

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

17 July - 20 July 2011, Kauai, Hawaii, United States

The ISOM/ODS technical sessions will be held along with NLO at the [Kauai Marriott Beach Resort](#). A shuttle will be provided courtesy of the ISOM/ODS committees. The shuttle will make continuous loops starting at the Kauai Beach Resort and going to the Kauai Marriott Beach Resort at the designated times below Sunday through Wednesday.

	Morning Loop	Lunch Loop	Afternoon Loop	Evening Loop
Sunday, 17 July			14:00–15:00	17:00–18:00
Monday, 18 July	07:00–08:00	12:30–13:30		18:45–19:45
Tuesday, 19 July	07:00–08:00	12:30–13:30	17:30–18:30	21:30–22:30
Wednesday, 20 July	07:00–08:00 and 9:30–10:30	12:30–13:30	17:30–18:30	21:00–22:00

The shuttle ride should take approximately 10 minutes each way. Please review the Schedule of Events and plan accordingly.

Self-parking, \$14 USD per day, and valet parking, \$17 USD per day, are both available at the Kauai Marriott Beach Resort.

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

Reflecting the international nature of the interest and work in optical memory and optical data storage, these two conferences are held jointly every third year. The unparalleled setting of this conference provides an outstanding opportunity to share the latest information in this dynamic field with your international colleagues.

The ISOM/ODS'11 offers an excellent forum for exchanging information on the status, advances, and future directions in the field of optical memory and optical data storage. Third generation high density recording systems using blue-violet lasers are growing in the commercial market. New developments in holographic, multi-dimensional, near-field, super-resolution, and hybrid recording technologies for the fourth generation systems will be the main focus at this conference.

New concepts based on nano-scale optical materials and phenomena will also be explored. Developments and methodologies in the areas of nano-photonics, plasmonics, spintronics, and bio-photonics are expected to influence future generation optical memory and optical data storage and will be in the spotlight of this conference.

Contributions from a variety of areas spanning from basic theory and modeling, testing and characterization to manufacturing and production methods including media and materials, components, coding and signal processing, drive technologies, and systems and applications for industrial and consumer use will be presented.

Special sessions on new concepts such as nano-photonics and future emerging technologies are also planned. Contributions on alternative technologies and theoretical studies from universities are strongly encouraged. Invited talks in many of these areas will round out the four-day program.

The conference chairs invite you to share your latest work with colleagues and network with leaders in the field including distinguished invited speakers and the program committee.

Topics to be Considered

- Holographic Recording
- Multi-Dimensional Recording
- Near-Field Recording
- Super-Resolution
- Hybrid Recording
- Advanced or Related Technologies
- Basic Theory and Modeling
- Testing and Characterization
- Media and Materials
- Components
- Coding and Signal Processing
- Drive Technologies
- Systems and Applications
- Nano-photonics
- Plasmonics
- Spintronics
- Bio-photonics
- Future Emerging Technologies

All OSA Meetings are peer reviewed. Accepted papers presented at the conference will be archived in Optics InfoBase, OSA's online library for OSA flagship journals and partnered and copublished journals.

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

17 July - 20 July 2011, Kauai, Hawaii, United States

Conference Program

The ISOM/ODS'11 offers an excellent forum for exchanging information on the status, advances, and future directions in the field of optical memory and optical data storage. 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

Invited Speakers

Recent progress on gold nanorod based 5D optical storage, James W. M. Chon, *Ctr. for Micro-Photonics, Faculty of Engineering and Industrial Sciences, Swinburne Univ. of Technology, Australia*

Ultrafast coherent switching of phase-change in rewritable optical media, Muneaki Hase, *Inst. of Applied Physics, Univ. of Tsukuba, Japan*

Fundamental Understanding of Near Field Transducers, Lambertus Hesselink, *Dept. of Electrical Engineering, Stanford Univ., USA*

Femtosecond laser based polarization multilevel storage, Wenhao Huang, *Univ. of Science and Technology of China, China*

Wavefront compensation for holographic data storage, Norihiko Ishii, Tetsuhiro Muroi, Nobuhiro Kinoshita, Koji Kamijo, Hiroshi Kikuchi, Naoki Shimidzu, *Science & Technology Research Laboratories, NHK (Japan Broadcasting Corp.), Japan*

All-semiconductor-laser light sources generating high-peak-power picosecond optical pulses, Masaru Kuramoto^{1,2}, Masao Ikeda^{1,2}, Hiroyuki Yokoyama¹, *¹NICHE, Tohoku Univ., Japan, ²Advanced Materials Labs, Sony Corp., Japan*

The role of nanotechnology in future data storage devices and systems, Masud Mansuripur, *College of Optical Sciences, The Univ. of Arizona, USA*

Subdiffraction Microholograms in a Single-Photon, Uniformly Inhibited System, Robert R. McLeod, *Univ. of Colorado at Boulder, USA*

A method to identify the vacancies in crystalline GeTe, Xiang Shui Miao, *Huazhong Univ. of Science and Technology, China*

Development and application of highly functional ultrashort pulse fiber lasers, Norihiko Nishizawa, *Dept. of Electrical Engineering and Computer Science, Graduate School of Engineering, Nagoya Univ., Japan*

High-speed Near Field Optical recording Using Plasmonic Flying Head, Liang Pan^{1,2}, Yong-Shik Park¹, Erick Ulin-Avila¹, Yi Xiong¹, Li Zeng¹, Cheng Sun^{1,3}, David B. Bogy^{1,2}, Xiang Zhang^{1,2}; ¹*NSF Nano-scale Science and Engineering Ctr. (NSEC), Univ. of California, Berkeley, USA*, ²*Computer Mechanics Laboratory, Dept. of Mechanical Engineering, Univ. of California, Berkeley, USA*, ³*Dept. of Mechanical Engineering, Northwestern Univ., USA*

Application of SIL based Near Field Recording Technology to High Speed Nano Patterning, No-Cheol Park, *Yonsei Univ., Japan*

Femtosecond nanoscale phase-change dynamics in GeSbTe thin films, Toshiharu Saiki, *Dept. of Electronics and Electrical Engineering, Keio Univ., Japan*

Progress on Micro-reflector optical disc system, Kimihiro Saito, *Sony Corp., Japan*

Nano Phase Change for Data Storage and Beyond, Luping Shi, *Data Storage Inst., Singapore*

Recent Progress on Micro-holographic Data Storage, Xiaolei Shi, *GE Global Research Ctr., USA*

Plasmonic coupling of near-field optical disk, Din Ping Tsai, *Dept. of Physics, National Taiwan Univ., Taiwan*

Nanophotonic polishing of substrate for application to hard-disk and optical disk processing, Takashi Yatsui, *Dept. of Electrical Engineering and Information Systems, School of Engineering, Univ. of Tokyo, Japan*

About The Joint International Symposium on Optical Memory & Optical Data Storage Topical Meeting

Reflecting the international nature of the interest and work in optical memory and optical data storage, these two conferences are held jointly every third year. The unparalleled setting of this conference provides an outstanding opportunity to share the latest information in this dynamic field with your international colleagues.

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Contributions from a variety of areas spanning from basic theory and modeling, testing and characterization to manufacturing and production methods including media and materials, components, coding and signal processing, drive technologies, and systems and applications for industrial and consumer use will be presented.

Special sessions on new concepts such as nano-photonics and future emerging technologies are also planned. Contributions on alternative technologies and theoretical studies from universities are strongly encouraged. Invited talks in many of these areas will round out the four-day program.

Papers are being considered in the following topic categories:

Fundamental studies and new concepts

- Holographic Recording
- Multi-Dimensional Recording
- Near-Field Recording
- Super-Resolution
- Hybrid Recording
- Advanced or Related Technologies
- Basic Theory and Modeling
- Testing and Characterization
- Media and Materials

- Components
- Coding and Signal Processing
- Drive Technologies
- Systems and Applications
- Nano-photonics
- Plasmonics
- Spintronics
- Bio-photonics
- Future Emerging Technologies

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

17 July - 20 July 2011, Kauai, Hawaii, United States

Special Events

[Luau](#)
[Hawaiian Cultural Workshop](#)
[ISOM/ODS Welcome Reception](#)
[Poster Sessions](#)
[Symposium Celebrating the 50th Anniversary of Nonlinear Optics](#)

Special Events

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 available as an additional product to all paid full technical registrants. To add luau tickets to an existing registration, contact custserv@osa.org or visit Registration on-site before 18.30, Monday, 18 July 2011. Tickets may be purchased for US\$ 110 for adults and US\$ 90 for children 12 and under. Children younger than 5 are free

Hawaiian Cultural Workshop for ODS 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.

To register for this workshop, [visit the registration page](#).

To add this workshop to an existing registration, contact custserv@osa.org.

ISOM/ODS Welcome Reception

A poolside ISOM/ODS Welcome Reception is planned for all ISOM/ODS attendees at the Kauai Beach Resort on Sunday, July 17th from 18.00 - 19.00. Please plan to attend to catch up with old friends and meet new ones.

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. x 8 ft. (1.22 m x 2.44 m) board on which to display the summary and results of his or her paper.

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**, Steve Harris, *Stanford Univ., USA*

Invited Speakers:

- **The Birth of Nonlinear Optics**, Nicolaas Bloembergen, *Univ. of Arizona, USA*
- **50 Years of Nonlinear Optics, Tunable Sources From OPOs to Coherent X-rays**, Robert Byer, *Stanford Univ., USA*
- **Vacuum Nonlinear Optics, Nonlinear QED**, Gérard Mourou, *Ecole Polytechnique, France*
- **Optical Parametric Amplifiers : From Broadly Tunable Past to Highly Powerful Future**, Algis Piskarskas, *Vilnius Univ., Lithuania*
- **Surface Nonlinear Optics**, Ron Shen, *Univ. of California at Berkeley, USA*
- **The Beginnings of Quantum Nonlinear Optics and Optical Phase Conjugation-Answers to Communication Challenges**, Amnon Yariv, *Caltech, US*

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

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ODS Program Committee

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General Chair
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Paul J. Wehrenberg, Apple Computer, Inc., USA

Aloha kākou! We are happy that you have joined us in Līhu‘e, Kaua‘i 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 Līhu'e and the rest of Kaua'i.

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 Hansen¹, Yuxin Zheng², Eugene Perederey¹, 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, <i>Kauai Court</i>		
Monday, 18 July			
7:00–18:30	Registration Open, <i>Kauai Court</i>		
8:00–8:15	Opening Remarks, <i>Kauai Ballroom, Kona</i>		Opening Remarks, <i>Kauai Ballroom, Ko'olau</i>
8:15–10:00	NMA • Materials I, <i>Kauai Ballroom, Kona</i>		OMA • Keynote/Nano-photonics (<i>ends at 10:15</i>)
10:00–10:30	Coffee Break & Exhibit Time, <i>Kauai Court</i>		
10:30–12:30	NMB • Quantum Optics I	NMC • Terahertz	(<i>starts at 10:45</i>) OMB • Holographic Memory
12:30–19:30	Free Afternoon for NLO Sessions (<i>on your own</i>)		
14:00 -- 15:45			OMC • Components
15:45 -- 17:15			OMD • ISOM/ODS Poster Session I, <i>Puna Ballroom</i>
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, <i>Kauai Court</i>		
8:00–10:00	NTuA • Plasmons and Solitons	NTuB • Nonlinear Spectroscopy I	OTuA • Near-field/Plasmonics
10:00–10:30	Coffee Break & Exhibit Time, <i>Kauai Court</i>		
10:30–12:30	NTuC • Solitons	NTuD • Materials II	OTuB • Femtosecond Applications/Phase-change
12:30–19:30	Free Afternoon for NLO Sessions (<i>on your own</i>)		
14:00--15:30			OTuC • Drive Technologies/Signal Processing
15:30--17:00			OTuD • ISOM/ODS Poster Session II, <i>Puna Ballroom</i>
19:00–21:00	Evening Registration Open, <i>Kauai Court</i>		
19:30–21:30	NTuE • Waveguides	NTuF • Biophotonics, Optomechanics and Optofluidics	(<i>starts at 19:00</i>) OTuE • Special Session on Hybrid Recording
Wednesday, 20 July			
7:30–17:30	Registration Open, <i>Kauai Court</i>		
8:00–10:00	NWA • Symposium Celebrating the 50th Anniversary of Nonlinear Optics I, <i>Kauai Ballroom, Kona</i>		
10:00–10:30	Coffee Break & Exhibit Time, <i>Kauai Court</i>		
10:30–12:30	NWB • Symposium Celebrating the 50th Anniversary of Nonlinear Optics II, <i>Kauai Ballroom, Kona</i>		OWA • Micro-hologram (<i>ends at 12:00</i>)
12:30–14:00	Lunch Break (<i>on your own</i>)		
14:00–15:30	NWC • Quantum Optics II	NWD • Frequency Comb Generation	OWB • Volume Recording
16:00--17:00	NWE • NLO Poster Session, <i>Puna Ballroom</i>		OWC • ISOM/ODS Postdeadline Session
15:30–17:30			
18:00–21:00	Luau, <i>Luau Gardens (Rain back-up: Ka Mala)</i>		
Thursday, 21 July			
7:30–12:30	Morning Registration Open, <i>Kauai Court</i>		
8:00–10:00	NThA • High Intensities, <i>Kauai Ballroom, Kona</i>		
10:00–10:30	Coffee Break & Exhibit Time, <i>Kauai Court</i>		
10:30–12:30	NThB • Photonic Crystal and Waveguides Arrays	NThC • Modelocked Lasers and Continuum Generation	
12:30–19:30	Free Afternoon (<i>on your own</i>)		
19:00–21:00	Evening Registration Open, <i>Kauai Court</i>		
19:30–21:30	NThD • Nanophotonics, <i>Kauai Ballroom, Kona</i>		
Friday, 22 July			
7:30–12:00	Morning Registration Open, <i>Kauai Court</i>		
8:00–10:00	NFA • Frequency Combs and Waveform Synthesis, <i>Kauai Ballroom, Kona</i>		
10:00–10:30	Coffee Break & Exhibit Time, <i>Kauai Court</i>		
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 Fejer¹; 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 Badikov¹, Dmitrii Badikov¹, Galina Shevyrdyaeva¹, Aleksey Tyazhev², Georgi Marchev², Vladimir Panyutin², Frank Noack², Valentin Petrov², Albert Kwasniewski³; 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 Boulanger¹; 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 Ishizuki¹, Takunori Taira¹; 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 Hara¹, Konosuke Takayanagi¹, Shinnosuke Matsumoto¹, Maki Nakajima¹, Ichiro Shoji¹; 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 Howell¹, David J. Starling¹, Paul B. Dixon¹, Andrew Jordan¹; 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 Huang¹, Xiaorong Gu¹, Min Ren¹, Yi Jian¹, Haifeng Pan¹, Guang Wu¹, E. Wu¹, Heping Zeng¹; 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 upconversion. 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 Zaske¹, Andreas Lenhard¹, Christoph Becher¹; 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 Nawata¹, Atsushi Sato², Kazuhiro Asai², Hiromasa Ito¹, Hiroaki Minamide¹; 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 Hasselbeck¹, Chia-Yeh Li¹, Jeffrey Cederberg², Aaron Katzenmeyer³, Maria Toimil-Molares³, Francois Leonard³, Albert Talin³, Mansoor Sheik-Bahae¹; 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 Suizu¹; 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 Fan¹, Jung-Tsung Shen², Sukru E. Kocabas¹; ¹*Electrical Engineering, Stanford University, USA*; ²*Electrical and System Engineering, Washington University 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 Katsuragawa¹; 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 Huang¹, Kahraman Köprülü¹, Geraldo A. Barbosa¹, Prem Kumar¹; 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. Solntsev¹, Andrey A. Sukhorukov¹, Dragomir N. Neshev¹, Yuri S. Kivshar¹; 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 Ropagnol¹, Roberto Morandotti², Tsuneyuki Ozaki³, Matt Reid⁴; 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 Notake¹, Yuye Wang¹, Kouji Nawata¹, Hiroshi Kawamata¹, Hiroaki Minamide¹; 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. Fülöp¹, Zoltán Ollmann¹, László Pálfalvi¹, Gábor Almási¹, János Hebling¹; 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 Venkataraman¹, Kasturi Saha¹, Pablo Londero¹, Alex Gaeta¹; 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 Wahlstrand¹, Haipeng Zhang^{1,2}, Soobong Choi¹, 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 Nevet¹, Alex Hayat¹, Meir Orenstein¹; 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. Fishman¹, Scott Webster¹, Lazaro A. Padilha^{1,3}, Morgan Monroe¹, 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-Bahae¹, Denis Seletskiy¹; 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 Bhandari¹, Takunori Taira²; 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 Marandi¹, Nick Leindecke¹, Konstantin Vodopyanov¹, Robert Byer¹; 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 Shao¹, Vincent Pouget¹, Emeric Faraud¹, Camille Larue¹, Dale McMorrow², Dean Lewis¹; ¹IMS, University Bordeaux 1, France; ²Naval 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 Kanda¹, Takuya Higuchi¹, Hirokatsu Shimizu¹, Kuniaki Konishi^{1,2}, Kosuke Yoshioka^{1,3}, Makoto Kuwata-Gonokami^{1,2}; ¹Department of Applied Physics, The University of Tokyo and CREST(JST), Japan; ²Photon Science Center, The University of Tokyo, Japan; ³Department 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 led 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 Tamaru¹, Makoto Kuwata-Gonokami^{1,2}; ¹Univ. of Tokyo, Japan; ²CREST-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 Halonen¹; ¹Dpt. of Chemistry, University of Helsinki, Finland; ²Centre 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 Peterson¹, Ryan Feaver^{1,2}, Peter Powers²; ¹AFRL/RYMWA, Air Force Research Lab, USA; ²Electro-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 Foltynowicz¹; ¹USURF, 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 Skupin³, Ole Bang¹, Wieslaw Krolikowski²; ¹DTU Fotonik, Technical University of Denmark, Denmark; ²Australian National University, Australia; ³Max 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 Randhawa¹, Jan Renger¹, Alexey Krasavin², Anatoly Zayats², Lacheze Sebastien³, Alex Bouhelier³, Romain Quidant¹; ¹The Institute of Photonic sciences, Spain; ²Department of physics, King's College, United Kingdom; ³Institut 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 B ejot; 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 Akahane³, Naokatsu Yamamoto³, Kazuhiro Ema⁴, Masahide Sasaki³; ¹Keio University, Japan; ²PRESTO, JST, Japan; ³NICT, Japan; ⁴Sophia 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 Kannari¹, Tomoya Ikuta¹, Ryuji Itakura², Kouichi Hosaka², Hiroshi Akagi², Kaoru Yamanouchi^{3,2}, Atsushi Yokoyama²; ¹Electronics & Electrical Engineering, Keio University, Japan; ²Quantum Beam Science Directorate, Kansai Photon Science Institute, Japan; ³Chemistry, 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 Sederberg¹, Abdul Elezzabi¹; ¹University 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-Colberg¹, Agustin Schiffrin¹, Daniel Gerster², Sascha Mühlbrandt¹, Nicholas Karpowicz¹, Joachim Reichert², Johannes Barth², Ralph Ernstorfer³, Reinhard Kienberger^{1,2}, Ferenc Krausz^{1,4}; ¹*Abteilung für Attosekundenphysik, Max Planck Inst. of Quantum Optics, Germany*; ²*Technische Universität München, Germany*; ³*Fritz Haber Inst., Germany*; ⁴*Ludwig-Maximilians-Universität, 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 Katte¹, Joseph W. Haus¹, Peter Powers¹, Andrew Sarangan¹, Jian Gao¹, Michael Scalora²; 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 Araújo¹, Edilson L. Falcão-Filho¹, Georges Boudebs², Hervé Leblond², Vladimir Skarka²; 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 Wong¹, Huimin Su¹, Zsolt Marczet^{1,2}, Ho Bun Chan^{1,2}, Zhi Hong Hang¹, Che Ting Chan¹; 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 Bache¹, Ole Bang¹, Binbin Zhou¹, Jeffrey Moses², Frank Wise³; 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 Leitenstorfer¹; 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 Ehlert¹, Adrienne Prem¹, Loucas Loumakos¹, Michael C. Downer¹; 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. Nelson¹; 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.

NTuC • Solitons

Kauai Ballroom, Kona

10:30–12:30

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

NTuC1 • 10:30

Invited

Discrete solitons, Demetrios Christodoulides¹; ¹University 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 Heinrich¹, Robert Keil¹, Felix Dreisow¹, Stefan Nolte¹, Alexander Szameit¹; ¹Physics, 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 Levi¹, Mikael Rechtsman¹, Barak Freedman¹, Yevgeny Krivolapov¹, Tal Schwartz¹, Ofer Manela¹, Mordechai Segev¹, Shmuel Fishman¹; ¹Physics, 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

Benôit Boulanger; Joseph Fourier Univ., France, Presider

NTuD1 • 10:30

Quartz Revisits Nonlinear Optics: Vacuum-UV Emission in Phase Matching, Sunao Kurimura¹, Masaki Harada^{1,2}, Ken-ichi Muramatsu², Motoi Ueda², Muneyuki Adachi^{1,3}, Tsuyoshi Yamada³, Tokio Ueno³; ¹Nat'l Inst. for Mat. Sci, Japan; ²Nikon Corp., Japan; ³Nidek 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. Smith¹, Ekaterina Poutrina¹, Da Huang¹, Alec Rose¹, Stephane Larouche¹; ¹Center 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 Cha¹, Byoung Joo Kim¹, Hee Joo Choi¹; ¹Pusan 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 Canalias¹, Andrius Zukauskas¹, Valdas Pasiskevicius¹, Fredrik Laurell¹; ¹Applied 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.

NTuC4 • 11:30

Control of soliton collision-induced enhancement of supercontinuum bandwidth in photonic crystal fiber fiber by variation of pump pulse duration, Marco Andreana¹, Alexis Labruyère¹, Alessandro Tonello¹, Stefan Wabnitz², Philippe Leproux¹, Vincent Couderc¹, Charles Duterte³, Andras Csereg³, Anthony Bertrand³, Yves Hernandez³, Domenico Giannone³, Stéphane Hilaire⁴, Guillaume Huss⁴; ¹XLIM - Université de Limoges, France; ²Dipartimento di Ingegneria dell'Informazione, Università di Brescia, Italy; ³Multitel asbl, Belgium; ⁴Leukos, 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 Abbott¹, David C. Smith¹, Keith R. Daly², Gaimpaolo D'Alessandro², Malgosia Kaczmarek¹; ¹School of Physics and Astronomy, University of Southampton, United Kingdom; ²School 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 Erkintalo¹, Goëry Genty¹, Benjamin Wetzel², John M. Dudley²; ¹Tampere University of Technology, Finland; ²Université 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 Gao¹, Lei Tian², Baile Zhang³, George Barbastathis^{2,3}; ¹Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology, USA; ²Department of Mechanical Engineering, Massachusetts Institute of Technology, USA; ³Singapore-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.

NTuD5 • 11:45

Thermal Management in High Power CW SHG Characterized by PMC, Hwan Hong Lim¹, Toshio Katagai², Sunao Kurimura¹, Noriaki Ohmae³, Norikatsu Mio³, Takahiro Shimizu², Ichiro Shoji²; ¹National institute for material science (NIMS), Japan; ²Department of Electrical, Electronic, and Communication Engineering, Chuo University, Japan; ³Department 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 Tehrani¹, Raman Kashyap^{1,2}; ¹Electrical Engineering Dept., Ecole Polytechnique, University of Montreal, Canada; ²Engineering 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 flat-top responses with bandwidths >141 nm for grating lengths <1 cm can be achieved.

NTuD7 • 12:15

Third Harmonic Generation in Silica Microfibres, Timothy Lee¹, Yongmin Jung¹, Christophe Codemard¹, Gilberto Brambilla¹, Neil G. Broderick²; ¹Optoelectronics Research Centre, University of Southampton, United Kingdom; ²Physics, 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 1.55µm 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-Davies¹; 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 Savanier¹, Aristide Lemaître², Christophe Manquest¹, Filippo Ghiglieno¹, Ivan Favero¹, Sara Ducci¹, Giuseppe Leo¹; 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 Xu¹, 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 Flom¹, San-Hui Chi¹, Armand Rosenberg¹, Animesh Nayak^{2,3}, Timothy V. Duncan³, Michael J. Therien³, James J. Butler⁴, Steven R. Montgomery⁵, Guy Beadie¹, James S. Shirk¹; 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 Amazutsumi¹, Junya Ota¹, Tomonori Matsushita¹, Takashi Kondo¹; 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 Matsushita¹, Kazuhiro Iwamoto¹, Junya Ota¹, Takashi Kondo¹; 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 Agrawal¹, Xiang Shou¹, Ajay Nahata¹; 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 Elazar¹, Victor Fleurov¹, Shimshon Barad¹; 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 Ma¹, I-Ning Hu¹, Almantas Galvanauskas¹; 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 Deleglise¹, Stefan Weis¹, Rémi Rivière¹, Albert Schliesser^{1,2}, Ewold Verhagen¹, Emanuel Gavartin¹, Xiao qing Zhou¹, Pierre Verlot¹, Leonard Neuhaus¹, 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 Wang¹, Takashi Notake¹, Kouji Nawata¹, Hiroshi Kawamata¹, Hiromasa Ito¹, Hiroaki Minamide¹; 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 Segev¹; 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 Lipson¹, Gustavo Wiederhecker¹, Sasikanth Manipatruni¹, Sunwoo Lee¹; 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 Harris¹; 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 Bloembergen¹; 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 Yariv¹; 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 Shen¹; 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 Byer¹; 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 Mourou¹; 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 Piskarskas¹; 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 Chu¹, Emre Togan¹, Mikhail Lukin¹; 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 Shin¹; 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 Shwartz¹, Steve Harris¹; 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 Kues¹, Nicoletta Brauckmann¹, Petra Gross¹, Carsten Fallnich¹; ¹*Institute of Applied Physics, Westfälische 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 Matsko¹, Anatoliy Savchenkov¹, Wei Liang¹, Vladimir Ilchenko¹, David Seidel¹, Lute Maleki¹; 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 Vodopyanov¹; 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 Ma¹, Matthew Rakher¹, Martin Stevens², Oliver Slattery¹, Kartik Srinivasan¹, Xiao Tang¹; ¹NIST, USA; ²NIST, 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 Rivoire¹, Sonia Buckley¹, Arka Majumdar¹, Hyochul Kim², Pierre Petroff², Jelena Vuckovic¹; ¹Stanford, USA; ²University 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 Papp¹, Scott Diddams¹; ¹Time 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.

Puna Ballroom

Wednesday, 20 July, 2011

15:30-17:30

NWE1

Fredkin Gates in $\chi(2)$ Microdisks via Quantum Zeno Blockade, Yuping Huang¹, Prem Kumar¹; 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 Li¹, Takuya Higuchi¹, Natsuki Kanda¹, Kuniaki Konishi¹, Makoto Kuwata-Gonokami¹; 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. Seidel¹, Zhengyang Zhang¹, Suxia Yan¹, Howe-Siang Tan¹; 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 Piccardi¹, Alessandro Alberucci¹, Gaetano Assanto¹, Nelson Tabiryan²; 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 Wilson³, 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 Nevet¹, Alex Hayat¹, Meir Orenstein¹; 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 Kaczmarek¹, Gaetano Assanto², Armando Piccardi², Alessandro Alberucci²; 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 Chuu¹, Steve Harris¹; ¹*Edward L. Ginzton Laboratory, Stanford University, USA*. We calculate the properties 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 Liao¹, Xin Yan¹, Weiqing Gao¹, Zhongchao Duan¹, Takenobu Suzuki¹, Yasutake Ohishi¹; 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 Petrov¹, Frank Noack¹; 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 Buckley¹, Kelley Rivoire², Jelena Vuckovic³; 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 Hu¹, Dmitry A. Fishman¹, Scott Webster¹, Marcus Seidel¹, 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 Fukuchi¹, Joji Maeda¹; 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 Schiek¹; 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 Steffensen¹, Karsten Rottwitt¹, Peter U. Jepsen¹, Ole Bang¹; 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 Setzpfandt¹, Andrey A. Sukhorukov², Thomas Pertsch¹; 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 chromophore-doped amorphous ferroelectric polymers, Atsushi Sugita¹, Masashi Morimoto¹, Yasuaki Tamaki¹, Nobuyuki Mase¹, Kawata Yoshimasa¹, Shigeru Tasaka¹; ¹*Shizuoka University, 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 Wang¹, Yuanli Zhang¹, Qun Zhao², Gary M. Gray², Christopher M. Lawson¹; 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 Elahi¹, Ibrahim Levent Budunoglu¹, Kutun Gürel¹, Fatih Ilday¹; 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 Boudebs¹, Kamil Fedus¹; 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 Williams¹, Eli Shlizerman¹, J. Nathan Kutz¹; 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 Hayashi¹, Hiroshi Sakai², Takunori Taira³, Hiroaki Minamide¹, 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 Liu¹; 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 Popmintchev¹, Andrius Baltuška¹, Margaret Murnane¹, Henry C. Kapteyn¹; ¹JILA/Univ. of Colorado, USA. We demonstrate bright coherent X-ray supercontinua at photon energies $>1.6\text{keV}$ ($<7.8\text{\AA}$) 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 Mennerat¹, O. Bonville¹, B. Le Garrec¹, Ph. Villeval¹, S. Durst¹, D. Lupinski¹, A. Kokh¹, N. Kononova¹, V. Vlezko¹, K. Kokh¹; ¹Commissariat à l'Énergie 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 Midorikawa¹; ¹RIKEN, 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. Seaberg¹, Daniel E. Adams¹, Chien-Chun Chen², Jianwei Miao², William F. Schlotter³, Yanwei Liu⁴, Carmen Menoni⁵, Margaret Murnane¹, Henry C. Kapteyn¹; ¹Department of Physics and JILA, University of Colorado, USA; ²Department of Physics, University of California, USA; ³SLAC National Accelerator Laboratory, USA; ⁴Center for X-ray Optics, Lawrence Berkeley National Laboratory, USA; ⁵Department 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 Young¹, Haijun Qiao¹, Keith A. Abel², Andras G. Pattantyus-Abraham¹, Murray W. McCutcheon¹, Georg W. Reiger¹, Charles Foell¹, Ellen Schelew¹, Frank van Veggel²; ¹Department of Physics and Astronomy, University of British Columbia, Canada; ²Chemistry, 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 Sivan¹, John B. Pendry¹; ¹Imperial College London, United Kingdom. We propose a new time-reversal scheme for optical pulses which overcomes the limitations of existing schemes. 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 Klopfer¹, L. Wang¹, R. K. Jain¹; ¹University 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. Sukhorukov¹; ¹Nonlinear Physics Centre, RSPE, Australian National University, Australia; ²Laser 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 Sorokin¹, Nikolai Tolstik², Irina T. Sorokina²; ¹Vienna University of Technology, Austria; ²Physics 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 Jirauschek¹, Fatih Ilday²; ¹Institute for Nanoelectronics, TU Muenchen, Germany; ²Department 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 Kutz¹, Edwin Ding¹; ¹Applied 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 Wise¹; ¹Applied 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 Cisek¹, Nehad Hirmiz¹, Ankur Saxena², Alexander Shik², Harry Ruda², Virginijus Barzda¹; 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 Eilenberger¹, Stefano Minardi¹, Frank Setzpfandt¹, Thomas Pertsch¹; 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 Setzpfandt¹, Andrey A. Sukhorukov², Dragomir N. Neshev², Roland Schiek³, Alexander S. Solntsev², Falk Eilenberger¹, Stefano Minardi¹, Raimund Ricken⁴, Yoohong Min⁴, Wolfgang Sohler⁴, Yuri S. Kivshar², Thomas Pertsch¹; 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 Schäfer¹, Christian Fries¹, Johannes A. L'huillier¹; 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. Ensley¹, Dmitry A. Fishman¹, Scott Webster¹, 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 ($\sim 10^{-3}$) 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 Zhang¹, Yi Qiu¹, Jianbing Xu¹, Kenneth K. Y. Wong¹, Kevin K. Tsia¹; 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 Gaeta¹; 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 Soljacic¹; 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 Stockman¹; ¹*Georgia State Univ., USA*. Abstract Not Available

NThD4 • 21:00

Optical Nonlinear Properties of Light-tunneling Heterostructures, Hong Chen¹; 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. Klimov¹; 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 Fabre¹, Nicolas Treps¹, Beniot Chalopin¹, German J. de Valcarcel¹, Jinxia Feng¹, Renne Medeiros¹, G. Patera¹, O. Pinel¹, Pu Jian¹; 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 Weiner¹; 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 Ye¹; 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 Hsieh², Wei-Hong Liang², Chien-Jen Lai⁵, Chao-Kuei Lee⁶, Ru-Pin Pan³, Lung-Han Peng⁴; ¹*Institute of Photonics Technologies, National Tsing Hua University, Taiwan*; ²*Institute of Atomic and Molecular 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 Zhi¹, Kai Wang¹, Xia Hua¹, Alexei Sokolov¹; 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 Béjot¹; 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. Keshav¹, Jinho Lee¹, Sharma Rishi², Aditya D. Mohite¹, Charudatta C. Galande³, Pulickel M. Ajayan³, Andrew M. Dattelbaum¹, Han Htoon¹, Antoinette J. Taylor¹, Rohit P. Prasankumar¹; 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 Papazoglou³, Stelios Tzortakis³, Mark Kuzyk⁴; ¹*College of Engineering, King Fahd 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 Masuda², Ladan Arissian¹; 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 Ahn¹, Jongseok Lim¹, Jae-uk Kim¹, Han-gyeol Lee¹; 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 5P_{1/2} and 5P_{3/2} levels in atomic Rb V-type energy system.

NFB6 • 12:15

Second-harmonic generation spectroscopic study of silicon nanocrystals embedded in SiO₂, Junwei Wei¹; 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 Hesselink¹; 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 Mansuripur¹; 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 Park¹, Erick Ulin-Avila¹, Yi Xiong¹, Li Zeng¹, Cheng Sun^{1,3}, David Bogy^{1,2}, Xiang Zhang¹; 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.

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 Ishii¹, Tetsuhiko Muroi¹, Nobuhiro Kinoshita¹, Koji Kamijo¹, Hiroshi Kikuchi¹, Naoki Shimidzu¹; ¹Science & 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 Honma¹, Tatsuya Hasegawa¹, Yuta Ishihara¹, Toru Sekiguchi¹; 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 Kunori¹, Atsushi Okamoto¹, Akihisa Tomita¹, Masanori Takabayashi¹; ¹Hokkaido 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 Takabayashi¹, Atsushi Okamoto¹; 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 Nakamura¹, Ken-ichi Shimada¹, Toshiki Ishii¹, Hajime Ishihara¹, Makoto Hosaka¹, Taku Hoshizawa¹; ¹Yokohama Research Laboratory, Hitachi, Ltd., Japan. A high-density recording 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 Hosaka¹, Toshiki Ishii¹, Taku Hoshizawa¹; ¹Yokohama 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 Yokoyama²; ¹Advanced materials laboratory, Sony corporation, Japan; ²New 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 Nishizawa¹; ¹Electrical 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 Mikami¹, Takahiro Kurokawa¹, Koichi Watanabe¹; ¹Hitachi, 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 Tatsu¹, Shigeharu Kimura¹, Tatsuro Ide¹, Takahiro Kurokawa¹, Koichi Watanabe¹; 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 Takeda¹, Suguru Nakatani¹; ¹Kyoto Institute of Technology, Japan. We fabricated a plasmonic lens with only a several micron diameter ring slit and confirmed that it can produce 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

Puna Ballroom

15:45 --17:15

OMD1

Müller Matrix Characterisation of μ -SIL, Carlos Macias-Romero¹, Peter Török¹, Matthew R. Foreman¹; 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. Chernoff¹, David L. Burkhead¹; 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 Kim¹, Gyuyeol Kong¹, Sooyong Choi¹; 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 Kim¹; 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 Honma¹, Yasuaki Yagisawa¹, Hidetomo Momose¹, Toru Sekiguchi¹; 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 Li¹, Min Gu¹; 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 Oh¹, Seungho Lim¹, Kyoung-Su Park¹, No-Cheol Park¹, Young-Pil Park¹, Jae-Sung Lee², Han-Baek Lee²; 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 Jiang¹, Barry M. Lunt¹, Travis Niederhauser², Matthew Linford¹; 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 Kim¹, Gyuyeol Kong¹, Sooyong Choi¹; 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. Lunt¹, Douglas Hansen², Matthew Linford¹; 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 Kong¹, Sooyong Choi¹; 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 Han¹; 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 Kim¹, Jaejin Lee¹; 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 Kim¹, Jinyoung Kim¹, Jaejin Lee¹; 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 Ou¹, Po-Cheng Kuo¹, Han-Feng Chang², Chin-Yen Yeh², Chao-Te Lee³, Donyau Chiang³; 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 In₁₀Ge_xSb_{52-x}Sn₂₃Te₁₅ 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 Shibukawa¹, Atsushi Okamoto¹, Akihisa Tomita¹, Masanori Takabayashi¹, Kunihiro Sato², Masatoshi Bunsen³; 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 Jeon¹, Sungbin Im¹; 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 Takeshita¹, Tomo Kishigami¹, Koichi Ikuta²; 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.

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OMD19

Withdrawn

OMD20

CuSi thin film for write-once blue laser optical recording, Sin-Liang Ou¹, Po-Cheng Kuo¹, Han-Feng Chang², Chin-Yen Yeh², Chao-Te Lee³, Donyau Chiang³; 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 Wu¹; 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 Funakoshi¹, Atsushi Okamoto², Masanori Takabayashi², Yuta Wakayama², Atsushi Shibukawa²; 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 Koo¹, Soo-Yong Kim^{2,1}, Jae Jin Jeung¹, Sang Woo Kim¹; 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 Tong¹, Xiangshui Miao¹; 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 Urness¹; 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

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OME3 • 18:00

An Approach for Measurements of Optical Constants for Molten Sb₂Te₃ by Spectroscopic Ellipsometer, Masashi Kuwahara¹, Rie Endo², Kouichi Tsutsumi³, Fukuyoshi Morikasa⁴, Tishio Fukaya¹, Masahiro Susa², Michio Suzuki³, Tomoyoshi Endo⁴; 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 Nonaka¹, Kouichi Nitta¹, Osamu Matoba¹; 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 Lee¹; 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 Yatsui¹, Wataru Nomura¹, Motoichi Ohtsu¹; ¹Univ 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 Park¹, Byung-Kwon Min², Young-Pil Park¹, Hyunseok Yang¹, Kyoung-Su Park¹, Sung-Mook Kang¹; ¹Center for Information Storage Device, Republic of Korea; ²Department 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 Koide¹, Takeshi Kajiyama¹, Haruki Tokumaru¹, Yoshimichi Takano², Yuta Nabata³, Tokoku Ogata³, Toshimasa Miyazaki³, Kiyoshi Ohishi³; ¹NHK (Japan Broadcasting Corp.), Japan; ²NHK Engineering Service, Japan; ³Nagaoka 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 Chabalko¹, Tuviah E. Schlesinger¹, Daniel D. Stancil¹, Yi Luo¹, James A. Bain¹; ¹Electrical 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 Min¹, Do-Hyung Kim², Janghyun Cho², No-Cheol Park¹, Kyoung-Su Park¹, Hyunseok Yang¹, Young-Pil Park¹; ¹Department of Mechanical Engineering, Yonsei University, Republic of Korea; ²Center 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.

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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 Hase¹, Kotaro Makino¹, Junji Tominaga²; ¹Institute of Applied Physics, University of Tsukuba, Japan; ²Nanodevice 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. Hira¹, Y. Hongo¹, K. Tajima¹, N. Kitamura¹, T. Homma¹, Toshiharu Saiki¹; ¹Department 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 Huang¹, Yanlei Hu¹; 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 Shi¹; ¹Data 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 Urakawa¹, Yoshihiko Deoka¹, Yuichi Suzuki¹, Tomoharu Mukasa¹, Junichi Horigome¹; ¹Core 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 Kikukawa¹, Hideharu Mikami¹, Tatsuro Ide¹, Kentaro Osawa¹, Koichi Watanabe¹; 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.

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OTuC3 • 14:30

Inter-track Crosstalk Canceling PRML Decoder for High Density Optical Disc, Hajime Ishihara¹, Yusuke Nakamura¹, Taku Hoshizawa¹; 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 Ogata¹, Yuta Nabata¹, Tatsuya Nakazaki¹, Kiyoshi Ohishi¹, Toshimasa Miyazaki¹, Masaki Sazawa¹, Daiichi Koide², Yoshimichi Takano², Haruki Tokumaru²; 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 Lim¹, Wonseok Oh¹, Byunghan Ko¹, Ungrae Cho², Kyoung-Su Park¹, No-Cheol Park¹, Young-Pil Park¹, Han-Baek Han³; 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 Mao¹, Junho Huh¹, Keunhwi Koo², Sang Woo Kim²; ¹*Emerging SOC Development, Samsung Electronics Co., Republic of Korea*; ²*Electrical 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 Kim¹, Gyuyeol Kong¹, Sooyong Choi¹; 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 Yamagishi¹; 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 Lee¹; 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.

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OTuD4

Simplified Two-Dimensional Partial Response Maximum Likelihood Detection Method Using a Priori Information for Holographic Data Storage Systems, Gyuyeol Kong¹, Sooyong Choi¹; 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. Lunt¹, Erin Bourgeois¹, Bradley M. Lunt¹; 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 Török¹; ¹*Imperial College London, United Kingdom*. SURPASS aims to develop and combine two superresolution technologies, namely near field detection with μ SILs 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 Chen¹, Pin Chieh Wu¹, Chen Jung Chen¹, Chun-Jen Weng², Hsin-Chen Lee³, Ta-Jen Yen³, Chieh-Hsiung Kuan⁴, Masud Mansuripur⁵, 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 Kong¹, Sooyong Choi¹; 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 Kim¹, Gyuyeol Kong¹, Sooyong Choi¹; 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 Li¹, Ying-Yen Huang¹, Yung-Hui Hung¹, Cheng-Pi Li¹, Min-Hao Pan¹; 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 Park¹, Jaejin Lee¹; 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 Zukeran¹, Atsushi Okamoto¹, Atsushi Shibukawa¹, Masanori Takabayashi¹; ¹A 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 Kim¹, Tom D. Milster¹; ¹College 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 100 μ m 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 Lee¹, Sung-Yong Lim², Nakyeong Kim², No-Cheol Park¹, Hyunseok Yang², Kyoung-Su Park¹, Young-Pil Park¹; ¹; ²Yonsei 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 Tanabe¹, Kohei Okubo¹, Tsutomu Ansai¹; ¹Ibaraki 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 Tsujioka¹; ¹Osaka 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 800x10³ readout cycles was demonstrated.

OTuD17

Super-resolution photoinduction-inhibition nanoscopy enabled three-dimensional optical data storage, Xiangping Li¹, Yaoyu Cao¹, Min Gu¹; ¹Centre 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 Weng¹; ¹department of Opto-electronic Engineering, National Dong Hwa University, Taiwan. using inorganic photo resist material with composition GeSbSnOx to nanolithography 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 Mai¹, Tsung-Eong Hsieh¹, Shiang-Yao Jeng²; ¹Department of Materials Science and Engineering, National Chiao Tung University, Taiwan; ²Prodisc 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.

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OTuD20

Research For Crosstalk And Black Matrix For 3D Display, Der-Ray Huang¹, Tzu-Chien Lin¹, Fu-Ha0 Chen²; 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 crosstalk, 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 Tseng¹, Bo Han Chen¹, Cheng Hung Chu¹, Chia Min Chang¹, Hai-Pang Chiang², 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 Liu¹; ¹*Western Digital, USA*. Abstract not available.

OTuE2 • 19:30 Invited

Adjoint FDTD for Nanophotonic Device Optimization, Paul Hansen¹, Yuxin Zheng², Eugene Perederay¹, 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 Clinton¹; 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 Kim¹; ¹*School of Mechanical Engineering, Yonsei University, Republic of Korea*. Abstract not available.

OTuE5 • 21:00 Invited

Future of magnetic recording, Liu Bo¹; 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;

Kimihiko Saito; Sony Corporation Japan; ; Presiders

OWA1 • 10:30 Invited

Recent Progress on Micro-holographic Data Storage, Eugene P. Boden¹, Kwok P. Chan¹, Dmitry V. Dylov¹, Evgenia M. Kim¹, Peter W. Lorraine¹, P. J. McCloskey¹, M. J. Misner¹, A. Natarajan¹, Victor Ostroverkhov¹; J. E. Pickett¹, Xiaolei Shi¹, Yuzuru Takashima^{1,2}, V. H. Watkins¹; ¹GE Global Research Center, USA; ²Stanford 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. McLeod¹, Benjamin A. Kowalski¹, Michael Cole¹; ¹Dept. 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 Mikami¹, Kentaro Osawa¹, Koichi Watanabe¹; ¹Hitachi, 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 Katayama¹, Shin Tominaga²; ¹Fukuoka Institute of Technology, Japan; ²NEC 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 Arizona United States; Presiders

OWB1 • 14:00 Invited

Progress on Micro-reflector optical disc system, Kimihiko Saito¹, Seiji Kobayashi¹; ¹Sony 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.

Joint International Symposium on Optical Memory &
Optical Data Storage (ISOM/ODS) • Marriot Kauai Beach Resort

OWB2 • 14:30 **Invited**

Recent Progress On Gold Nanorod Based 5D Optical Storage, James W. Chon¹; 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 Ide¹, Kentaro Osawa¹, Hideharu Mikami¹, Koichi Watanabe¹; 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 Takashima¹; 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)

- A**
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Abel, Keith A-NThB1
Adachi, Muneyuki-NTuD1
Adams, Daniel E-NThA4
Agrawal, Amit-NTuE5
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Buckley, Sonia-NWC5, **NWE11**
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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 Park¹; ¹Department of Mechanical Engineering, Yonsei University, Republic of Korea.* The near-field optical characterization was conducted with a grating based HAMR head and SPAH media as a function of wavelengths. A touch-down characterization was also analyzed to understand the flying stability with 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/Nanophotonics.**

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.**

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AND EXHIBIT

POSTDEADLINE PAPERS

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17-20 July 2011

Kauai, Hawaii, USA



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Storage (ISOM/ODS)**

17 – 20 July, 2011

Marriott Kauai Beach Resort

Kauai, Hawaii, USA

Postdeadline Papers Program

• Wednesday, 20 July, 2011 •

Kauai Ballroom, Ko'olau

16:00 – 17:00

OWC • ISOM/ODS Postdeadline Session

Presiders to be Announced

OWC1 • 16:00

Physical and Chemical Characterization of Laser-recorded Phase-change Marks on Amorphous Ge₂Sb₂Te₅

Thin Films, C. Chang¹, T. Ming Lun¹, C. Chu¹, D. Tsai¹, D. Tsai², M. Mansuripur³; ¹National Taiwan University, Taipei, Taiwan; ²National Applied Research Laboratories, Taiwan; ³The University of Arizona, USA. As-deposited thin films of Ge₂Sb₂Te₅ are investigated for the purpose of understanding the local electrical conductivity and structural phase-transitions of recorded marks under the influence of focused laser beam.

OWC2 • 16:15

Experimental and Simulation Analysis of Reflection Type Hologram Recording Using Co-axial Dual

Reference Beams, K. Katakura, T. Yamada, M. Yamamoto, Tokyo University of Science, Japan. We propose a novel holographic recording/reconstructing system: a dual-reference beam reflection system that is expected to increase the storage capacity and stable reconstruction in angle multiplexed hologram recording.

OWC3 • 16:30

Coherent Photon Echo Gain in a Slow Light Regime, J. Hahn, B.S. Ham, Inha University, Republic of Korea. In a spectral hole-burning-based ultraslow-light regime, a few hundred times enhanced photon echoes are observed, where the slow light plays a role to break the critical constraint of ultralow echo efficiency in conventional photon echoes.

OWC4 • 16:45

A Record High Area Density Based on The BD Optical Parameters, K. Takahashi, J. Nakano, Sony Corp., Japan.

We succeeded in storing 50GB or more digital data within one layer of an optical disc by improving the performance of the material system and by introducing signal processing techniques.

Key to Authors and Presiders
(**Bold** denotes Presenting Authors)

C

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H

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