data storage, Xiangping Li[1], Yaoyu Cao[1], Min Gu[1]; [1]*Centre for Micro-Photonics, Swinburne University of Technology, Australia.* In this paper we report on the using photoinduction-inhibition method to break the diffraction limit. Super-resolved recording bits as well as their application in three-dimensional optical data storage have been demonstrated

OTuD18
Nano- structure on Si-substrate by Using Innovative Nano-lithography Processes, You-Chen Weng[1]; [1]*department of Opto-electronic Engineering, National Dong Hwa Unversity, Taiwan.* using inorganic photo resist material with composition GeSbSnOx to nanolithrography process ,to fabricate nano honeycomb structure .The reflectance of the nanostructure in near visible light is 8~13%.

OTuD19
Signal Properties and Microstructure of Write-Once Blu-ray Disc Containing Cu-Al Alloy/Si Bi-layer as the Recording Medium, Hung-Chuan Mai[1], Tsung-Eong Hsieh[1], Shiang-Yao Jeng[2]; [1]*Department of Materials Science and Engineering, National Chiao Tung University, Taiwan;* [2]*Prodisc Technology Inc, Taiwan.* Signal properties and microstructure of write-once blu-ray (BD-R) disc containing Cu-Al alloy/Si bi-layer were investigated. Recording mechanism correlated to the formation of Cu- and Si-rich solid-solution phases and preliminary annealing in the marks was observed.

OTuD20

Research For Crosstalk And Black Matrix For 3D Display, Der-Ray Huang[1], Tzu-Chien Lin[1], Fu-Ha0 Chen[2]; *[1]Department of Opto-Electronic Engineering, NDHU, Taiwan; [2]Electro-Optics Laboratories, ITRI, Taiwan.* In 3D-lenticular display often use slanted lenticular to reduce Dead-zone problem, but in this kind of display the crosstalk will increasing with the slant angle ; to resolve this issue . By this way, we can eliminate the problems of overlapping and cresstalk, according to the simulation of ASAP we can verify the results is a feasible way to the 3D-lenticular display. In this research, I propose a spatial multiplexed auto-stereoscopic display with binocular parallax , motion parallax , multi-viewing zones and high resolution .

OTuD21

Nanofabrication for multi states of Ge2Sb2Te5 by femto-second laser induced forward transfer, Ming Lun Tseng[1], Bo Han Chen[1], Cheng Hung Chu[1], Chia Min Chang[1], Hai-Pang Chiang[2], Din Ping Tsai[3,4]; *[1]Physics, National Taiwan University, Taiwan; [2]Institute of Optoelectronic Sciences, National Taiwan Ocean University, Taiwan; [3]Instrument Technology Research Center, National Applied Research Laboratories, Taiwan; [4]Research Center for Applied Sciences, Academia Sinica, Taiwan.* The nano patterns of phase-change material Ge2Sb2Te5 are fabricated by the femto-second laser-induced forward transfer. The size and the phase state of the Ge2Sb2Te5 patterns can be effectively controlled by varying the laser fluence and film thickness. Also, the multilevel electronic states of fabricated patterns are observed through the C-AFM . This research has great potential in the area of the optical and the electrical data storage.

OTuE • Hybrid Recording (Special Session)

Kauai Ballroom, Ko'olau
19:00—21:30
Lambertus Hesselink; Department of Electrical Engineering, Stanford University United States;
No-Cheol Park; Center for Information Storage Device Korea, Republic of Korea; Presiders

OTuE1 • 19:00 Invited

Energy Assisted Magnetic Recording, Francis Liu[1]; *[1]Western Digital, USA.* Abstract not available.

OTuE2 • 19:30 Invited

Adjoint FDTD for Nanophotonic Device Optimization, Paul Hansen[1], Yuxin Zheng[2], Eugene Perederey[1], Lambertus Hesselink[1,2]; *[1]Applied Physics, Stanford Univ-Geophysics Dept, USA; [2]Electrical Engineering, Stanford University, USA.* We present a numerical technique for optimization of nanometallic structures. The sensitivity of optical behavior with respect to the nanostructure's shape may be efficiently obtained with two FDTD simulations and used for automatic optimization.

OTuE3 • 20:00 Invited

Hybrid Recording Technology, Tom Clinton[1]; *[1]Research, Hitachi Global Storage Technologies, USA.* Abstract not available.

OTuE4 • 20:30 Invited

Near Field Optical Characterization and Mechanical Flying Stability for HAMR., Young-Joo Kim[1]; *[1]School of Mechanical Engineering, Yonsei University, Republic of Korea.* Abstract not available.

OTuE5 • 21:00 Invited

Future of magnetic recording, Liu Bo[1]; *[1]Intermag, Canada.* Abstract not available.

• Wednesday, 20 July, 2011 •

OWA • Micro-hologram

Kauai Ballroom, Ko'olau
10:30—12:00
Yuzuru Takashima; Stanford University, Electrical Engineering Department United States;
Kimihiro Saito; Sony Corporation Japan; ; Presiders

OWA1 • 10:30 Invited
Recent Progress on Micro-holographic Data Storage, Eugene P. Boden[1], Kwok P. Chan[1], Dmitry V. Dylov[1], Evgenia M. Kim[1], Peter W. Lorraine[1]; P. J. McCloskey[1], M. J. Misner[1], A. Natarajan[1], Victor Ostroverkhov1; J. E. Pickett[1], Xiaolei Shi[1], Yuzuru Takashima[1,2], V. H. Watkins[1]; *[1]GE Global Research Center, USA; [2]Stanford University, USA.* Advances in micro-holographic materials and systems are presented. New materials show improved index change (10x) and sensitivity (100x) at >3x lower intensity vs. previously reported. Experimental results supporting single-sided optical drive concept is presented.

OWA2 • 11:00 Invited
Subdiffraction Microholograms in a Single-Photon, Uniformly Inhibited System, Robert R. McLeod[1], Benjamin A. Kowalski[1], Michael Cole[1]; *[1]Dept. of Electrical and Computer Eng, Univ. of Colorado at Boulder, USA.* Microholograms well below the diffraction limit are demonstrated in a photopolymer system with uniformly distributed inhibitor. This enables both increased storage density and increased readout signal via suppression of out-of-focus exposure. A model of the micron-scale reaction kinetics of the system is presented.

OWA3 • 11:30
Experimental Demonstration of Optical Phase Multi-Level Recording in Microhologram, Hideharu Mikami[1], Kentaro Osawa[1], Koichi Watanabe[1]; *[1]Hitachi, Ltd., Central Research Laboratory, Japan.* Optical phase was experimentally recorded in microholograms. Four-level phase modulation was successfully regenerated from weak 30-nW microholograms with errors of +7.0/-12.2 degrees, suggesting a further increase in the number of levels is possible.

OWA4 • 11:45
Proposal for Rewritable Microholographic Recording Using Polarization-Sensitive Materials,
Ryuichi Katayama[1], Shin Tominaga[2]; *[1]Fukuoka Institute of Technology, Japan; [2]NEC Corporation, Japan.* Rewritable microholographic recording using polarization-sensitive materials, in which polarization directions of a beam are recorded, is proposed. Polarization states for beams in the medium are switched with switchable waveplates. Recording and readout principles are explained.

OWB • Volume Recording

Kauai Ballroom, Ko'olau
14:00—15:30
James Chon; Swinburne University of Technology Australia;
Tom Milster; University of Artizona United States; Presiders

OWB1 • 14:00 Invited
Progress on Micro-reflector optical disc system, Kimihiro Saito[1], Seiji Kobayashi[1]; *[1]Sony Corporation, Japan.*
We review the Micro-Reflector optical disc system and report on an approach to investigate void formation recording mechanism with a computer simulation.

OWB2 • 14:30 Invited

Recent Progress On Gold Nanorod Based 5D Optical Storage, James W. Chon[1]; [1]*Centre for Micro-Photonics, Faculty of Engineering and Industrial Sciences, Swinburne University of Technology, Australia.* In this talk, I will discuss how the detuned scattering from gold nanorods can potentially replace the two-photon luminescence readout scheme in the future optical storage medium based on gold nanorods.

OWB3 • 15:00

Reduction of Interlayer Crosstalk in Multilayer Optical Disc by using Phase-Diversity Homodyne Detection, Tatsuro Ide[1], Kentaro Osawa[1], Hideharu Mikami[1], Koichi Watanabe[1]; [1]. We studied interlayer crosstalk in using phase-diversity homodyne detection on a multilayer optical disc. Simulations and experiments on a dual-layer disc having a layer spacing less than 10 μm showed that phase-diversity homodyne detection provided higher tolerance to interlayer crosstalk than the conventional intensity detection.

OWB4 • 15:15

Design and Implementation of Zoom Objectives for Multi-layer Optical Data Storage, Yuzuru Takashima[1]; [1].
A zoom objective lens has been designed and implemented based on a newly proposed power arrangement having a constant focal length and a linear movement of single zooming component for selection of recording layers.

Kauai Court, Coffee Break, 15:30 – 16:00

Kauai Ballroom, Ko'olau, Postdeadline Papers, 16:00 – 17:00

Key to Authors and Presiders
(**Bold** denotes Presider or Presenting Author)

2011 Nonlinear Optics (NLO) and Joint International Symposium on Optical Memory & Optical Data Storage (ISOM/ODS) Update Sheet and Exhibit Information

Nonlinear Optics (NLO)

NLO Blogger
The Young Professional Miaochan Zhi is serving as a dedicated blogger to 2011 NLO. Miaochan is affiliated with the Institute for Quantum Studies and Physics Department, Texas A&M. She's been a Young Professional for about a year and a half. Please take some time to visit her blog at nlomeeting.blogspot.com.

Withdrawn Presentations
NWB4 (invited)

Session Schedule Update
Session "NWB--Symposium Celebrating the 50th Anniversary of Nonlinear Optics II" will end at 12:00 instead of 12:30.

Presenter Changes
László Pálfalvi; *Inst. of Physics, Univ. of Pécs, Hungary* will present **NMC7, Towards Generation of mJ-Level Ultrashort THz Pulses by Optical Rectification.**

Presider Updates
Steven Cundiff, JILA/Univ. of Colorado and NIST, USA, will preside over session **NFB -- Nonlinear Spectroscopy II.**

Joint International Symposium on Optical Memory & Optical Data Storage (ISOM/ODS)

Withdrawn Presentations
OTuD17 (contributed)

Program Updates

Please note the author by-line and abstract update for invited presentation **OTuE4, Near Field Optical Characterization and Mechanical Flying Stability for HAMR.,** *Young-Joo Kim, Young-Pil Park[1]; [1]Department of Mechanical Engineering, Yonsei University, Republic of Korea.* The near-field opticalcharacterization was conducted witha grating based HAMR head and SPAH media as a function of wavelengths. A touch-down characterization was also analyzed to understand theflyingstabilitywith the laser module for the light delivery.

Please note the title, author by-line, and abstract update for invited presentation **OTuE1, Challenges of Energy Assisted Magnetic Recording,** Francis Liu, Kroum Stoev, Michael Alex, Michael Madison, Eric Champion, Christopher Wolf, Andreas Moser, Davide Guarisco, Matt Gibbons, Ram Acharya, Sudhir Malhotra, Alex Chernyshov**,** *Western Digital, USA***.** Energy assisted magnetic recording physics are studied by optical-thermal-magnetic modeling and spin-stand testing. Specifically, effects of DC-media noise, jitter noise, heat sink and head geometry to EAMR recording performance are discussed.

Presider Updates
Adam Urness, *Univ. of Colorado at Boulder, USA*, will co-preside over session **OMA -- Keynote/Nano-photonics.**

Atsushi Kikukawa, *Hitachi, Japan*, will co-preside over session **OMC – Components.**

Cheng Sun, *Northwestern Univ., USA*, will co-preside over session **OTuA -- Near-field/Plasmonics**.

Bernard Bell, *Seagate Technologies, USA*, will co-preside over session **OTuC -- Drive Technologies/Signal Processing.**

Luping Shi, *Data Storage Inst*., *Singapore*, and Takeshi Shimano, *Hitachi, Japan*, will preside over session **OWC – ISOM/ODS Postdeadline Session.**