



IQEC/CLEO Pacific Rim 2011

International Quantum Electronics Conference (IQEC) and
Conference on Lasers and Electro-Optics (CLEO) Pacific Rim

Incorporating the Australasian Conference on Optics, Lasers and
Spectroscopy and the Australian Conference on Optical Fibre Technology



Sunday 28 August –
Thursday 1 September 2011

SYDNEY CONVENTION
AND EXHIBITION CENTRE
AUSTRALIA



www.iqec-cleopr2011.com

Hosts



PROGRAMME

Sunday 28 August 2011

1030-1330

Workshop 1: Modulation Formats and Signal Processing Techniques to Approach the Shannon Limit

Room: Bayside 204A

Sponsored by:



Institute of Photonics and Optical Science

Organisers: Mark Pelusi (The University of Sydney, Australia) and William Shieh (The University of Melbourne, Australia)

Presenters:

- **Mark Pelusi** (The University of Sydney, Australia)
- **Bill Shieh** (The University of Melbourne, Australia)
- **Rod Tucker** (The University of Melbourne, Australia)
- **Arthur Lowery** (Monash University, Australia)
- **Hidenori Takahashi** (KDDI R&D Laboratories Inc, Japan)
- **Steve Frisken** (Finisar)
- **Jinno Masahiko** (NTT Network Innovation Laboratories, Japan)
- **Vincent Chan** (Massachusetts Institute of Technology, USA)

1200-1215

MORNING TEA - Level 2 Foyer

1030-1330

Workshop 2: Metamaterials for Cloaking: Fundamental Curiosity or Breakthrough Technology?

Room: Bayside 204B

Sponsored by:



Organisers: Ross McPhedran (The University of Sydney, Australia) and Dragomir Neshchev (Australia National University, Australia)

Presenters:

- **Richard Blaikie** (University of Canterbury, New Zealand)
- **Michal Lipson** (Cornell University, USA)
- **Ilya Shadrivov** (Australian National University, Australia)
- **C.T. Chan** (Hong Kong University of Science and Technology, China)
- **Thomas Pertsch** (Friedrich-Schiller-University, Jena, Germany)

1215-1230

MORNING TEA - Level 2 Foyer

1430-1730

Workshop 3: Platforms for Quantum Computing – Which Way Forward?

Room: Bayside 204A

Organisers: Tim Duty (University of New South Wales, Australia) and Michael Steel (Macquarie University, Australia)

Presenters:

- **Andrew White** (The University of Queensland, Australia)
- **Andrew Greentree** (The University of Melbourne, Australia)
- **Andrew Doherty** (The University of Sydney, Australia)
- **David Reilly** (The University of Sydney, Australia)
- **Barry Sanders** (University of Calgary, Canada)
- **Stojan Rebic** (Macquarie University, Australia)
- **Andrea Morello** (University of New South Wales, Australia)
- **Matthew Sellars** (Australian National University, Australia)
- **David Kelpinski** (Griffith University, Australia)

1600-1615 AFTERNOON TEA

- Level 2 Foyer

1430-1730

Workshop 4: Will Guided-Wave Parametric Processing Ever Move Out of the Lab?

Room: Bayside 204B

Sponsored by:



Organisers: Michel Marhic (Swansea University, UK), Jochen Schroeder (The University of Sydney, Australia) and Chunle Xiong (The University of Sydney, Australia)

Presenters:

- **Alex Gaeta** (Cornell University, USA) Four-Wave Mixing to the Home
- **John Harvey** (University of Auckland, New Zealand) Parametric Oscillators as Pumps for Parametric Processing
- **Prem Kumar** (Northwestern University, USA) Guided-Wave Parametric Processing: Prospects for Real-World Quantum Applications
- **Barry Luther-Davies** (Australian National University, Australia) Limits to Four-Wave Mixing in chalcogenide photonic chips
- **Shu Namiki** (National Institute of Advanced Industrial Science and Technology – AIST, Japan) Format- and Bit-Rate-Agnostic Wavelength Converters for Commercial Use
- **Simon Poole** (Finisar Australia) Parametric Optical Processing: an Industry Perspective
- **Stojan Radic** (University of California San Diego, USA) High Fidelity Signal Replication and Its Processing Implications
- **William Wadsworth** (University of Bath, UK) Guided Wave Parametric Generation for High Power Lasers

1615-1630 AFTERNOON TEA

- Level 2 Foyer

1430-1730

Workshop 5: Introduction into Fabrication for Optics and Photonics

Room: Bayside 201

Organised and Sponsored by:



Introduction What is the Australian National Fabrication Facility? – *ANFF Ltd*

Module 1: Lithography, deposition and etching

Photolithography – *Linda Macks (NSW Node) and Dave O'Connor (OptoFab Node)*
Direct Write Optical and Electron Beam Lithography – *Dave O'Connor (OptoFab Node) and Fay Hudson (NSW Node)*
Deposition Techniques – *Fay Hudson (NSW Node)*
Etching Techniques – *Elfi van Zeijl (NSW Node)*

Module 2: Laser based fabrication

Laser Machining – *Ben Johnston (OptoFab Node)*
Femtosecond Laser Fabrication for Photonics – *Graham Smith (OptoFab Node)*

Module 3: Optic fibres

Fabrication and Development of New Optical Glasses – *Heike Ebendorff-Heidepriem (OptoFab Node)*

Polymer Fibre Drawing – *Alexander Argyros (OptoFab Node)*

Module 4: Case studies

Case Study: Fabricating Diamond Waveguides – *Francois Ladouceur (NSW Node user)*
Case Study: Bionic Eye – *Stephen Praver (VIC Node)*

1615-1630 AFTERNOON TEA

- Level 2 Foyer

1730-1900

WELCOME RECEPTION – Parkside Ballroom Foyer

0900-0915

Opening Ceremony

Room: Bayside Auditorium A

Ken Baldwin

General Chair IQEC/CLEO Pacific Rim 2011

0915-1000

Plenary Session 1 (2080)

Chair: Halina Rubinsztein-Dunlop, The University of Queensland, AUSTRALIA

2080-PT-2

Jun Ye Supported by the Frew Fellowship

University of Colorado, USA

Quantum Metrology – Optical Atomic Clocks and Many-Body Physics

I will present the latest results of an optical atomic clock based on precision measurement per-formed on a quantum multi-particle system.

1000-1030

Official Opening and OSA “Advocate of Optics” Award Ceremony

Senator Stephen Conroy

1030-1100

MORNING TEA - Bayside Gallery

1100-1300

Session 1

Room: Bayside Auditorium A

Room: Bayside 101

Nanophotonics 1 (2210)

Symposium 1

Chair: Min Gu, Swinburne University, AUSTRALIA

1100-1130

INVITED SPEAKER

Aniwat Tандаеһаnurat¹, Yasutomo Ota¹, Naoto Kumagai¹, Satomi Ishida¹, Satoshi Iwamoto¹, Yasuhiko Arakawa¹

1. Institute for Nano Quantum Information Electronics, The University of Tokyo, Japan

Observation of Purcell Effect in a 3D Photonic crystal Nanocavity with a Single Quantum Dot

Room: Bayside 102

Mode-locked Fibre Lasers (2230)

Symposium 3

Chair: Stuart Jackson, Institute of Photonics and Optical Science, AUSTRALIA

1100-1115

INVITED SPEAKER

Norihiko Nishizawa¹, Yuto Nozaki¹, Youichi Sakakibara^{2,3}, Eriko Itoga², Hiromichi Kataura^{2,3}

1. Department of Electrical Engineering and Computer Science, Nagoya Univ. Japan
2. National Institute of Advanced Science (AIST)-Japan
3. JST CREST, Saitama

Dynamics of Er-doped Ultrashort Pulse Fiber Laser using Single Wall Heterointerfaces

Room: Bayside 103

Photonic Devices and Modelling (2240)

Symposium 4

Chair: Barry Luther-Davies, Australian National University, AUSTRALIA

1100-1115

INVITED SPEAKER

Nadav Gutman¹, Hugo Dupree¹, Lindsay C. Botten², Andrew A. Sukhorukov³, C. Martijn de Sterke¹

1. POS and CUDOS, School of Physics, University of Sydney, Australia
2. CUDOS, School of Mathematical Sciences, University of Technology, Australia
3. CUDOS, School of Physics, Australian National University, Australia

Stationary Inflection

Room: Bayside 104

Biophotonics (2250)

Symposium 5

Chair: Jin Dayong, Macquarie University, AUSTRALIA

1100-1130

INVITED SPEAKER

Nicholas Smith¹, Katsumasa Fujita², Satoshi Kawata², Yutaro Kumagai³

1. Biophotonics Lab, Immunology Frontier Research Center, Osaka University, Japan
2. Dept. Applied Physics, Osaka University, Japan
3. Host Defense Lab, Immunology Frontier Research Center, Osaka University, Japan

Optical Control of Cell Functions: Using Laser Light to Remote Control Signalling, Contraction and Action Potentials in

Room: Bayside 105

Nonclassical States of Light (2260)

Symposium 6

Chair: Geoff Pryde, Griffith University, AUSTRALIA

1100-1115

INVITED SPEAKER

Michael Foertsch^{1,2,5}, Gerhard Schunk^{1,2}, Josef Fuerst^{1,2}, Dmitry Strekalov^{1,3}, Andrea Aiello^{1,2}, Ulrik Andersen^{1,4}, Christoph Marquardt^{1,2}, Gerd Leuchs^{1,2}

1. Max Planck Institute for the Science of Light, Germany
2. Department of Physics, University of Erlangen- Nuremberg, Germany
3. Jet Propulsion Laboratory, California Institute of Technology, USA
4. Department of Physics, Technical University of Denmark, Denmark
5. Department of Physics, Technical University of Denmark, Denmark

Sub-Poissonian Fluctuations in a 1D Bose Gas: from Quantum Quasi-Condensate to the

Room: Bayside 106

Atom Optics and Interferometry (2270)

Symposium 7

Chair: Matthew Davis, University of Queensland, AUSTRALIA

1100-1115

INVITED SPEAKER

Karen Kheruntsyan¹, T. Jacqmin², J. Armijo², T. Berrada^{2,3}, I. Bouchoule²

1. School of Mathematics and Physics, The University of Queensland, Australia
2. Laboratoire Charles Fabry, Institut d'Optique, France
3. Vienna Center for Quantum Science and Technology, Atominstitut, Vienna

Sub-Poissonian Fluctuations in a 1D Bose Gas: from Quantum Quasi-Condensate to the

We observed the Purcell effect in a three-dimensional photonic crystal nanocavity with a single quantum dot. The enhancement and suppression factors of the spontaneous emission rate are ~2 and 1.6, respectively.

1130-1145 **2210-CT-2**

Sahand Mahmoodian¹, Scott Brownless¹, Felix Lawrence¹, Kokou Dossou², Lindsay Botten^{3,2}, Martijn de Sterke¹

1. *CUDOS, School of Physics, University of Sydney, Australia*
2. *CUDOS, School of Mathematical Sciences, University of Technology, Australia*

Guiding Mechanisms and Dispersion Engineering in Photonic Crystal Waveguides

We examine guiding mechanisms of photonic crystal (PC) waveguide modes through the properties of their evanescent fields, providing an unambiguous definition of gap-guided and index-guided modes. We use this to enhance dispersion engineering.

1145-1200 **2210-CT-3**

J. Scott Brownless^{1,2}, Felix Lawrence^{1,2}, Sahand Mahmoodian^{1,2}, Kokou Dossou^{3,2}, Lindsay Botten^{3,2}, C. Martijn de Sterke^{1,2}

1. *School of Physics, University of Sydney, Australia*
2. *Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), Australia*
3. *Department of Mathematical Sciences, University of Technology, Sydney, Australia*

Diffraction Engineering with Braided modes in Photonic Crystal

We propose and design III-V/Si hybrid laser structures utilizing conductive wafer-bonded III-V/Si heterointerfaces with advantages such as spontaneous lateral current confinement, along with a preliminary demonstration of InAs/GaAs quantum dot lasers direct-bonded onto Si-substrates.

1115-1130 **2220-CT-2**

James Lott¹, Gerrit Fiol², Philip Moser², Alexey Payusov^{2,3}, Philip Wolff², Nikolai Ledentsov¹, Dieter Bimberg²

1. *VI Systems GmbH, Germany*
2. *Technische Universität von Berlin, Germany*
3. *St. Petersburg Academic University Nanotechnology Research and Education Centre, Russian Federation*

Small Spectral Width 850 nm VCSELs for Communication

We demonstrate error-free 25 Gb/s optical fiber communication links at 850 nm with vertical-cavity surface-emitting lasers. At 25°C through 300 meters of fiber we achieve a record low dissipated-energy-to-bit rate ratio of 122.4 mW/Tbps.

1130-1200 **2220-IT-3**

INVITED SPEAKER
Yasu Arakawa¹

1. *University of Tokyo, Japan*

Quantum Dot Lasers And Amplifiers

We discuss historical overview and recent progress of quantum dot lasers, including lasing characteristics such as temperature-stable operation and high speed modulation, applications, future challenges, and a business model of QD Laser Inc. for commercialization.

Carbon Nanotube Polyimide Film

Dynamics of Er-doped ultrashort pulse fiber laser with single wall carbon nanotube polyimide film were investigated both experimentally and numerically. Dependence on output coupling ratio, temporal response of nanotube, and dispersion properties were discussed.

1115-1130 **2230-CT-2**

Feng-Zhou Liu¹, Nan-Kuang Chen², Hsiu-Po Chuang³, Jim-Wei Lin³, Ynchieh Lai⁴, Shien-Kuei Liaw⁵, Yu-Chung Chang⁶, Shang-Da Yang³, Chen-Bin Huang³, Sien Chi⁷

1. *Department of Electro-Optical Engineering, National United University, Taiwan*
2. *Optoelectronics Research Center, National United University, Taiwan*
3. *Institute of Photonics Technologies, National Tsing Hua University, Taiwan*
4. *Department of Photonics, National Chiao Tung University, Taiwan*
5. *Graduate Institute of Electro-Optical Engineering, National Taiwan University of Taiwan*
6. *Department of Electrical Engineering, National Changhua University of Education, Taiwan*
7. *Department of Photonics Engineering, Yuan Ze University, Taiwan*

Two-Dimensional Surface Waves in Modulated Photonic Lattices

We study surface waves in two-dimensional modulated photonic lattices and demonstrate that, in a sharp contrast to one-dimensional lattices where localized surface modes can exist, the radiation escapes along the boundaries of the two-dimensional structure.

1130-1145 **2240-CT-3**

Zhe Xiao^{1,3}, Feng Luan^{1,2}, Jing Zhang³, Tsung-Yang Liow³

1. *School of Electrical and Electronics Engineering Nanyang Technological University, Singapore*
2. *CNTRA CNRS/NTU/THALES, UMI 3288, Research Techno Plaza, 50 Nanyang Drive, Singapore*
3. *Institute of Microelectronics, Singapore*

Pulsewidth-stretchable Femtosecond Erbium Fiber Lasers Using an Intracavity Short-pass Edge Filter

We demonstrate pulsewidth-stretchable Er³⁺-doped femtosecond mode-locked fiber lasers by incorporating a tunable short-pass edge filter into the ring cavity. Pulsewidth stretch ratio of

Points in Optical Waveguides: Accessible Frozen Light

Stationary Inflection Points (SIPs) around a frequency ω_0 are of the form $(\omega - \omega_0) \sim k^m$ for any positive odd integer. We show theoretically that SIPs of any order m can be created in optical waveguides and induce frozen light.

1115-1130 **2240-CT-2**

Ivan Garanovich¹, Alexander Szameit², Andrey Sukhorukov¹, Matthias Heinrich³, Felix Dreisow³, Thomas Pertsch³, Stefan Nolte³, Andreas Tünnermann³, Yuri Kivshar¹

1. *Nonlinear Physics Centre, Australian National University, Australia*
2. *Solid State Institute and Physics Department, Technion, Israel*
3. *Institute of Applied Physics, Friedrich-Schiller-University Jena, Germany*

4D Spatial-Spectral Super-resolution Imaging of Nanoscopic Membrane Signalling Domains

We present a practical implementation of single-molecule based localisation microscopy by combining single laser line excitation and use of conventional dyes. We investigate the organization of membrane proteins into clusters in cardiac and neuronal cells.

1145-1200 **2250-CT-3**

Xiangdong Zhu¹, Yiyang Fei¹, Yung-Shin Sun¹, James Landry¹

1. *University of California, Department of Physics, USA*

Label-Free Screening Small Molecule Compounds for Protein Ligands with Optically Detected Microarrays

We developed an optical scanner for label-free screening small molecule compounds in microarray format for protein ligands. It has a detection throughput of 12,000

Living Cells

Biological effects can be generated by laser irradiation of living cells, such as calcium waves, membrane hyperpolarization, and cell contraction. Intentional generation of cell dynamics by laser light is becoming a new field in biophotonics

1130-1145 **2250-CT-2**

David Baddeley¹, Isuru Jayasinghe¹, Cherrie Kong¹, David Crossman¹, Juliette Cheyne¹, Johanna Montgomery¹, Mark Cannell¹, **Christian Soeller¹**

1. *Department of Physiology, University of Auckland, New Zealand*

Low Frequency Optical Squeezing

We present our most recent results showing 8.5dB of squeezing over most of the frequency band of interest for ground based interferometric gravitational wave detectors and explain what it took to get these results.

1130-1145 **2260-CT-3**

Gideon Alon¹, Oo-Kaw Lim¹, Amar Bhagwat¹, Chao-Hsiang Chen¹, Michael Vasilyev², **Prem Kumar¹**

1. *Center for Photonic Communication and Computing, Northwestern University, USA*
2. *Department of Electrical Engineering, University of Texas at Arlington, USA*

Amplification of a Squeezed-Quadrature

1. *School of Mathematics and Physics, The University of Queensland, Australia*
 2. *Joint Quantum Institute, NIST and University of Maryland, USA*
 4. *School of Physics, Monash University, Australia*

5. *School of Advanced Optical Technologies, Germany*

Non-classical Light Generated in a Whispering Gallery Mode Parametric Oscillator

We present the generation of quantum correlated twin beams in a whispering gallery mode resonator made from lithium niobate and the first direct observation of amplitude squeezing for the single parametric beams.

1115-1130 **2260-CT-2**

Michael Stefszky^{1,2}, Sheon Chua¹, Conor Mow-Lowry¹, Daniel Shaddock¹, Ben Buchler², Ping Koy Lam¹, David McClelland²

1. *Centre for Gravitational Physics, Department of Quantum Science, ANU, Australia*
2. *Centre for Quantum Computation and Communication Technology, DQOS, ANU, Australia*

Matter Waves with Orbital Angular Momentum: Collapse Suppression and Bistability.

We explore the influence of the orbital angular momentum on the dynamics of attractive Bose-Einstein condensates. We show that the number of atoms corresponding to the collapse threshold can be radically increased for such rotating nonlinear matter waves in radially symmetric and rotating elliptic traps.

1130-1145 **2270-CT-3**

Gordon McDonald¹, P. A. Altin¹, D Doring¹, J. E. Daps¹, T. H. Barter¹, J. D. Close¹, N. P. Robins¹, S. A. Haine², T. M. Hanna³, R. P. Anderson⁴

1. *Department of Quantum Science, The Australian National University, Australia*
2. *School of Mathematics and Physics, The University of Queensland, Australia*
3. *Joint Quantum Institute, NIST and University of Maryland, USA*
4. *School of Physics, Monash University, Australia*

Strongly Interacting Regime

By measuring atom number fluctuations in slices of a single 1D Bose gas, we probe the crossover from weak to strong interactions and identify signatures of sub-regimes dominated by thermal and quantum fluctuations.

1115-1130 **2270-CT-2**

Jasur Abdullaev¹, Anton Desyatnikov¹, Elena Ostrovskaya¹

1. *Nonlinear Physics Centre, The Australian National University, Australia*

Matter Waves with Orbital Angular Momentum: Collapse Suppression and Bistability.

We explore the influence of the orbital angular momentum on the dynamics of attractive Bose-Einstein condensates. We show that the number of atoms corresponding to the collapse threshold can be radically increased for such rotating nonlinear matter waves in radially symmetric and rotating elliptic traps.

1130-1145 **2270-CT-3**

Gordon McDonald¹, P. A. Altin¹, D Doring¹, J. E. Daps¹, T. H. Barter¹, J. D. Close¹, N. P. Robins¹, S. A. Haine², T. M. Hanna³, R. P. Anderson⁴

1. *Department of Quantum Science, The Australian National University, Australia*
2. *School of Mathematics and Physics, The University of Queensland, Australia*
3. *Joint Quantum Institute, NIST and University of Maryland, USA*
4. *School of Physics, Monash University, Australia*

Nanophotonics 1 (2210)
continued

Waveguide Arrays

We consider discrete diffraction in coupled photonic crystal waveguides in a hexagonal lattice. We show that in these structures the (discrete) diffraction coefficient depends strongly on frequency and can even change sign. This behavior does not occur in photonic crystal waveguides in square lattices. This behavior is interesting in its own right and has intriguing consequences for the propagation of discrete spatial solitons.
ACOFT Presentation

1200-1215 **2210-CT-4**
Kokou B. Dossou¹, Lindsay C. Botten¹

1. *School of Mathematical Sciences; University of Technology, Australia*

Computation of Scattering Matrices Using a Three Dimensional Finite Element Method

We have developed a 3D finite element method (FEM) which offers the flexibility to model scattering from photonic crystal and metamaterial elements with arbitrary geometry. The FEM is accurate and satisfies the energy balance relation.

1215-1230 **2210-CT-5**
Emanuel Gavartin¹, **Remy Brave²**, Isabelle Sagnes², Olivier Arcizet³, Alexios Beveratos², Tobias Klippenberg¹, Isabelle Robert²
1. *Ecole Polytechnique Federale de Lausanne, Switzerland*

Mode-locked Fibre Lasers (2230)
continued

3.53 (882/250) can be efficiently achieved under a temperature variation of 4°C.

1130-1145 **2230-CT-3**

Sun Young Choi¹, Dae Kun Cho¹, Fabian Rotermund¹, Yong-Won Song², Kyurghwan Oh², Dong-Il Yeom¹

1. *Division of Energy Systems Research, Korea*
2. *Optoelectronic Materials Center, Korea*
3. *Institute of Physics and Applied Physics, Korea*

Graphene-Filled Hollow Optical Fiber for All-Fiber Laser Mode-Locking

We propose a novel in-line saturable absorber by employing graphene-filled hollow optical fiber. The all-fiber laser based on graphene-mode locker delivered femtosecond pulses at 1593 nm with 3-nm spectral bandwidth, exhibiting 17 MHz repetition rate.

1145-1200 **2230-CT-4**

Jiang Liu¹, Rusheng Wei², Ke Wang¹, Xiangang Xu², **Pu Wang¹**

1. *Beijing University of Technology, China*
2. *Shandong University, China*

Mode-locked Yb-doped Fiber Laser with Epitaxial Graphene Grown on 6H-SiC Substrates

Graphene epitaxially grown on 6H-SiC substrates by thermal decomposition was used as saturable absorbers for mode-locking of ytterbium-doped fiber lasers. Stable picosecond 19 nJ

Photonic Devices and Modelling (2240)
continued

Ultra-Broadband High-Efficiency Grating Couplers for Light Injection in Horizontal Slot Waveguide

An ultra-broadband high-efficiency grating coupler has been designed at operating wavelength 1.55µm in horizontal slot waveguide. The 1dB bandwidth is 70nm which doubles the previously reported value; Maximum coupling efficiency of 72% has been achieved.

1145-1200 **2240-CT-4**

Kristopher Rowland¹, Shahraam Afshar¹, Tanya Monro¹

1. *Institute for Photonics & Advanced Sensing, University of Adelaide, Australia*

Simple Binary Stack Analysis via a Phase Space Transformation

A simple phase space based technique is presented for the analysis of binary layered optical media operating at effective refractive indices below the lowest index of the layers, relevant for multilayer waveguides, cavities and reflectors.

1200-1215 **2240-CT-5**

Pairy Chen¹, Ross McPhedran¹, Ara Asatryan², Lindsay Botten², Chris Poulton², Michael Steel³, C. Martijn de Sterke¹

1. *CUDOS & IPDS, School of Physics, University of Sydney, Australia*
2. *CUDOS, School of Mathematical Sciences, University of Technology Sydney, Australia*

Biophotonics (2250)
continued

compounds per slide and thus promises screening 100,000 compounds per day.

1200-1215 **2250-CT-4**

Dayong Jin¹, Yiqing Lu¹, Jiangbo Zhao¹, Wei Deng¹, Jie Lu¹, James A. Piper¹

1. *Advanced Cytometry Labs, MQ Biofocus Research Centre, Macquarie University, Australia*

Advances in Lanthanide Bioprobes and High-throughput Background-free Biophotonics Sensing

We report time-domain techniques of biophotonics sensing. Our bioprobes have been engineered to emit tunable luminescence across multiple sharp spectra and microsecond-long lifetimes. This offers high-throughput opportunities for cellular-level disease diagnosis at low cost.

1215-1230 **2250-CT-5**

Jian Long Xiao¹, Tsi Hsuan Hsu¹, Po Ling Kuo³, Chau Hwang Lee^{1,2}

1. *Institute of Biophotonics, National Yang-Ming University, Taiwan*
2. *Research Center for Applied Sciences, Academia Sinica, Taiwan*
3. *Department of Electrical Engineering, National Taiwan University, Taiwan*

Controlling the Movements of Cancer-Cell Lamellipodia by Laser Light

We use 405 and 1064 nm laser light to guide the growth of cancer cell lamellipodia. Actin distributions

Nonclassical States of Light (2260)
continued

Using a Cascaded Traveling-Wave Phase-Sensitive Optical Parametric Amplifier

We demonstrate a two-stage system of cascaded traveling-wave phase-sensitive optical parametric amplifiers, achieving 3.6 dB squeezed-quadrature amplification (0.9 dB deamplification) on top of 1.3 dB squeezing provided by the first stage.

1145-1200 **2260-CT-4**

Chunle Xiong¹, Christelle Monati^{1,2}, Alex Clark^{1,3}, Christian Grillet¹, Graham Marshall⁴, Michael Steel¹, Juntao Li⁵, Liam O'Faolain⁵, Thomas Krauss⁵, Benjamin Eggleton¹

1. *CUDOS, School of Physics, University of Sydney, Australia*
2. *Institut des Nanotechnologies de Lyon, Ecole Centrale de Lyon, France*
3. *Centre for Quantum Photonics, University of Bristol, UK*
4. *CUDOS, Department of Physics & Astronomy, Macquarie University, Australia*
5. *School of Physics and Astronomy, University of St Andrews, UK*

Generation of Correlated Photon Pairs in a Highly-Integrated Silicon Photonic Crystal Waveguide

We generate correlated photon pairs in the telecom band from a 96 µm long dispersion-engineered silicon photonic crystal waveguide. The spontaneous four-wave mixing process producing the photon pairs is enhanced by slow-light propagation.

Atom Optics and Interferometry (2270)
continued

Optically Trapped Atom Interferometry Using the Clock Transition of Large Rubidium-87 Bose-Einstein Condensates

We present a Ramsey-type atom interferometer operating with an optically trapped sample of 10⁶ Bose-condensed Rubidium-87 atoms. We investigate this interferometer experimentally and theoretically with an eye to the construction of future high precision atomic sensors.

1145-1200 **2270-CT-4**

Peter Drummond¹, Qiongyi He¹, Shiguo Peng¹, **Margaret Reid¹**
1. *Swinburne University of Technology, Australia*

Planar Quantum Squeezing and Atom Interferometry

We obtain a novel planar squeezing uncertainty relation for spin variances in a plane, and show how to obtain such planar squeezed states using a BEC. These minimize interferometric phase-noise at all phase angles simultaneously.

1200-1230 **2270-IT-5**

INVITED SPEAKER Andrew Truscott¹, Robert Dall¹, Sean Hodgman¹, Andrew Manning¹, Wu Rugway¹, Mattias Johnsson¹, Ken Baldwin¹, Karen Kheruntsyan²

1. *The Australian National University, Australia*
2. *The University of Queensland, Australia*

Higher Order Correlations

2. *Laboratoire de Photonique et de Nanostructures, France*

Optomechanical Coupling in a Two-dimensional Photonic Crystal Defect Cavity

We observe the optomechanical properties of a 2D suspended photonic crystal defect cavity of diffraction-limited size. Two families of mechanical modes are observed: flexural (MHz regime) and localized modes (GHz). We demonstrate strong optomechanical coupling (80 kHz)

1230-1245

Seiji Takeda¹, Romain Peretti², Than-Phong Vo², Ségolène Callard², Christian Seassal², Pierre Viktorovitch², Minoru Obara¹

1. *Keio University, Japan*

2. *Ecole Centrale de Lyon, France*

Lasing Characteristics Of Anderson Localization Modes In Two-Dimensional Random Photonic Crystals

We show the impact of structural randomness on lasing modes in random photonic crystals. We first time ever exhibit near-field direct imaging of two-dimensional Anderson localized modes by using SNOM.

1245-1300

Seung-Woo Jeon¹, Bong-Shik Song¹

1. *School of Information and Communication Engineering, Sungkyunkwan University, Korea*

High Quality Factor Nanocavity in a Rod-type Photonic Crystal Structure for Controlling TM light

1230-1245

Jin Yuan Hsing¹, M.Y. Kuo², T.E. Tzeng¹, K.Y. Chuang¹, M.H. Shih², T.S. Lay¹

1. *Department of Photonics, National Sun Yat-Sen University, Taiwan*

2. *Research Center for Applied Science, Academia Sinica, Taiwan*

Optical Sensing in Vertical-Coupled Double Microdisk Lasers with InGaAs Quantum Dots-in-a-Well Structure

Vertical-coupled double microdisk lasers of gap=100 nm are fabricated. The lasing spectrum for the device immersed in refractive index liquid shows wavelength shifts for the bonding and anti-bonding WGMs of m=9 and m=10.

1230-1245

Chang Su Jun¹, Ju Hee Im², Sang Hwa Yoo³, Byoung Yoon Kim¹, Sun Young Choe¹, Fabian Rotermund², Dong-Il Yeom²

1. *Department of Physics, KAIST, Korea*

2. *Division of Energy Systems Research, Ajou University, Korea*

3. *Division of Electrical Engineering, KAIST, Korea*

Passive Harmonic Mode-Locking of Fiber Laser Based on Evanescent Field Interaction with Carbon Nanotube Saturable Absorber

We demonstrated harmonically mode-locked soliton laser based on evanescent field interaction of carbon-nanotube saturable absorbers. The repetition rate was 943 MHz at 34th harmonics with super-mode suppression of 60 dB at 18 mW output power.

1200-1230

Invited Speaker

I. Hardt¹, J. Jiang¹, C. Mohr¹, J. Bethge¹, M. E. Fermann¹

1. *IMRA America, Inc. USA*

Advanced Ultrashort Pulse Fiber Lasers

New developments in femtosecond fiber-lasers include ultrabroad coherent supercontinuum generation, power levels up to 80W, Yb-fiber laser and sub-100fs Tm-fiber-systems. Those sources are CEO-phase stabilized for advanced frequency comb applications

1200-1245

Chang Su Jun¹, Ju Hee Im², Sang Hwa Yoo³, Byoung Yoon Kim¹, Sun Young Choe¹, Fabian Rotermund², Dong-Il Yeom²

1. *Department of Physics, KAIST, Korea*

2. *Division of Energy Systems Research, Ajou University, Korea*

3. *Division of Electrical Engineering, KAIST, Korea*

Single Mode AlGaNAs/InP Hexagonal Resonator Microlasers

AlGaNAs/InP hexagonal resonator microlasers are fabricated using standard photolithography and ICP etching process. Single mode operation is achieved for a hexagon microlaser with side length of 16 μ m and output waveguide width of 2 μ m.

1200-1230

Invited Speaker

I. Hardt¹, J. Jiang¹, C. Mohr¹, J. Bethge¹, M. E. Fermann¹

1. *IMRA America, Inc. USA*

Fast Simulation of Slab Structures using Modal Methods

A faster method of simulating 2D slabs, both metallic and dielectric, with cylindrical inclusions is proposed. The method is applicable to photonic crystal defect-row waveguides and extraordinary transmission through metallic films, capable of producing both in-plane dispersion relations and transmission spectra.

1215-1230

Ned Charles¹, Jon Lawrence^{2,3,4}, Nemanja Jovanovic^{2,3,4}, Peter Tuthill¹, Barnaby Norris¹, Paul Stewart¹, Simon Gross^{2,5}, Michael Withford^{2,5}

1. *Sydney Institute for Astronomy, School of Physics, Australia*

2. *MQ Photonics Research Centre, Australia*

3. *Centre for Astronomy, Astrophysics and Astro Photonics, Australia*

4. *Australian Astronomical Observatory, Australia*

5. *Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), Australia*

3. *CUDOS, MQ Department of Physics and Astronomy, Macquarie University, Australia*

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Techniques for Designing Physically Path-Length Matched Optical Circuitry

A pressing need exists for optically-path-length-matched waveguides in monolithic integrated photonics for applications such as high angular resolution optical stellar interferometry. In this paper, we discuss techniques for rapid prototyping of physically-path-length-matched three-dimensional photonic circuitry.

1245-1300

So V. Pham¹, Meindert Dijkstra¹, Anton J. F. Hollin¹, R. M. de Ridder¹, Henk A. G. M. van Wolferen¹, Gijs J.M. Krijnen¹, Mark Pollnau¹, Hugo J. W. M. Hoekstra¹

1. *University of Twente, The Netherlands*

Grated Waveguide Cavity for Label-free Protein and Mechano-optical Gas Sensing

We demonstrate the versatility of a silicon nitride grating waveguide optical cavity as compact integrated optical sensors for (bulk) concentration detection, label-free

are also affected by the light illumination. The cell morphology is changed by 405 nm optical patterns.

1230-1245

Almar Palompon^{1,2}, Masaya Okada², Jun Ando^{1,2}, Hiroyuki Yamakoshi¹, Kosuke Dodo¹, Mikiko Sodeoka¹, Satoshi Kawata^{2,3}, Katsumasa Fujita^{1,2}

1. *Sodeoka Live Cell Chemistry Project, ERATO, Japan Science and Technology Agency, Japan*

2. *Department of Applied Physics, Osaka University, Japan*

3. *Nanophotonics Lab, RIKEN Advanced Science Institute, Japan*

Slit-scanning Confocal Raman Microscopy: Practical Applications in Live Cell Imaging

Raman microscopy is recognized as a powerful tool but not yet practical for live cell imaging because of long acquisition times. Using a slit-scanning Raman microscope, we demonstrate realistic applications in live cell imaging.

1245-1300

Sacha Kocsis^{1,2}, Boris Braverman¹, Sylvain Ravets³, Martin Stevens⁴, Richard Mirin⁴, Krister Shalm^{1,5}, Aephraim Steinberg¹

1. *CIQO, and Institute for Optical Sciences, Department of Physics, U. of Toronto, Canada*

2. *Centre for Quantum Dynamics, Griffith University, Australia*

3. *Laboratoire Charles Fabry, Institut d'Optique, Univ. Paris-Sud, France*

4. *National Institute of Standards and Technology, USA*

5. *Institute for Quantum Computing, University of Waterloo, Canada*

Observing the Average Trajectories of Single Photons in a Two-Slit Interferometer

We reconstruct the trajectories of single photons in a two-slit interferometer, by weakly measuring photon momentum, and post-selecting on the result of a strong measurement of photon position in a series of planes.

1245-1300

Chao Feng¹, Tod Wright¹, Matthew Davis¹

1. *The University of Queensland, Australia*

Quantum Drag Forces Below the Superfluid Critical Velocity in Dilute Gas Bose-Einstein Condensates

Zero temperature quantum fluctuations are hypothesised to give rise to drag forces on impurities moving at any velocity in

are also affected by the light illumination. The cell morphology is changed by 405 nm optical patterns.

1200-1215

A McMillan¹, M Delgado-Pinar¹, J Rarity², **W Wadsworth¹**

1. *University of Bath, UK*

2. *University of Bristol, UK*

Generation of Narrowband 1550 nm Photons in the Anomalous Dispersion Region of a Birefringent PCF

We present simulation results along with measured spectral and dispersion data for a highly birefringent PCF designed to produce naturally narrowband photons, at telecom wavelengths, from a 1064 nm pump through cross-polarised four-wave mixing.

1230-1245

Andrei Sidorov¹, Mikhail Egorov¹, Russel Anderson², Valentin Ivamnikov¹, Bogdan Opanchuk¹, Peter Drummond¹, Brenton Hall¹

1. *CAOLUS, Swinburne University of Technology, Australia*

2. *School of Physics, Monash University, Australia*

Long Coherence Time of an Interacting Bose-Einstein Condensate

Mean-field induced self-rephasing and the synchronized application of spin echo allow us to preserve coherence of an interacting Bose-Einstein condensate for a long time (> 4 s) in a trapped Ramsey interferometer on an atom chip.

1245-1300

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Monday 29 August 2011

Nanophotonics 1 (2210)
continued

We proposed a high quality factor nanocavity in a rod-type photonic crystal slab structure for controlling TM light. The quality factor of the nanocavity is 470,000 and the modal volume is as small as $0.7(\lambda/n)^3$

Mode-locked Fibre Lasers
(2230) *continued*

1245-1300 **2230-C17**

Chunmei Ouyang¹, Ping Shum¹, Kan Wu¹, Jia Haur Wong¹

1. School of Electrical and Electronic Engineering Nanyang Technological University, Singapore

Bidirectional Operation of a Mode-Locked Fiber Laser Based on a Four-Port Circulator and Two SESAMs

We demonstrate a novel bidirectional fiber laser mode-locked with two semiconductor saturable absorber mirrors (SESAMs) incorporated into the laser cavity through a four-port circulator. The laser allows the generation of two independent counterpropagating mode-locked pulse trains, each with individual fundamental repetition. In the experiment, two counterpropagating pulse trains, with repetition rate of 21.3 MHz and 15.2 MHz, respectively, are obtained simultaneously. By controlling the intracavity loss imposed on these two pulse trains, either one of the two pulse trains can be switched on or off.

Photonic Devices and Modelling
(2240) *continued*

1230-1300 **2240-IT-7**

**INVITED SPEAKER
Alexander Gaeta**¹

1. Cornell University, USA

Novel CMOS-Compatible Sources Based On Nonlinear Optics

protein sensing, and - with an integrated cantilever suspended above it - gas sensing.

Biophotonics (2250)
continued

Nonclassical States of Light
(2260) *continued*

Presentation withdrawn

a superfluid. We present simulations demonstrating the presence of this force in dilute gas Bose Einstein condensates.

Atom Optics and Interferometry
(2270) *continued*

1300-1400 LUNCH - Bayside Gallery

1400-1530 Session 2

Room: Bayside Auditorium A

Metamaterials (2440)

Symposium 4

Chair: Richard Blaikie, University of Canterbury, NEW ZEALAND

Room: Bayside 101

Applied Nonlinear Optics 1 (2420)

Symposium 2

Chair: Stephane Coen, The University of Auckland, NEW ZEALAND

Room: Bayside 102

Gratings and Sensing (2410)

Symposium 1

Kevin Cook, The University of Sydney, AUSTRALIA

Room: Bayside 103

Silicon Photonics (2430)

Symposium 3

Chair: David Moss, Sydney University, AUSTRALIA

Room: Bayside 104

Ultrafast Laser Modification of Optical Materials (2470)

Symposium 7

Chair: Michael Withford, Macquarie University, AUSTRALIA

Room: Bayside 105

Imaging and 3D Displays (2450)

Symposium 5

Chair: Ken Hsu, National Chiao Tung University, TAIWAN

Room: Bayside 106

Attosecond and Extreme UV Science (2460)

Symposium 6

Chair: David Kelpinski, Griffith University, AUSTRALIA

1400-1430	2440-IT-1 INVITED SPEAKER Bumki Min¹ , Muhan Choi ¹ , Seung Hoon Lee ¹ , Yushin Kim ¹ , Seung Beom Kang ² , Jonghwa Shim ³ , Min Hwan Kwak ² , Kwang-Young Kang ² , Yong-Hee Lee ³ , Namkyoo Park ⁴ , <i>1. Mechanical Engineering, KAIST, Korea</i> <i>2. ETRI, Korea</i> <i>3. Physics, KAIST, Korea</i> <i>4. EECSS, Seoul National University, Korea</i>	1400-1415	2420-CT-1 Ravi Pant^{1,2} , Christopher Poulton ^{1,3} , Duk-Yong Choi ^{1,4} , Enbang Li ^{1,2} , Steve Madden ^{1,4} , Barry Luther-Davies ^{1,4} , Benjamin Eggleton ^{1,2} <i>1. CUDOS, ARC Centre of Excellence, Australia</i> <i>2. School of Physics, University of Sydney, Australia</i> <i>3. University of Technology Sydney, Australia</i> <i>4. Laser Physics Centre, Australian National University, Australia</i>	1400-1430	2410-IT-1 INVITED SPEAKER Qingwen Liu¹ , Ziyuan He ¹ , Tomochika Togunaga ² , Kazuo Hota ¹ <i>1. Dept. of Electrical Engineering and Information Systems, The University of Tokyo, Japan</i> <i>2. Dept. of Environment Systems, The University of Tokyo, Japan</i>	1400-1415	2430-CT-1 Chad Husko¹ , Trung Vo ¹ , Bill Corcoran ¹ , Juntao Li ² , Thomas Krauss ² , Benjamin Eggleton ¹ <i>1. Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), Australia</i> <i>2. School of Physics and Astronomy, University of St Andrews, UK</i>	1400-1430	2470-IT-1 INVITED SPEAKER Roberto Osellame¹ <i>1. Institute for Photonics and Nanotechnologies (IFN) – CNR, Italy</i>	1400-1415	2450-CT-1 I-Ching Chen¹ , Yi-Wen Chiu ¹ , Lijiana Fuk ² , Yu-Chueh Hung ¹ <i>1. Institute of Photonics Technologies, National Tsing Hua University, Taiwan</i> <i>2. DFG-Centre for Functional Nanostructures, Karlsruhe Institute of Technology, Germany</i>	1400-1415	2460-CT-1 Dong Hyuk Ko ¹ , Kyung Taec Kim ² , Jae-Hwan Lee ¹ , Chang Hee Nam¹ <i>1. Department of Physics and Coherent X-ray Research Center, KAIST, Korea</i> <i>2. Advanced Photonics Research Institute, GSST, Korea</i>
1400-1430	2440-IT-1 INVITED SPEAKER Extremely high refractive index terahertz metamaterials We demonstrate extremely high indices of refraction from large-area, freestanding, flexible terahertz metamaterials. In addition, two-dimensionally isotropic high index metamaterials are proposed for polarization-insensitive effective refractive indices in the terahertz frequency range.	1400-1430	2430-CT-1 Ultracompact All-Optical XOR Logic Gate in A Slow-Light Silicon Photonic Crystal Waveguide We demonstrate an ultracompact photonic chip-based all-optical exclusive-OR (XOR) gate via four-wave mixing in a dispersion-engineered silicon photonic crystal waveguide. We achieve error-free operation for 40 Gbit/s differential phase shift keying (DPSK) signals at 30mW powers.	1400-1430	2470-IT-1 Enhanced Light Emission from Blue Organic Light-emitting Devices with DNA Biopolymer We demonstrated high luminance of blue OLEDs using DNA biopolymer modified by aromatic surfactant. Further enhancement can be achieved by incorporating silver nanoparticles in DNA matrix using photosynthesis technique.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER Nonlinear Fibre Design for Broadband Phase Sensitive Amplification We present a soft glass fibre design for high nonlinearity and broadband, low dispersion and simulate its performance as a phase sensitive amplifier for high bit rate signals at 1 T b/s. We use a degenerate, two pump four wave mixing scheme and show that with a fibre length of less than 1 m we are able to achieve 14 dB discrimination	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER Ann Roberts¹ , Ling Lin ¹ <i>1. The University of Melbourne, Australia</i>	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER Resonance Blue-tuning of Nanohole Arrays and Metamaterials through Substrate Milling Strong localization of the electromagnetic field at resonances of nanostructured metamaterials and hole arrays produces a sensitivity to selective removal of the substrate. This leads to blue-tuning of the resonance.	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER A.A. Asatryan¹ , L.C. Botter ¹ , M.A. Byrne ¹ , V.D. Freilikhel ² , S.A. Gredeskul ^{3,4} , I.V. Shadrinov ⁴ , R.C. McPhedran ⁵ , Yu.A. Kivshar ^{4,6}	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER Hashan Tilanka Munasinghe¹ , Shahraam Afshar Vahid ¹ , David Richardson ² , Tanya Monro ¹ <i>1. Institute for Photonics and Advanced Sensing, University of Adelaide, Australia</i> <i>2. Optoelectronics Research Centre, University of Southampton, UK</i>	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER Marcello Ferrera^{1,2} , Yang-Woo Park ¹ , Luca Razzari ^{1,3} , Brent Little ⁴ , Chu Sai ⁴ , Roberto Morandotti ¹ , David Moss ⁵ , Jose Azana ¹ <i>1. INRS - Énergie, Matériaux et Télécommunications, (Québec), Canada</i> <i>2. University of St Andrews, School of Physics and Astronomy, North Haugh, Scotland</i> <i>3. IIT, Istituto Italiano di Tecnologia, Via Morego, Italy</i> <i>4. Infinera Ltd, 169 Java Drive, California, USA</i> <i>5. CUDOS, School of Physics, University of Sydney, Australia</i>	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER Roberto J. Williams¹ , Christian Voigtlander ² , Graham D. Marshall ¹ , Andreas Tunnermann ² , Stefan Nolte ² , M. J. Steel ¹ , Michael J. Withford ¹ <i>1. CUDOS, MQ Photonics Research Centre, Macquarie University, Australia</i> <i>2. Institute of Applied Physics, Friedrich-Schiller-University, Germany</i>	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER Soon-gi Park¹ , Jonghyun Kim ¹ , Youngmin Kim ¹ , Sung-Wook Min ² , Byoungso Lee ¹ <i>1. School of Electrical Engineering, Seoul National University, Korea</i> <i>2. Department of Information Display, Kyung Hee University, Korea</i>	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER Ye Pu¹ , Chia-Lung Hsieh ¹ , Rachel Grange ¹ , Xin Yang ¹ , Ioannis Papadopoulos ¹ , Demetri	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER Michael Pullen^{1,2} , William Wallace ^{1,2} , Dane Laban ^{1,2} , Adam Palmer ^{1,2} , Friedrich Hanne ³ , Alexei Grum-Grzhimalo ^{4,5} , Brant Abelin ⁴ , Klaus Bartschat ⁴ , Dan Welfen ⁴ , Igor Ivanov ⁶ <i>1. ARC Centre of Excellence for Coherent X-Ray Science, Griffith University, Australia</i> <i>2. Australian Attosecond Science Facility and Centre for Quantum Dynamics, Australia</i> <i>3. Atomic and Electronics Physics Group, Westfälische Wilhelms-University, Germany</i> <i>4. Department of Physics and Astronomy, Drake University, Australia</i> <i>5. Institute of Nuclear Physics, Moscow State University, Russia</i> <i>6 Research School of Physical Sciences, The Australian National University, Australia</i>	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		
1400-1430	2440-IT-1 INVITED SPEAKER Invited Speaker Ye Pu¹ , Chia-Lung Hsieh ¹ , Rachel Grange ¹ , Xin Yang ¹ , Ioannis Papadopoulos ¹ , Demetri	1400-1430	2430-CT-1 Compatible 1st and 2nd Order Integrator We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2450-CT-1 5-layered Depth-fused Three-dimensional Horizontally Striped Screen We propose a multi-layered depth-fused three-dimensional display using striped scattering polarizers. The proposed system has better depth expression and viewing angle compared to the previous system. Feasibility of the proposal is demonstrated by the experiment.	1400-1430	2470-IT-1 Quantum Optics The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.	1400-1430	2460-CT-1 Comparison of RABITT and FROG Measurements in the Temporal Reconstruction of Attosecond Pulse Trains Attosecond high-harmonic pulses obtained from Ar were characterized by the two methods RABITT and FROG CRAB. The comparison of the two results revealed the capabilities of the two methods well.		

Metamaterials (2440)
continued

1. Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS) and Department of Mathematical Sciences, University of Technology, Sydney, Australia
2. Department of Physics, Bar-Ilan University, Ramat-Gan, Israel
3. Department of Physics, Ben Gurion University of the Negev, Beer Sheva, Israel
4. Nonlinear Physics Center and CUDOS, Australian National University, Australia
5. School of Physics and CUDOS, University of Sydney, Sydney, NSW 2006, Australia
6. St.Petersburg State University of Information Technologies, Mechanics and Optics, Russia

Dispersion Effects on the Anderson Localization in Disordered One Dimensional Metamaterial Stacks

We have carried out a comprehensive study of dispersion and absorption effects on Anderson localization in one-dimensional metamaterial stacks and have shown that the field is delocalized in e or m-near-zero media at normal incidence.

1500-1515 **2440-CT-4**
Michael Steel¹, Patrick Chaumet², Adel Rahmani³

1. Department of Physics and Astronomy, Macquarie University, Australia
2. Institut Fresnel, CNRS, Aix-Marseille Université, Campus de St-Jerome, France
3. Department of Mathematical Sciences, University of Technology, Sydney, Australia

Applied Nonlinear Optics 1 (2420) continued

between the amplified and deamplified signal quadratures with 1 W pump power.

1430-1500 **2420-IT-3**

INVITED SPEAKER

Satoshi Ashihara¹

1. Tokyo University of Agriculture and Technology, Japan

Spectral broadening and phase shaping of mid-IR pulses

Spectral broadening and temporal compression of mid-IR pulses were demonstrated by self-phase modulation and dispersive propagation. The precise phase shaping of mid-IR pulses has been achieved by a pulse shaper based on AOM.

1500-1515 **2420-CT-4**

Wen Qi Zhang¹, Max A. Lohie¹, Tanya M. Monto¹, Shahraam Afshar V¹

1. Institute for Photonics & Advanced Sensing (IPAS), The University of Adelaide, Australia

Nonlinear polarization self-flipping and optical switching

In asymmetric waveguides the nonlinear phase difference can dominate the linear contribution, provided the birefringence is sufficiently small. Polarization self-flipping and its application to optical power limiting at mW levels is demonstrated.

1515-1530 **2420-CT-5**

Xin Gai¹, Rongping Wang¹, Barry Luther-Davies¹,

Gratings and Sensing (2410) continued

Modeling Of Apodized Point-by-Point Fiber Bragg Gratings

We present coupled-mode-theory modeling of apodized fiber Bragg gratings inscribed using a point-by-point technique. We show that the local detuning in these gratings is almost constant, due to the morphology of the femtosecond laser-inscribed structures.

ACOFT Presentation

1445-1500 **2410-CT-3**

Graham Wild¹, Geoff Swan¹, **Steven Hincley¹**

1. Photonics Research Laboratory, School of Engineering, Edith Cowan University, Australia

A Fibre Bragg Grating for Intrusion Detection

We show the implementation of an optical Reed switch, for intrusion detection systems. The Reed switch uses converts the magnetic field into a strain, which is then converted into an optical signal by an FBG

ACOFT Presentation

1500-1515 **2410-CT-4**

Harpreet Bai¹, Will Brown², Wade Scott A², Fotos Sidiroglou¹, Nicoleta M. Dragomir¹, Greg W. Baxter¹, Stephen F. Collins¹

1. Optical Technology Research Laboratory, Centre For Telecommunications and Microelectronics, Victoria University, Australia
2. CAOUS, Swinburne University of Technology, Australia

Silicon Photonics (2430) continued

waveforms by using an integrated CMOS compatible four-port micro-ring resonator. The device offers an unprecedented processing speed > 400GHz.

1 430-1445 **2430-CT-3**

Jian-Hua Chen¹, Yu-Lin Yang¹, Ming-Feng Lu¹, Yang-Tung Huang¹, Jia-Min Shieh²

1. Institute of Electronics, National Chiao-Tung University, Taiwan
2. National Nano Device Laboratories, Taiwan

Design, Fabrication, and Characterization of Si-Based ARROW Photonic Crystal Waveguides

Si-based ARROW PCWGs were first successfully fabricated. For the preliminary experiments, the losses about 5 dB/mm or even lower with a long length of 800- μ m were achieved. Design, fabrication, and characterization of the devices will be presented.

1445-1500 **2430-CT-4**

Christy K. Y. Fung¹, Xia Chen^{1,2}, Gordon K. P. Lei¹, Chester Shu¹, Hon Ki Tsang¹

1. Department of Electronic Engineering, The Chinese University of Hong Kong, China
2. Advanced Technology Institute, University of Surrey, UK

Silicon Waveguide Side-cladding Distributed Bragg Reflector Hybrid Laser

We report the design, simulation and experimental results of a hybrid

Ultrafast Laser Modification of Optical Materials (2470) continued

1445-1500 **2470-CT-3**

M. Lancy¹, B. Pournellec¹, K. Cook², **J. Canning²**

1. LPCE/ICMCM, UMR CNRS-UPS 8182, Université Paris Sud 11, France
2. Interdisciplinary Photonic Laboratories (iPL), School of Chemistry, The University of Sydney, Australia

Nanogratings And Molecular Oxygen Formulation During Femtosecond Laser Irradiation In Silica

Nanogratings produced in the irradiated region of femtosecond laser processed glass are shown to consist of nanoplasts of mesoporous glass layers. Nanopore formation is due to glass decomposition leading to the generation of molecular oxygen.

1500-1530 **2470-IT-4**

INVITED SPEAKER

Yasuhiko Shimotsuma¹,

Masaaki Sakakura², Kiyotaka Miura¹, Kazuyuki Hirao¹, Peter Kazansky³

1. Department of Material Chemistry, Kyoto University, Japan
2. C-PIER, Kyoto Univ, Japan
3. Optoelectronics Research Centre, University of Southampton, UK

Manipulation of Self-assembled Nanostructure in Glass

We observed ultrafast writing dynamics of form birefringence produced by self-organized nanogratings. Rewritable five-dimensional optical data storage using self-assembled form birefringence was demonstrated.

Imaging and 3D Displays (2450) continued

Psaltis¹

1. Optics Laboratory, School of Engineering, Switzerland

Second Harmonic Nanoparticles in Biological Imaging

Nanocrystals with second harmonic response is a new class of nonlinear optical nanoprobes with dramatically different properties from fluorescent agents. We review the application of such nanocrystals in biomedical imaging.

1500-1515 **2450-CT-4**

Jae-Hyeung Park¹, Hyun-Eui Kim¹, Hee-Seung Kim¹, Kyeong-Min Jeong¹

1. Chungbuk National University, Korea

Depth Filtering of Three-dimensional Object Using Integral Imaging

Integral imaging is a useful tool in capturing and reproducing three-dimensional information of the object. In this paper, we analyze the frequency characteristics of the light ray field captured by integral imaging technique. Correspondence between a depth plane and frequency domain representation of the captured light ray field is identified and filtering operation is performed. By the proposed method, various manipulation of the captured three-dimensional information can be implemented including depth pass filtering, depth rejection filtering, and view generation of depth filtered three-dimensional information.

Attosecond and Extreme UV Science (2460) continued

Carrier-envelope Phase Effects in Few-cycle Ionisation of Atomic Hydrogen

We have observed carrier-envelope phase effects in the ionisation of atomic hydrogen exposed to an intense few-cycle laser pulse. Experimental data show good agreement with an advanced ab initio time dependent Schrödinger equation simulation.

1430-1445 **2460-CT-3**

Eiji Takahashi¹, T. Togashi^{2,3}, M. Aoyama¹, K. Yamakawa⁴, T. Sato^{2,5}, A. Iwasaki⁵, S. Owada⁵, K. Yamanouchi⁶, T. Hara², S. Matsubara³, T. Ohshima², Y. Otake², H. Tanaka^{2,3}, T. Tanaka^{2,3}, H. Tomizawa^{2,3}, T. Watanabe^{2,3}, M. Yabashi⁷, K. Midorikawa¹, T. Ishikawa²

1. RIKEN Advanced Science Institute, Hiroswawa, Japan
2. RIKEN, XFEL Project Head Office, Sayo, Hyogo, Japan
3. Synchrotron Radiation Research Institute, Japan
4. Japan Atomic Energy Agency, Quantum Beam Science Directorate, Japan
5. The University of Tokyo, Tokyo, Japan

EUV-FEL Seeded by High-Order Harmonic

We first demonstrated a seeded FEL radiation in the EUV region at 61.2 nm with the 13th high-order harmonic beam. We observed single-peak spectra with drastic enhancements of intensity by nearly three-orders of magnitude.

Radiation Dynamics in Discrete Invisibility Cloaks

We study the radiation dynamics of a dipole inside a discrete invisibility cloak. The dynamics differ drastically from the case of an ideal, continuous cloak, with the cloak sometimes enhancing the visibility of the source.

1515-1530

2440-CT-5

Walter Somerville¹, David Powell¹, Ilya Shadrivov¹

1. *Nonlinear Physics Centre, The Australian National University, Australia*

Second Harmonic Generation in the Zero-Index Regime

We experimentally demonstrate second harmonic generation, in the regime where both the fundamental frequency and second harmonic waves have zero phase velocity – the zero-index regime, utilising a dual-band composite right-left handed transmission line.

Chunle Xiong², Ben Eggleton²
1. *CUDOS, Laser Physics Centre, The Australian National University, Australia*
2. *CUDOS, (POS), University of Sydney, Australia*

Flattened Dispersion Ge11.5As24Se64.5 Glass waveguide for Correlated Photon Generation: Design and Analysis

A realizable waveguide structure providing ultra-low anomalous dispersion is achievable by changing the effective index of the top cladding using a SiO₂ layer. Using atomic layer deposition to produce the silica layer, the dispersion can be tuned with an accuracy of ~0.33-0.4ps-km-1nm⁻¹.

ACOFI Presentation

Effect of Phase Mask Misalignment on Alternative Type of PiPhase-Shifted FBGs at Twice the Bragg Wavelength

Effects of fabrication conditions on an alternative type of pi-phase-shifted fibre Bragg grating at twice the Bragg wavelength were investigated, showing that slight variations in the alignment of phase mask affect the grating spectra.
ACOFI Presentation

1515-1530 2410-CT-5

Kevin Cook¹, Eric Lindner², Christoph Chojetzki², Sven Brückner², Martin Becker², Manfred Rothhardt², Hartmut Bartelt², Kevin Chen³

1. *Interdisciplinary Photonic Laboratories (iPL), School of Chemistry, The University of Sydney, Australia*
2. *Institute of Photonic Technology (iPHT), Germany*
3. *Department of Electrical and Computer Engineering, The University of Pittsburgh, USA*

Regeneration of Gratings by Post-H₂ Loading

Regeneration of two types of gratings is demonstrated using post-hydrogen loading. This increases the flexibility of the regeneration process by allowing access to gratings that are written with hydrogen and also reducing the demands for immediate regeneration after grating writing.

silicon laser with side-cladding Bragg grating as wavelength selective component and erbium doped fiber as gain medium. Over 35dB side-mode-suppression-ratio (SMSR) is achieved.

1500-1530

2430-IT-5

INVITED SPEAKER

Andrew Poon¹, Shaoqi Feng¹, Ting Lei¹, Hong Cai¹, Aïmé Sayarath¹, Yu Zhang¹

1. *The Hong Kong University of Science and Technology, Hong Kong*

Silicon Microresonators for On-chip Optical Interconnects and Optofluidics

We will discuss the latest progress in our work on using microring and microdisk resonators on silicon chips for multi-channel on-chip optical interconnects, biosensing and optical manipulation of microparticles.

1515-1530
Guang Zheng¹, Yanwei Wang¹, Tao Fang¹, Hua Cheng¹, Bin Wang¹, Yan Qi¹, Boxia Yan¹, Yong Bi¹, Ying Zhang¹, Jing Chen¹

1. *Academy of Opto-Electronics, Chinese Academy of Science, China*

45,000 Lumens Super High Brightness Laser Projection System

A super high brightness laser projector is first shown, with steady output reaching up to 45,000 lumens. A highly flexible structure with remote light source and separated water-cooling system is employed for use in harsh application environment.

1445-1500

2460-CT-4

Lap Van Dao^{1,3}, Naylyn Gafney^{1,3}, Hoang Vu Le^{1,3}, Trevor Smith^{2,3}, Peter Hannaford^{1,3}

1. *Centre for Atom Optics and Ultrafast Spectroscopy, Swinburne University of Tech, Australia*
2. *The School of Chemistry, University of Melbourne, Australia*
3. *Australian Research Council Centre of Excellence for Coherent X-Ray Science, Australia*

High Power Infrared Source for Phase-

Matched High Order

Harmonic Generation in

Water Window Region

We report an enhancement, by a factor of two, of the cut-off energy of high-harmonic radiation generated in a semi-infinite gas cell when laser pulses with energy 2 mJ and wavelength 1300 nm are applied, compared with 800 nm pulses. Water window radiation (~ 4.4 nm) is generated by using helium gas.

1500-1530

2460-IT-5

INVITED SPEAKER

Zenghu Chang¹

1. *CREOL and Department of Physics, University of Central Florida, USA*

Probing Sub-Cycle Excitation Dynamics With Isolated Attosecond Pulses

The dynamics of Stark shift and Autoionization in atoms are probed in a transient absorption scheme using isolated attosecond pulses generated with the Generalized Double Optical Gating. Both processes were controlled by intense laser pulses.

<p>Room: Bayside Auditorium A</p> <p>Nanoparticles and Applications (2610)</p> <p>Symposium 1</p> <p>Chair: Aniwat Tandachaturat, Institute For Nano Quantum Information Electronics, The University of Tokyo, JAPAN</p> <p>1600-1630 2610-IT-1</p> <p>INVITED SPEAKER</p> <p>Ning Dai¹</p> <p><i>1. Shanghai Institute of Technical Physics, China</i></p> <p>Fabrication Of Solar Cells Using Semiconductor Quantum Dots And Nano-Materials</p> <p>We report the fabrication of CuSe, TiO₂, and ZnO nano-materials and the investigation on their uses as photo-anodes and light harvesting and light trapping materials in nano-based solar cells.</p> <p>1630-1645 2610-CT-2</p> <p>Baohua Jia¹, Dario Buso^{1,2}, Zhengguang He¹, Mengxin Ren³, Joel Van Embden⁴, Paolo Falcaro², Alessandro Antonello⁵, Alessandro Martucci⁵, Min Gu¹</p> <p><i>1. Centre for Micro-Photonics and CUDOS, Swinburne University of Technology, Australia</i> <i>2. CSIRO, Materials Science and Engineering, Australia</i> <i>3. Key Laboratory of Weak Light Nonlinear Photonics, Nankai University, China</i> <i>4. RMIT, Aerospace Mechanical & Manufacturing Engineering, Australia</i> <i>5. Universita' di Padova, Ingegneria Meccanica - settore Materiali, Italy</i></p>	<p>Room: Bayside 101</p> <p>Applied Nonlinear Optics 2 (2620)</p> <p>Symposium 2</p> <p>Chair: Shahtaraam Akshar, Institute for Photonics & Advanced Sensing, AUSTRALIA</p> <p>1600-1615 2620-CT-1</p> <p>Darren Hudson¹, Stephen Dekker¹, Eric Magi¹, Alex Judge¹, Stuart Jackson¹, Enbang Li¹, Jas Sanghera², Brandon Shaw², Ishwar Aggarwal², Benjamin Eggleton¹</p> <p><i>1. CUDOS, School of Physics, The University of Sydney, Australia</i> <i>2. Naval Research Laboratory, USA</i></p> <p>Octave Spanning Supercontinuum in an As2S3 Taper using Ultra-low Pump Power: Experiment and Theory</p> <p>An octave spanning spectrum is generated in an As₂S₃ taper via 77 pJ pulses from an ultrashort fiber laser. Chirp compensation allows the octave to be generated directly from the un-amplified laser output.</p> <p>1615-1630 2620-CT-2</p> <p>Gys Van Der Westhuizen¹, Johan Nilsson¹</p> <p><i>1. Optoelectronics Research Centre (ORC), University of Southampton, UK</i></p> <p>All-fibre OPO system for Visible Wavelengths</p> <p>An all-fibre PCF-based optical parametric oscillator at 718 nm, pumped to and synchronously spliced by an all-fibre Yb-doped MOPA, reaches an average in-fibre pump-to-anti-Stokes power</p>	<p>Room: Bayside 102</p> <p>High Power Laser Technology (2630)</p> <p>Symposium 3</p> <p>Chair: Poh Boon Phua, DSO National Labs, SINGAPORE</p> <p>1600-1615 2630-CT-1</p> <p>Vladimir Pervak^{1,2}, Oleg Pronin³, Olga Razkazovskaya³, Ferenc Krausz^{1,3}</p> <p><i>1. Ludwig-Maximilians-Universitaet Muenchen, Am Coulombwall, Germany</i> <i>2. Ultrafast Innovations GmbH, Am Coulombwall, Germany</i> <i>3. Max Planck Institute of Quantum Optics, Germany</i></p> <p>High Dispersive Mirrors for the High Energy Lasers</p> <p>We report on two newly developed types of dispersive mirrors. First type covers range of 1027-1033 nm, has 99.9% reflectance and -4500 fs² of group delay dispersion (GDD). Second type is high dispersive mirror (HDM) which provides GDD of -3000 fs² and covers wavelength range of 1020-1035 nm. The fabricated mirrors have reflectance 99.97%. The mentioned large GDD allows to compress the nanosecond pulses down to femtosecond range.</p> <p>1615-1630 2630-CT-2</p> <p>Hong Jin Kong¹, Sangwoo Park¹, Seongwoo Cha¹, Milan Kalal², Ondrej Slezak²</p> <p><i>1. KAIST, Korea</i> <i>2. Czech Technical University, Czech Republic</i></p> <p>4-beam Combination Laser Using Stimulated</p>	<p>Room: Bayside 103</p> <p>Optical Signal Processing (2640)</p> <p>Symposium 4</p> <p>Chair: Mark Pelusi, CUDOS/PODS, AUSTRALIA</p> <p>1600-1630 2640-IT-1</p> <p>INVITED SPEAKER</p> <p>Cibby Pulikasseril¹, Luke A. Stewart¹, Michael A. F. Roelens¹, Glenn W. Baxter¹, Simon Poole¹, Steve Frisken¹</p> <p><i>1. Finisar Australia, 244 Young st, Waterloo, NSW, Australia</i></p> <p>Spectral Modeling of Wavelength Selective Optical Networks</p> <p>Spectral modeling of wavelength selective switches (WSS) has previously used supergaussian functions to predict the channel bandwidth. We show that an error function-based model produces a more accurate representation of WSS channels.</p> <p><i>ACOFT Presentation</i></p> <p>1630-1645 2640-CT-2</p> <p>Joel Carpenter¹, Timothy D. Wilkinson¹</p> <p><i>1. Electrical Engineering Division, Engineering Department, University of Cambridge, UK</i></p> <p>Adaptive Enhancement of Multimode Fibre Bandwidth by Twin-spot Offset Launch</p> <p>A binary grating on a Spatial Light Modulator generates twin antiparallel spots with adjustable positions across the core of a multimode fibre allowing adaptive excitation of</p>	<p>Room: Bayside 104</p> <p>Frequency Dissemination and Frequent Control (2650)</p> <p>Symposium 5</p> <p>Chair: Andre Luiten, University of Western Australia, AUSTRALIA</p> <p>1600-1615 2650-CT-1</p> <p>Yabai He^{1,2}, Magnus Hsu¹, Michael Wouters¹, Malcolm Gray¹, Bruce Warrington¹, Brian Orr², Daniel Shaddock³, Kenneth Baldwin⁴, Guido Aben⁵</p> <p><i>1. National Measurement Institute, Australia</i> <i>2. MQ Photonics Research Centre, Macquarie University, Australia</i> <i>3. Centre for Gravitational Physics, The Australian National University, Australia</i> <i>4. Research School of Physics and Engineering, The Australian National University, Australia</i> <i>5. AARNET, Australia</i></p> <p>An Optical Fiber-based System for High - Stability Distribution of Reference Radio-frequencies</p> <p>We present a novel optical fiber-based radio-frequency distribution system that incorporates low-cost commercially available components. It has a fractional frequency stability of 7×10⁻¹⁷ (averaged over 104 s) for distribution of an 80-MHz signal.</p> <p>1615-1630 2650-CT-2</p> <p>Jianhua Shang^{1,2}, Shuqiang Zhao¹, Yan He³, Weibiao Chen²</p>	<p>Room: Bayside 105</p> <p>Cavity Qunntum Electrodynamic (2660)</p> <p>Symposium 6:</p> <p>Chair: Barry Sanders, University of Calgary, CANADA</p> <p>1600-1615 2660-CT-1</p> <p>James Quach¹, Chun-Hsu Su¹, Andrew Martin², Andrew Greentree², Lloyd Hollenberg¹</p> <p><i>1. Centre for Quantum Computation and Communication Technology, School of Physics, Australia</i> <i>2. School of Physics, The University of Melbourne, Australia</i></p> <p>Engineering Electromagnetic Metamaterials from Coupled Cavity Arrays</p> <p>We present a metamaterial design based on the tight-binding properties of coupled optical-cavity arrays and quantum-mechanical atom-cavity arrays. By tailoring their dispersion properties, waveguiding of photonic and polaritonic Bloch waves can be engineered.</p> <p>1615-1630 2660-CT-2</p> <p>Scott Parkins¹, Howard Carmichael¹, Changsuk Noh¹, Steffen Zeeb¹</p> <p><i>1. Dan Walls Centre for Pure and Applied Optics, University of Auckland, New Zealand</i></p> <p>Superradiant Decay and Dipole-Dipole Interaction of Distant Atoms in a Two-Way Cascaded Cavity QED System</p>	<p>Room: Bayside 106</p> <p>Ultrafast Dynamics (2670)</p> <p>Symposium 7</p> <p>Chair: Igor Litvinyuk, Griffith University, AUSTRALIA</p> <p>1600-1630 2670-IT-1</p> <p>INVITED SPEAKER</p> <p>R. J. Dwayne Miller¹</p> <p><i>1. University of Hamburg, Germany</i></p> <p>Making The Molecular Movie: First Frames.... Coming Features</p> <p>Femtosecond Electron Diffraction has enabled atomic resolution to structural changes as they occur, essentially watching atoms move in real time -- directly observe the very essence of chemistry and biology. This experiment has been referred to as "making the molecular movie". Recent results will be presented from the latest advance in electron sources and characterization to direct observation of structure order parameters to classic barrier crossing processes in cyclization reactions.</p> <p>1630-1645 2670-CT-2</p> <p>Jeffrey Davis¹, Christopher Hall¹, Lap Van Dao¹, Keith Nugent², Harry Quiney², H.H. Tan³, C. Jagadish³</p> <p><i>1. Swinburne University of Technology, Australia</i> <i>2. University of Melbourne, Australia</i> <i>3. The Australian National University, Australia</i></p> <p>Three-Dimensional Electronic Spectroscopy of Excitons in</p>
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Functional Three-dimensional Nonlinear Nanostructures in a Gold Nanocomposite

We developed a novel nanocomposite consisting of an organic-inorganic hybrid polymer and gold ion nanoparticles. The nanocomposite has been proven to be suitable for functional three-dimensional nanostructure fabrication due to the fact that dominant formation of the nanoparticles is triggered in the post bake process after nanofabrication. The nanocomposite has high third-order nonlinearity due to the local field enhancement of the gold nanoparticles.

1645-1700 **2610-CT-3**

Alexander Huggenberger^{1,2}, Christian Schneider^{1,2}, Tobias Heindel^{1,2}, Martin Kamp², Stephan Reitzenstein^{1,2}, Sven Höfling^{1,2}, Lukas Worschech^{1,2}, Alfred Forchel^{1,2}

1. *Wilhelm Conrad Röntgen-Center for Complex Material Systems, University Würzburg, Germany*
2. *Technische Physik, Physikalisches Institut, University Würzburg, Am Hubland, Germany*

Site-controlled In(Ga)As

Quantum Dots with

Narrow Emission

Linewidth for Integration

into Nanophotonic

Devices

Site-controlled In(Ga)As quantum dots were grown by molecular beam epitaxy on pre-patterned GaAs (001) substrates and integrated into optical resonators. The emission linewidth of single site-controlled quantum dots exhibits values down to 38 μeV .

conversion efficiency of 10.3% at a frequency-shift of 140 THz.

1630-1700 **2620-IT-3**

INVITED SPEAKER

Aaron Bernstein¹

1. *Univ. of Texas At Austin - Ctr For High Energy Density Science, USA*

New Opportunities for

Controlling Long Distance

Filaments in Air Through

Two Beam Coupling

Two beam coupling in air provides new opportunities for controlled propagation of intense laser beams to long distances. New experimental data and theoretical considerations demonstrate robustness and scalability of the effect.

1700-1715 **2620-CT-4**

Wilhelm G Kaenders¹, Axel Friedenaue¹, Bernhard Ernstsberger¹, Vladimir Karpov², Vladimir Protopopov², Wallace Clements², Wolfgang Hackenberg³, Domenico Bonaccini Calia³, Steffan A Lewis³

1. *OPTICA Photonics AG, Germany*
2. *MPB Communications Inc., Canada*
3. *European Southern Observatory Germany*

18+2 W at 589 nm via

Frequency Doubling of

Diode-Laser-Seeded

1178-nm CW PM Raman

Fiber Amplifier for

Deployment at ESO VLT

The rationale and design of a a 589-nm Laser Guide Star System is presented, based on the amplification of narrow-band diode laser seeds using ESO's patented Raman Fiber approach in the near infrared and subsequent resonant frequency doubling, developed and realized by two industrial partners

Brillouin Scattering Phase Conjugation Mirror and its Application

A 4-beam combination laser using stimulated Brillouin scattering phase conjugation mirrors is constructed. The input energy is $32.2 \text{ mJ} \pm 0.3 \text{ mJ}$, and the output energy is 169 mJ $\pm 6 \text{ mJ}$. The average phase fluctuations between the sub-beams are less than $\pi/26.1$

1630-1645 **2630-CT-3**

M. Murakami¹, H. Nagatomo¹, T. Johzaki¹, K. Shigemori¹, Y. Hironaka¹, T. Watarai¹, Y. Arinaga¹, T. Norimatsu¹, H. Shiraga¹, H. Azechi¹, M. Karasik², J. Weaver², Y. Aglitskiy², A. Velkovich², S. Zalesak², J. Bates², A. Schmitt², J. Sethian², S. Obenshain²

1. *Institute of Laser Engineering, Osaka University, Suita, Osaka, Japan*
2. *Naval Research Laboratory, Washington, USA*

Progress of Impact

Ignition

In impact ignition research, a maximum velocity $\sim 1000 \text{ km/s}$ has been achieved. Two-dimensional simulations show the feasibility of the impact ignition. Optimized direct illumination scheme is also addressed.

1645-1700 **2630-CT-4**

Candice Mézel¹, Guillaume Duchateau¹

1. *CEA, Centre d'Etudes du Ripault, 37260 Monts, France*

A Simple Approach for

Modeling Multiphoton

Absorption in Dielectric

Materials

A model is derived to evaluate the laser-induced ionization rate in

antisymmetric mode-groups for improving modal dispersion or modal multiplexing. *ACOFI Presentation*

1645-1700 **2640-CT-3**

Bikash Nakarmi¹, M. Rakib-Uddin¹, and Yong Hyub Won¹

1. *Korea Advanced Institute of Science and Technology (KAIST), Munji Campus, 119, Munji-ro, Yuseong-gu, Daejeon, Korea*

Realization of All-optical

Bit-equality Checking

Function Using Fabry-

Perot Lasers

All-optical bit-equality checking function is demonstrated using Fabry-Perot laser diodes (FP-LDs). The proposed function is based on multi-input injection locking in FP-LDs. We measured output waveforms and eye diagram with extinction ratio of 12.33 dB *ACOFI Presentation*

1700-1715 **2640-CT-4**

Jia Haur Wong¹, Huy Quoc Lam², Kenneth Eng Kian Lee², Vincent Wong², Peng Huel Lim¹, Sheel Aditya¹, Perry Ping Shum¹

1. *Network Technology Research Centre, School of Electrical & Electronic Engineering, Nanyang Technological University, Singapore*
2. *Temasek Laboratories, Nanyang Technological University, Singapore*

Generation of Flat

Supercontinuum for

Time-Stretched Analog-

to-Digital Converters

Flat supercontinuum (SC) generation with less than 1 dB fluctuation in the telecommunication band is demonstrated using a regenerative active mode-locked fiber laser together with a dispersion-flattened highly nonlinear fiber.

1. *School of Information Science & Technology, Donghua University, China*

2. *Key Laboratory Space Laser Communication and Testing Technology, CAS, China*

All-fiber Heterodyne

Laser Doppler Vibrometry

for Acousto-optic

communication

A novel all-fiber heterodyne Laser Doppler Vibrometry for acousto-optic communication has been developed. Using this system, the 6 kHz signal can be reconstructed by detecting the vibration of a glass sticking on the PZT.

1630-1700 **2650-IT-3**

INVITED SPEAKER

Gesine Grosche¹

1. *Physikalisches-Technische Bundesanstalt (PTB), Germany*

High Performance

Frequency Comparisons

Over Optical Fibre

Ultra-stable frequencies, such as optical clock signals, can be compared and disseminated with phase-stabilized fibre links based on optical telecommunication fibre. We present methods and results for a metrology network which spans 1000 km.

1700-1715 **2650-CT-4**

Dong Wei¹, Kiyoshi Takamasu², Hirokazu Matsumoto²

1. *Global COE Program -Mechanical Systems Innovation-, School of Engineering, The University, Japan*
2. *Department of Precision Engineering, The University of Tokyo, Japan*

An Evaluation System for

Distance Estimation

Using the Repetition

Interval of a

We investigate theoretically the modification of atomic spontaneous emission in a two-way cascaded cavity QED system consisting of microtoroidal resonators connected via an optical fiber.

1630-1645 **2660-CT-3**

Young-Tak Chough¹, **Howard Carmichael**²

1. *Department of Optical Communications Engineering, Korea Communications Engineering, Korea*
2. *Department of Physics, New Zealand*

Trapping States -

Revisited

We revisit the trapping states of the micromaser from a quantum trajectory point of view, treating many simultaneously interacting atoms and a random atomic beam. Previous studies of trapping states are severely restricted by simplifying assumptions. We show that sub-Poissonian maser fields are generated still after the principal restrictions are lifted.

1645-1700 **2660-CT-4**

Dimitris Angelakis^{1,2}

1. *Science Department, Technical University of Crete, Greece*
2. *Centre for Quantum Computation, Singapore*

Photonic Quantum

Simulators: Mimicking

Condensed Matter

Physics with Photons

We will briefly review the main ideas in Photonic Quantum Simulators and analyze our recent results in mimicking Luttinger liquid behaviour with photons in hollow-core waveguides.

Asymmetric Double Quantum Wells

We demonstrate three-dimensional electronic spectroscopy of excitons in a double quantum well system using a three-dimensional phase retrieval algorithm to isolate coherence pathways, reveal details of many-body interactions and identify an otherwise hidden cross-peak.

1645-1700 **2670-CT-3**

Yusuke Furukawa¹, Yasuo Nabekawa¹, Eiji Takahashi¹, Tomoya Okino², Kaoru Yamanouchi², Katsumi Midorikawa¹

1. *RIKEN Advanced Science Institute, Japan*
2. *The University of Tokyo, Japan*

Full-scanning Nonlinear

Fourier-transform

Spectroscopy of D2 Using

High-order Harmonic

Radiation

We measured full-scanning nonlinear Fourier-transform spectroscopy of D2 molecules using high-order harmonic radiation. We compared the spectral shape obtained from the nonlinear Fourier-transform spectroscopy to that measured directly with a spectrometer.

1700-1715 **2670-CT-4**

Takanori Kozai¹, S.

1. *Department of Advanced Materials Science, Kagawa University, Japan*

Femtosecond Coherent

Anti-Stokes Raman Beats

between Vibration Modes

in PVA Film

Monday 29 August 2011

<p>Nanoparticles and Applications (2610) <i>continued</i></p>	<p>Applied Nonlinear Optics 2 (2620) <i>continued</i></p>	<p>High Power Laser Technology (2630) <i>continued</i></p>	<p>Optical Signal Processing (2640) <i>continued</i></p>	<p>Frequency Dissemination and Frequenc Control (2650) <i>continued</i></p>	<p>Cavity Qumtum Electrodynamics (2660) <i>continued</i></p>	<p>Ultrafast Dynamics (2670) <i>continued</i></p>
<p>1700-1715 2610-CT-4 Betty Kouskousis¹, Xinagping Li¹, Stefania Castelletto¹, Min Gu¹ 1. <i>Centre for Micro-Photonics, Swinburne University of Technology, Australia</i></p>	<p>for implementation on the Nasmyth platform inside the rotated telescope structure. 1715-1730 2620-CT-5 Stuart Murdoch¹, Jae Jang¹ 1. <i>Physics Dept, University of Auckland, New Zealand</i></p>	<p>dielectric materials. It consists in an analytical description of multiphoton absorption process coupled with ab-initio calculations providing the electronic structure of the material. 1700-1730 2630-IT-5 INVITED SPEAKER Almantas Galvanauskas¹ 1. <i>University Of Michigan, USA</i></p>	<p>1715-1730 2640-CT-5 Cibby Pulikkaseril¹, Jochen Schröder², Michael A.F. Roelens¹ 1. <i>Finisar Australia, 244 Young st., Waterloo, NSW, Australia</i> 2. <i>Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), School of Physics A28 The University of Sydney NSW, Australia</i></p>	<p>1700-1730 2660-IT-5 INVITED SPEAKER Andrew Doherty¹ 1. <i>University of Sydney, Australia</i> Microwave Bistability in Circuit QED The physics of a Josephson junction qubit coupled to a bistable microwave cavity will be discussed in light of recent experiments. The qubit excitation spectrum is sensitive to the effective temperature, oscillation frequency and damping rate of the intracavity field fluctuations.</p>	<p>1700-1730 2670-CT-5 Rode¹ Eugene G. Gamaly¹, Andrei V. Rode¹ 1. <i>Laser Physics Centre, Research School of Physics and Engineering Australian National University, Australia</i></p>	<p>We have performed femtosecond time-resolved coherent anti-Stokes Raman spectroscopy in Polyvinyl alcohol. We observed CARS signal beats between vibrational modes of CH and OH in PVA and measured the coherent vibrational relaxation rates. <i>ACOPT Presentation</i></p>
<p>Nanoscopic Localisation And Characterisation Of Nanoparticle Embedded Photonic Materials The nanoscopic characteristics of photonic materials embedded with single emitting nanoparticles is presented. The effect of localisation of single emitters within a photonic material on the photoluminescence and material properties of the device is presented. 1715-1730 2610-CT-5 Fan Wang¹, Suriati Paiman², Qiang Gao², Hoe Tan², Jagadish Chennupati², Peter Reece¹ 1. <i>School of Physics, The University of New South Wales, Australia</i> 2. <i>Research School of Physics and Engineering, Australia</i></p>	<p>Passive Brillouin Suppression in Fiber Ring Cavities We demonstrate how Brillouin scattering can be passively suppressed in meter length fiber ring cavities by carefully setting the fiber length. Experimentally we demonstrate a factor 3.4 increase in Brillouin threshold using this technique.</p>	<p>Emulation of Modulated Data Channels in Optical Networks using a Programmable Optical Processor We demonstrate a method of filtering broadband ASE to emulate high bit rate optically modulated signals, allowing accurately shaped artificial channels to be loaded into a channel plan for optical networks. <i>ACOPT Presentation</i></p>	<p>Robust Optical Injection Locking to a 250 MHz Narrow-Band Optical Pre-Filtering A semiconductor laser was injection locked to a single optical frequency comb mode with a dither-free phase locked loop. The standard deviation was 0.014Hz over 24 hours with an Allan deviation of 1x10⁻¹⁷ at 10s averaging.</p>	<p>1715-1730 2650-CT-5 David S. Wu¹, Radan Slavik¹, Giuseppe Marra², David J. Richardson¹ 1. <i>Optoelectronics Research Centre, University of Southampton, UK</i> 2. <i>National Physical Laboratory, UK</i></p>	<p>Electron-Phonon Relaxation in Metals Excited by Ultra-Short Laser Pulse We show, that the electron-phonon relaxation rate in fs-laser excited metal is a strong function of the time-dependent lattice temperature. The lattice heating and re-structuring occurs on a much shorter time scale than previously expected.</p>	<p>Electron-Phonon Relaxation in Metals Excited by Ultra-Short Laser Pulse We show, that the electron-phonon relaxation rate in fs-laser excited metal is a strong function of the time-dependent lattice temperature. The lattice heating and re-structuring occurs on a much shorter time scale than previously expected.</p>
<p>Two-Photon Luminescence Study of Optically Trapped InP Semiconductor Nanowires We report that strong two-photon luminescence emission (2PE) is observed in trapped single indium phosphide semiconductor nanowire; and a blue shift was observed between single-photon luminescence emission spectra and 2PE spectra.</p>	<p>1730-1930 Poster Session 1 - Bayside Terrace, Level 2 Full listing of poster presentations including summaries can be found on page 71.</p>	<p>1730-1930 Poster Session 1 - Bayside Terrace, Level 2 Full listing of poster presentations including summaries can be found on page 71.</p>	<p>1730-1930 Poster Session 1 - Bayside Terrace, Level 2 Full listing of poster presentations including summaries can be found on page 71.</p>	<p>1730-1930 Poster Session 1 - Bayside Terrace, Level 2 Full listing of poster presentations including summaries can be found on page 71.</p>	<p>1730-1930 Poster Session 1 - Bayside Terrace, Level 2 Full listing of poster presentations including summaries can be found on page 71.</p>	<p>1730-1930 Poster Session 1 - Bayside Terrace, Level 2 Full listing of poster presentations including summaries can be found on page 71.</p>

1730-1930

Poster Session 1 - Bayside Terrace, Level 2

Full listing of poster presentations including summaries can be found on page 71.

0830-1015

Plenary Session 2

Room: Bayside Auditorium A

Chair: Ben Eggleton
The University of Sydney, AUSTRALIA

0930-1015

3120-PT-3

Ken-ichi Kitayama

Osaka University, Japan

Photonic Networks Beyond the Next - Power-saving, Security, and Resilience

Today the transmission capacity per fiber has hit nearly its limit of 100 Tbit/s. For better quality of human life, in this talk I will address the other R&D issues of photonic networks: its power-saving, security, and resilience.

0915-0930

Award Presentation

0830-0915

3040-PT-1

Mark Kasevich

Sponsored by:
Stanford University, USA



Precision Atom Interferometry

Recent advances in techniques to manipulate atomic de Broglie waves enable new classes of precision inertial sensors based on atom interferometry. This talk will summarize the scientific and technological prospects for these sensors.

1015-1045

MORNING TEA - Bayside Gallery

1045-1245

Session 4

Room: Bayside Auditorium A

Room: Bayside 101

Pulsed Fibre Lasers (3240)

Symposium 4
Chair: Inghat Hart, IMPRA America, Inc, USA

1045-1100

3240-CT-1

Songtao Du¹, Wendi Wu², Jun Zhou³, Jing He¹, Qihong Lou¹, Xijia Gu³

1. Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China
2. College of Physics and Engineering of Qufu Normal University, China
3. Department of Electrical and Computer Engineering, Ryerson University, Canada

Room: Bayside 102

Precision Interferometry (3220)

Symposium 2
Chair: Jesper Munch, Institute for Photonics & Advanced Sensing, AUSTRALIA

1045-1100

3220-CT-1

Malcolm Gray¹, Magnus Hsu¹, Ian Littler¹, Richard Warrington¹, Jan Herrmann¹, Daniel Shaddock²

1. National Measurement Institute - Australia
2. Australian National University, Australia

Precision Length Measurement using an All-digital Phasemeter for

Room: Bayside 103

Semiconductor Modulators and Beam Optics (3230)

Symposium 3
Chair: Robert Rehm, Fraunhofer IAF, GERMANY

1045-1115

3210-IT-1

Rich Mildren¹
1. MQ Photonics Research Centre, Macquarie University, Australia

Performance Extension of Raman Lasers Using Synthetic Diamond

Diamond's extreme properties are attractive for enabling large increases in laser capability. This

Room: Bayside 104

Nanophotonic Sensing and Imaging (3250)

Symposium 5
Chair: Cather Simpson, University of Auckland, NEW ZEALAND

1045-1115

3250-IT-1

INVITED SPEAKER
Leann Tilley^{1,2,3}, Paul McMillan^{1,2,3}, Matt Dixon^{1,2,3}, Eric Hanssen², Jeff Yeoman^{1,2}, Cynthia Whitchurch⁴, Nick Klonis^{1,2,3}

1. La Trobe Institute for Molecular Science, Australia
2. Centre of Excellence for Coherent Science, Australia

Room: Bayside 105

Plasmonics (3260)

Symposium 6
Chair: Timothy Davis, CSIRO Materials Science & Engineering, AUSTRALIA

1045-1100

3260-CT-1

Kristy Vernon¹, Daniel Gomez², Tim Davis³
1. Applied Optics Group, School of Physics, Queensland University of Technology, Australia
2. School of Physics, University of Melbourne, Australia
3. CSIRO Materials Science and Engineering, Australia

Quantum Dot Coupling to Stripe Plasmon Waveguides

Room: Bayside 106

Quantum Information 1 (3270)

Symposium 7
Chair: Kae Nemoto, National Institute of Informatics, JAPAN

1045-1100

3270-CT-1

Alexandr Sergeevich¹, Joshua Combes², Anushya Chandran³, Howard Wiseman⁴, Stephen Bartlett¹
1. ARC Centre for Engineered Quantum Systems, The University of Sydney, Australia
2. Center for Quantum Information and Control, University of New Mexico, USA
3. Department of Physics, Princeton University, USA

Pulsed Fibre Lasers (3240)
continued

102W Picosecond All Fiber One-Stage MOPA Laser

Picosecond pulses from a passively mode-locked ytterbium-doped single mode fiber laser were amplified in a one-stage fiber MOPA system to produce in excess of 100 W of average power in 76 ps pulses at 18.6 MHz repetition rate at 1064 nm with bandwidth of 0.5 nm.

1100 -1115 **3240-CT-2**
Jiang Liu¹, Sida Wu², Quan-Hong Yang², **Pu Wang¹**

1. *Institute of Laser Engineering, Beijing University of Technology, P. R. China*
2. *School of Chemical Engineering and Technology, Tianjin University, P. R. China*

Sub-100 ns Pulses from a Graphene Passively Q-switched Yb-doped Fiber Laser

We report 70 ns pulse generation at 1064.2 nm from an Yb-doped fiber laser passively Q-switched by a graphene saturable absorber in a short linear cavity. The maximum output power was 12 mW and single pulse energy was 46 nJ. The pulse repetition rate of the laser can be widely tuned from 140 kHz to 257 kHz along with the increase of the pump power.

1115-1130 **3240-CT-4**
Akira Shirakawa¹, Hidenori Yamada¹, Michio Matsumoto¹, Masaki Tokurakawa¹, **Ken-ichi Ueda¹**

Precision Interferometry (3220)
continued

Heterodyne Laser Interferometry

We report on an all-digital radio-frequency phase meter for application in precision length measurements using heterodyne laser interferometry. We achieve a sensitivity of 5 micro-radians/(rt(Hz)), corresponding to a displacement of 0.5 pm/(rt(Hz)).

1100-1115 **3220-CT-2**
Daniel Shaddock¹, Andrew Sutton¹, Danielle Wuichenich¹, Tim Lam¹

1. *Centre for Gravitational Physics, The Australian National University, Australia*

Digital Enhanced Homodyne Interferometry for High Precision Metrology

We present a novel technique for optical interrogation of multiplexed displacement sensors with homodyne detection for measurement of distributed optical systems.

1115-1145 **3220-IT-3**
INVITED SPEAKER

Stanley Whitcomb^{1,2}

1. *LIGO Laboratory, California Institute of Technology, USA*
2. *University of Western Australia, Australia*

Laser Interferometer Gravitational-wave Detectors: Advancing toward a Global Network

Gravitational wave detectors based on precision laser interferometry over long baselines

Frequency Conversion of Solid State Lasers (3210)
continued

paper reviews progress in diamond Raman lasers for reducing device size, extending power and increasing wavelength reach.

1115-1130 **3210-CT-2**
Alexander Sabella¹, Jim Piper², Rich Mildren²

1. *Defence Science and Technology Organisation, Australia*
2. *MQ Photonics Research Centre, Macquarie University, Australia*

Efficient 1064 nm Conversion to the Eye-safe Region Using an External Cavity Diamond Raman Laser

We present a 1064 nm pumped diamond Raman laser operating with 7.1% quantum conversion efficiency to the 2nd Stokes wavelength of 1485 nm. Up to 1.6 W average power is produced with excellent beam quality.

1130-1145 **3210-CT-3**
Jipeng Lin¹, Helen M. Pask¹, Andrew J. Lee¹, David J. Spence¹

1. *Macquarie University, Australia*

Study of Amplitude Noise in a Continuous-Wave Intracavity frequency-Doubled Raman Laser

The amplitude noise of a CW intracavity frequency-doubled self-Raman Nd:GdVO₄ laser (yellow laser) was studied both experimentally and theoretically, showing significant different performance at high pump powers (rms>20%) and low pump power (rms <1%) of amplitude noise.

Semiconductor Modulators and Beam Optics (3230)
continued

We show giant beam-steering from a slow-light waveguide amplifier with wavelength-tuning of input light. A tunable deflection-angle can be over 40 degrees. Flat intensity-distribution in a long-amplifier enables an ultra-large number of resolution-points over 4,000.

1100-1115 **3230-CT-2**

Hong C. Nguyen¹, Yuya Sakai¹, Mizuki Shinikawa¹, Norihiro Ishikura¹, Toshihiko Baba¹

1. *Yokohama National University, Japan*

10 Gb/s Operation and Slow Light Effect in Photonic Crystal Silicon Optical Modulators

We demonstrate 10 Gb/s modulation in CMOS-fabricated MZI modulators incorporating 200 μm-long photonic crystal waveguides. For NRZ PRBS modulation, we observe open eye patterns at 10 Gb/s and 2 Gb/s, with and without pre-emphasis, respectively.

1115-1130 **3230-CT-3**

Aaron McKay¹, Natalia Trela¹, Howard J Baker¹, Denis R Hall¹

1. *Heriot-Watt University, UK*

Reformatting Linear Beam Arrays to Hexagonal Beam Arrays Using Custom Refractive Micro-Optics

Custom laser-cut refractive surfaces are used to reformat a 49-emitter single-mode laser-

Nanophotonic Sensing and Imaging (3250)
continued

3. *Bio21 Molecular Science and Biotechnology Institute, University of Melbourne, Australia*
4. *University of Technology, Australia*

Super-resolution optical imaging of malaria parasites

Super-resolution optical microscopy uses ingenious strategies to overcome the "diffraction barrier", providing cellular detail that was beyond imagining only a few years ago. We have used 3-D structured illumination microscopy (SIM) to image malaria parasites.

1115-1130 **3250-CT-2**

Varun Sreenivasan¹, Ekaterina Ivukina², Timothy Kelf¹, Oleg Stremovskiy², Ann Goodchild³, Mark Connor³, Sergey Deyev²

1. *Department of Physics and Astronomy, Macquarie University, Australia*
2. *Laboratory of Molecular Immunology, Russian Academy of Sciences, Russia*
3. *Australian School of Advanced Medicine, Macquarie University, Australia*

Interfacing Nanodiamonds for Single Molecular Optical-biomedical Imaging

Luminescent nanodiamond is attractive for targeted drug-delivery and bio-labelling due to its unique optical and chemical properties. A versatile bioconjugation protocol to dock biomolecules on the colloidal

Plasmonics (3260)
continued

Quantum dot coupling to nanowires may enable the development of active nano-optical devices, but the positioning of the wire is problematic. As an alternative, we investigate using lithographic stripe plasmon waveguides coupled to quantum dots.

1100-1115 **3260-CT-2**

Dmitri Gramotnev^{1,2}, Daniel Mason³, Michael Vogel⁴

1. *University of Southern Denmark, Niels Bohrns Alle 1, Denmark*
2. *Nanophotonics Pty Ltd, Australia*
3. *Pohang University of Science and Technology, Korea*
4. *The University of Queensland, Australia*

Nanofocusing in Metallic Nanostructures: Recent Developments and Results

In this paper, we present the most recent new results on plasmon nanofocusing in tapered metallic structures and its applications in near-field optical microscopy, nanorefractometry, nanosensors, trapping and manipulation of nanoparticles and single molecules.

1115-1130 **3260-CT-3**

Asanka Pannipitiya¹, Ivan D. Rukhlenko¹, Malin Premaratne¹

1. *Department of Electrical and Computer Systems Engineering, Monash University, Australia*

Plasmonic Waveguides with Resonant-Cavity Structures for

Quantum Information 1 (3270)
continued

Bayesian Approach to Hamiltonian Parameter Estimation and Measurement of Double Quantum Dot

We analyze and optimize double-quantum-dot qubit Hamiltonian parameter estimation algorithms based on the Bayesian updating approach. The theoretical framework for measurement and parameter estimation processes are developed, and we provide numerical simulations showing the algorithms' performance.

1100-1115 **3270-CT-2**

William Munro^{1,2}, Ashley Stephens², Simon Devitt², Kae Nemoto²

1. *NTT Basic Research Laboratories, NTT Corporation, Japan*
2. *National Institute of Informatics, Japan*

Quantum Communication without Memories or Shared Entanglement

Long-range quantum communication and its associated repeater network are a necessity for any future quantum internet. The performance of such networks is currently limited by the time it takes to establish entangled links between the appropriate parties on the network. We present in this talk the design of a communications network for the direct transfer of quantum information where the rate at which quantum data can

<p>1. <i>Institute for Laser Science, University of Electro-Communications, Japan</i></p> <p>Q-switched Multicore Photonic Crystal Fiber Laser Phase-locked by End-seal Technique</p> <p>Q-switched and phase-locked Yb-doped multicore fiber laser is reported. The monolithic in-phase mode selection at the output fiber end realizes clean single-lobe beam profile and high slope efficiency of 62% with 280uJ, 100ns pulses.</p> <p>1130-1145</p> <p>3240-CT-5</p> <p>Mingzhong Li¹, Feng Jing¹, Honghuan Lin¹, Jianjun Wang¹</p> <p>1. <i>Research Center of Laser Fusion, Japan</i></p>	<p>require sensitivities equivalent to displacements of ~10-19 m over multikilometer baselines. I will describe the development of these devices.</p> <p>1145-1200</p> <p>3210-CT-4</p> <p>Jonas Jakutis Neto^{1,2}, Jipeng Lin¹, Andrew Lee¹, Huijin Zhang³, Jiyang Wang³, Niklaus Ursus Wettter², Helen Pask¹</p> <p>1. <i>MQ Photonics Research Centre, Department of Physics, Macquarie University, Sydney, Australia</i> 2. <i>Instituto de Pesquisas Energéticas e Nucleares, CNEN/SP, Universidade de São Paulo, Brazil</i> 3. <i>State Key Laboratory of Crystal Materials and Institute of Crystal Materials, China</i></p> <p>High Beam Quality cw 1.5 W BaWO4 Raman Laser Using Nd:YLF as Laser Active Medium</p> <p>1.5W of 1stStokes, 1167nm, cw output power was produced by a Nd:YLF/BaWO4 Raman laser. A M2 of 1.51 and 1.43 was obtained. Also, a preliminary result for a cw 583nm laser has delivered 0.61W.</p> <p>1200-1215</p> <p>3210-CT-5</p> <p>Andrew R. Wade¹, Kirk McKenzie², Yanbei Chen³, Daniel A. Shaddock¹, Jong H. Chow¹, David E. McClelland</p> <p>1. <i>Australian National University, Australia</i> 2. <i>Jet Propulsion Laboratory, USA</i> 3. <i>California Institute of Technology, USA</i></p>	<p>diamond and demonstration of cellular internalization is presented.</p> <p>1130-1145</p> <p>3250-CT-3</p> <p>Masood Naqshbandi^{1,2}, John Canning^{1,2}, Angelica Lau^{1,2}, Maxwell J Crossley¹</p> <p>1. <i>School of Chemistry, The University of Sydney, Australia</i> 2. <i>Interdisciplinary Photonics Laboratories (iPL), The University of Sydney, Australia</i></p> <p>Controlled Fabrication of Macroscopic Mesostuctured Silica Spheres for Potential Diagnostics and Sensing Applications</p> <p>We report on fabricating macro-scale mesostructured silica spheres on superhydrophobic surfaces from silica nanoparticles via evaporative self-assembly. We overcome the problem of structural instability of the sphere by using various dopants and increasing the evaporation time.</p> <p>1145-1200</p> <p>3250-CT-4</p> <p>Changxi Yang¹, Ting Liu¹</p> <p>1. <i>Dept of Precision Instruments, Tsinghua University, China</i></p> <p>Photochemical Synthesis of Gold and Gold-Silver Nanostructures for Optical Fiber SERS Sensors</p> <p>Two kinds of fiber SERS probes were prepared by photochemical methods. One was based on gold nanoparticles with great monodispersity. The other was based on gold-silver nanoalloys, which show excellent SERS activities and good tunability.</p>	<p>be transmitted is not limited by the distance the information needs to be sent but instead by the time to perform efficient local gate operations. Our scheme requires neither the establishment of entanglement between communication nodes nor the use of long-lived quantum memories.</p> <p>1115-1130</p> <p>3270-CT-3</p> <p>Geoff Pryde¹, Sacha Kocsis¹, Tim Ralph², Guoyong Xiang^{1,3}</p> <p>1. <i>Griffith University, Australia</i> 2. <i>The University of Queensland, Australia</i> 3. <i>University of Science and Technology of China, China</i></p> <p>Heralded Noiseless Amplification of Photonic Qubits</p> <p>We experimentally demonstrate the heralded noiseless amplification of a photon polarisation qubit subjected to loss, using two amplifier stages based on generalized quantum scissors. This is a key step towards realizing device-independent quantum key distribution.</p> <p>1130-1145</p> <p>3270-CT-4</p> <p>Barry Sanders¹, Alexander Hentschel¹</p> <p>1. <i>Institute for Quantum Information Science, University of Calgary, Canada</i></p> <p>An Efficient Algorithm for Optimizing Adaptive Quantum Metrology Processes</p> <p>We introduce an efficient self-learning swarm-intelligence algorithm for devising feedback-based quantum metrological procedures to replace what is otherwise an difficult and</p>
<p>diode bar into seven groups of aperture-filled arrays of Gaussian beams. A circular far-field pattern was produced with near-symmetrical divergences and low M2 values.</p> <p>1130 1145</p> <p>3230-CT-4</p> <p>Han-Sung Chan^{1,2}, Nicholas Forget³, A H Kung^{1,2}</p> <p>1. <i>Institute of Atomic and Molecular Sciences, Academia Sinica, Taiwan</i> 2. <i>Institute of Photonics Technologies, National Tsing Hua University, Taiwan</i> 3. <i>Faslite, Batiment 403, Ecole Polytechnique, France</i></p> <p>Ultrabroad Band Acousto-optic Programmable Dispersive Filters for Five Discrete Harmonics Spanning the Blue to Mid-infrared Frequencies</p> <p>We demonstrate the modified acousto-optic programmable dispersive filters can be used for the waveform synthesis consisting of five discrete harmonics spanning the blue to mid-infrared frequencies.</p> <p>1145-1215</p> <p>3230-IT-5</p> <p>INVITED SPEAKER</p> <p>Martin Hill¹, Milan Marell¹</p> <p>1. <i>Eindhoven University of Technology, The Netherlands</i></p> <p>Plasmonic and Metallic Nano-Cavity Lasers</p> <p>Metallic structures have opened up many new possibilities for creating nano-lasers, smaller, faster and perhaps better than previously thought possible. We examine our progress in both surface emitting and metallic/plasmonic waveguide devices.</p>	<p>1145-1200</p> <p>3210-CT-4</p> <p>Ken Kashiwagi¹, Hiroyuki Ishizu¹, Yosuke Mizuno¹, Takashi Kurokawa¹</p> <p>1. <i>Tokyo University of Agriculture and Technology, Japan</i></p> <p>Optical Pulse Compression with Waveform Reshaping Using Pulse Synthesizer and Cascaded Fiber Pair</p> <p>Pulse compression with waveform reshaping has been demonstrated using a high nonlinear fiber and a</p>	<p>1145-1200</p> <p>3210-CT-4</p> <p>Jonas Jakutis Neto^{1,2}, Jipeng Lin¹, Andrew Lee¹, Huijin Zhang³, Jiyang Wang³, Niklaus Ursus Wettter², Helen Pask¹</p> <p>1. <i>MQ Photonics Research Centre, Department of Physics, Macquarie University, Sydney, Australia</i> 2. <i>Instituto de Pesquisas Energéticas e Nucleares, CNEN/SP, Universidade de São Paulo, Brazil</i> 3. <i>State Key Laboratory of Crystal Materials and Institute of Crystal Materials, China</i></p> <p>High Beam Quality cw 1.5 W BaWO4 Raman Laser Using Nd:YLF as Laser Active Medium</p> <p>1.5W of 1stStokes, 1167nm, cw output power was produced by a Nd:YLF/BaWO4 Raman laser. A M2 of 1.51 and 1.43 was obtained. Also, a preliminary result for a cw 583nm laser has delivered 0.61W.</p> <p>1200-1215</p> <p>3210-CT-5</p> <p>Andrew R. Wade¹, Kirk McKenzie², Yanbei Chen³, Daniel A. Shaddock¹, Jong H. Chow¹, David E. McClelland</p> <p>1. <i>Australian National University, Australia</i> 2. <i>Jet Propulsion Laboratory, USA</i> 3. <i>California Institute of Technology, USA</i></p> <p>A Polarisation Folded Speed Meter for Gravitational Wave Detection</p> <p>A polarisation speed meter for gravitational wave detection is presented as an alternative to conventional position meters limited by quantum backaction. This configuration is shown to beat the standard quantum limit over a broad range of frequencies</p>	<p>1145-1200</p> <p>3240-CT-6</p> <p>Ken Kashiwagi¹, Hiroyuki Ishizu¹, Yosuke Mizuno¹, Takashi Kurokawa¹</p> <p>1. <i>Tokyo University of Agriculture and Technology, Japan</i></p> <p>Optical Pulse Compression with Waveform Reshaping Using Pulse Synthesizer and Cascaded Fiber Pair</p> <p>Pulse compression with waveform reshaping has been demonstrated using a high nonlinear fiber and a</p>

Pulsed Fibre Lasers (3240)
continued

single mode fiber as a pulse compressor. The pulse with 380-fs width was generated by phase spectrum readjustment.

1200-1230 **3240-IT-7**
INVITED SPEAKER

Claude Agueraray¹, Vladimir Kruglov¹, John D. Harvey¹

1. *Auckland University, Physics Department, New Zealand*

Parabolic and Hyper-Gaussian Similaritons Propagating in Fiber Amplifier and Lasers with Saturation Effect.

We present an analytical solution for parabolic similaritons with saturation effects and new self-similar linearly chirped pulses generated in normal dispersion fibers with fast decaying gain, the Hyper-Gaussian pulse, suitable for low energy systems.
ACOFT Presentation

Precision Interferometry (3220)
continued

1215-1230 **3220-CT-6**
Danielle Wuchenich¹, Daniel Shaddock¹, Timothy Lam¹, Jong Chow¹, David McClelland¹

1. *The Australian National University, Australia*

Multiplexing below the Frequency Noise Limit Using Digitally Enhanced Interferometry

Digitally enhanced interferometry enables the simultaneous interrogation of multiplexed interferometric displacement sensors with ~200 pm resolutions. We improve the displacement sensitivity by combining information from multiple sensors to suppress errors due to laser frequency noise.

1230-1245 **3220-CT-7**

Thanh Nguyen¹, John Miller¹, Bram Slagmolen¹, Adam Mullavey¹, Conor Mow-Lowry¹, Jong Chow¹, David McClelland¹

1. *Centre for Gravitational Physics, The Australian National University, Australia*

Servo-modified Optical Spring

We actively control the effective optical spring by manipulating the phase and magnitude of the feedback system used to lock a resonant cavity to a laser to observe the optical damping and pure optical spring regimes.

Frequency Conversion of Solid State Lasers (3210)
continued

1215-1230 PPLN as simultaneously an electro-optic Bragg Q-switch and an optical frequency mixer in a Nd:YVO4 laser. ~2-kW peak-power eye-safe light was obtained with this system.

1215-1230 **3210-CT-6**

Renpeng Yan¹, Xin Yu¹, Deying Chen¹, Fei Chen¹, Cheng Wang¹, Xudong Li¹, Junhua Yu¹

1. *Harbin Institute of Technology, China*

High-Repetition-Rate, High Peak Power 456 nm Nd:GdVO4/BiBO Blue Laser

A diode-pumped high-repetition-rate, high peak power 456nm blue laser is present. The highest peak power of 2.3 kW blue laser is obtained at a pulse repetition of 10 kHz.

1230-1245 **3210-CT-7**

Yan Qi^{1,2}, Yong Bi¹, Yu Wang¹, Boxia Yan¹, Tao Fang¹, Yanwei Wang¹, Guang Zheng¹, Bin Wang¹, Hua Cheng¹, Ying Zhang¹

1. *Academy of Opto-Electronics, Chinese Academy of Science, China*
2. *Graduate University of Chinese Academy of Science, China*
3. *Phoenix Vision Opto-Electronics Technology Ltd, China*

High Power and Efficient Continuous Wave 456 nm Blue Laser for Laser Display

With low Nd doped Nd:GdVO4 and LBO intracavity frequency

Semiconductor Modulators and Beam Optics (3230)
continued

1215-1230 **3230-CT-6**

Takaaki Mukai¹, Kentaro Hara¹, Makoto Inoue¹, Shigeru Nagiyama¹, Daisuke Miyazaki¹

1. *Graduate School of Engineering, Osaka City University, Japan*

Self-Pumped Phase Conjugate Mirror Using a Broad-Area Laser Diode

Self-pumped phase conjugate mirror is successfully constructed using a broad-area laser diode with angled feedback configuration. We demonstrate the light output decrease and the half-axial mode specific to the phase conjugate resonator.

1230-1245 **3230-CT-7**

Juna Sathian¹, Esa Jaatinen¹

1. *Queensland University of Technology, Australia*

Polarization Dependent Photorefractive Amplitude Modulation Production in MgO:LiNbO3 Phase Modulators

We present experimental and theoretical results of the intensity dependence of residual amplitude modulation (RAM) production in electro-optic phase modulators. By utilizing the anisotropy of the medium, we show that RAM has a photorefractive origin.

Nanophotonic Sensing and Imaging (3250)
continued

1200-1215 **3250-CT-5**

Kota Kuwamitsu¹, Hiroaki Yoshioka¹, Ryo Goto¹, Hirofumi Watanabe¹, Nahoko Naruishi², Yoshihide Tanaka², Yuji Oki¹

1. *Kyushu University, Japan*
2. *National Institute of Advanced Industrial Science and Technology, Japan*

Integration of Distributed-feedback (DFB) Solid-state Dye Lasers with Optical Pumping Systems for PDMS Micro Biochemistry Chips

DFB solid-state dye lasers and optical pumping systems were integrated by mounting the waveguide laser on the beam expander. Lasers with optimized beam extension by making the waveguide of five layers were built on chips.

1215-1230 **3250-CT-6**

Morihiko Hamada^{1,2}, Noriaki Tsurumachi¹, Shunsuke Nakanishi¹, Edakkattuparambil S. Shibu², Mitsuuru Ishikawa², Vasudevanpillai Biju²

1. *Department of Advanced Materials Science, Kagawa University, Japan*
2. *National Institute of Advanced Industrial Science and Technology (AIST), Japan*

Photochemical Reaction of CdSe/ZnS Single Quantum Dots with Amine

We report on realization of single-

Plasmonics (3260)
continued

Strong longitudinal component of the radially polarized mode of the silicon nano fibers theoretically shows 10 times higher excitation efficiency of the surface plasmon resonance than that of the fundamental mode of the same type fiber at 1.1µm wavelength.

1200-1215 **3260-CT-6**

Alexander Minovich¹, Angela Klein², Norik Janunts², Thomas Pertsch², Dragomir Neshev¹, Yuri Kivshar¹

1. *Nonlinear Physics Centre, Australian National University, Australia*
2. *Institute of Applied Physics, Friedrich-Schiller-University, Germany*

Near-field Observation of Airy Plasmons

We demonstrate experimentally the generation and near-field imaging of propagating Airy plasmon beams. These self-accelerating plasmons exhibit self-healing properties and enable novel applications of plasmonics and surface optical tweezers.

1215-1230 **3260-CT-7**

Wei Liu¹, Dragomir Neshev¹, Andrey Miroschnichenko¹, Ilya Shadrivov¹, Yuri Kivshar¹

1. *Nonlinear Physics Centre, CUDOS, Research School of Physics and Engineering, ANU, Australia*

Plasmonic Analogue of Quantum Paddle Balls

We demonstrate a plasmonic analogue of the motion dynamics

Quantum Information 1 (3270)
continued

inefficient problem. Our algorithm can be trained with simulated or real-world trials and accommodates experimental imperfections, losses, and decoherence.

1145-1215 **3270-IT-5**

INVITED SPEAKER
Wolfgang Tittel¹

1. *University Of Calgary, Canada*

Quantum Memory for Quantum Repeaters

After an introduction to quantum repeaters and the need for quantum memory to overcome the distance barrier in quantum communication, I will report on our recent realization of a solid-state quantum memory for entangled photons.

1215-1230 **3270-CT-6**

Andreas Jechow¹, Erik Streed¹, Benjamin Norton¹, Matthew Petrasianus¹, David Kielpinski¹

1. *Griffith University, Australia*

High-Resolution Imaging of Trapped Ions for Scalable Quantum Computing

A microfabricated phase Fresnel lens was used to image trapped ytterbium ions. This scalable architecture yields ion spot sizes of 440nm (FWHM), the highest imaging resolution ever achieved with an atom in free space.

doubled, a high power and efficient continuous wave 456 nm blue laser is developed, as the pump power of 35 W, 7.6 W output power is achieved.

molecule photochemical reactions of amines on the surface of semiconductor quantum dots under high-intensity laser excitations. Real-time monitoring of the photochemical reaction was accomplished using time-resolved single-molecule spectroscopy and microscopy.

1230-1245 **3250-CT-7**

Jiangbo Zhao¹, James Piper¹, Judith Dawes¹, Dayong Jin¹, Ewa Goldys¹
 1. *Department of Physics and Astronomy, and MQ Photonics Research Centre, Macquarie, Australia*

Mechanisms of Size-Dependent Lifetime Quenching in Luminescent Upconverting Colloidal NaYF₄:Yb,Er Nanocrystals

Upconversion decay rates in colloidal NaYF₄:Yb,Er nanocrystals for biolabelling depend on nanoparticle size. Lifetime dependence on various quenching mechanisms is explained using rate equations to describe the evolution of upconverting green and red luminescence.

of quantum particles under a linear restoring force bouncing off a barrier located at the equilibrium position (quantum paddle balls).

1230-1245 **3260-CT-8**

Hansik Yun¹, Il-Min Lee¹, ByoungHo Lee¹

1. *Seoul National University, Korea*

Selective Synthesis of Silver Nanoparticles and their Localized Surface Plasmon Resonances

A selective synthesis method of silver nanoparticles in pre-patterned trenches is presented. In order to show their potential applications of plasmonic devices, we characterized their localized surface plasmon resonances by measuring far- and near-field intensities.

1230-1245 **3270-CT-7**

Simon Devitti¹, Ashley Stephens¹, William Munro², Kae Nemoto¹

1. *National Institute for Informatics, Japan*
 2. *NTT Basic Research Lab, Japan*

Integration of Highly Probabilistic Sources into Optical Quantum Architectures.

We introduce a design for an quantum computer constructed exclusively from a single quantum component. This architecture introduces highly probabilistic elements while maintaining complete specificity of the structure and operation for a large scale optical quantum computer.

1245-1400 LUNCH - Bayside Gallery

1400-1530 Session 5

Room: Bayside Auditorium A Room: Bayside 101

Spectroscopy and Chemical Applications (3410)
 Symposium 1
 Chair: Brian Orr, Macquarie University, AUSTRALIA

Applied Nonlinear Optics 3 (3420)
 Symposium 2
 Chair: Dragomir Neshev, Australian National University, AUSTRALIA

Room: Bayside 102

THz Sources (3430)
 Symposium 3
 Chair: Hideaki Ohgaki, Kyoto University, JAPAN

Room: Bayside 103

Passive Optical Networks (3440)
 Symposium 4
 Chair: Naokatsu Yamamoto, National Institute of Information and Communications Technology, JAPAN

Room: Bayside 104

Femtosecond Laser Microfabrication (3460)
 Symposium 6
 Chair: Saulius Juodkazis, Swinburne University of Technology, AUSTRALIA

Room: Bayside 105

Optical Information Processing and Computing (3450)
 Symposium 5
 Chair: Yoshio Hayasaki, Utsunomiya University, JAPAN

Room: Bayside 106

Quantum Information 2 (3470)
 Symposium 7
 Chair: Bill Munro, NTT Basic Research Labs, JAPAN

Spectroscopy and Chemical Applications (3410) *continued*

1400-1430 **3410-IT-1**

INVITED SPEAKER

S.H. Kable¹, A.T. Maccaroni¹, B.R. Heazlewood¹, G. de Wit¹, M. Quinn¹, S.A. Reid², K. Nauta¹, M.J.T. Jordan¹

1. School of Chemistry, University of Sydney, Australia
2. Department of Chemistry, Marquette University, Australia

Chemistry at the Threshold: Unexpected Products, Unusual Mechanisms, and Generally Weird Things that Happen Near the Energetic Threshold for a Reaction.

Reactions that occur near the energetic threshold can produce unexpected results, including i) fragments that 'roam' in their mutual van der Waals well; ii) facile and unexpected HD exchange; and iii) triplet fragmentation.

1430-1445 **3410-CT-2**

Julie Kho^{1,3}, Charles Rohde^{1,2,3}, Peter Boyd¹, Frederique Vanholsbeeck², Cather Simpson^{1,2,3}

1. Department of Chemistry, The University of Auckland, New Zealand
2. Department of Physics, The University of Auckland, New Zealand
3. The Photon Factory, The University of Auckland, New Zealand

An Alternative Fiber-based Method of Supercontinuum Generation for Transient Absorption Spectroscopy

Applied Nonlinear Optics 3 (3420) *continued*

1400-1415 **3420-CT-1**

Takayuki Suzuki^{1,2}, Kazuhiko Misawa^{1,2}

1. Tokyo University of Agriculture and Technology, Japan
2. JST-CREST, Japan

Extreme Nonresonant Background Reduction for Rapid Phase-modulation CARS Spectroscopy by Phase Sensitive Detection

We demonstrated phase-modulation CARS in which a narrowband probe were rapidly modulated by a Michelson interferometer. A nonresonant background was extremely reduced by a probe delay and phase-sensitive detection resulting in signal-to-noise of 9.4 dB.

ACOFF Presentation

1415-1430 **3420-CT-2**

Yana V. Izdebskaya¹, Anton S. Desyatnikov¹, Gaetano Assanto², Yuri Kivshar¹

1. Nonlinear Physics Center, Research School of Physics and Engineering, The Australian National University, Australia
2. NooEL-Nonlinear Optics and Optoelectronics Lab, Department of Electronic Engineering, University of Rome "Roma Tre", Italy

Spatial Solitons Carrying Phase Singularities in Nematic Liquid Crystals

We demonstrate self-trapped laser beams carrying optical vortices in nematic liquid crystals. We experimentally observe

THz Sources (3430) *continued*

1400-1415 **3430-CT-1**

D.S. Kim², S.B. Choi¹, J.S. Kyoung², M.A. Seo³, H.S. Kim², H.R. Park², Bong-Jun Kim⁴, Hyun-Tak Kim⁴, K.J. Ahn²

1. JILA, University of Colorado and National Institute of Standards and Technology, USA
2. Department of Physics and Astronomy and Center for Subwavelength Optics, Seoul National University, Korea
3. Center for Integrated Nanotechnologies, Los Alamos National Laboratory, USA
4. Metal-Insulator Transition Laboratory, Korea

Enhanced Optical Pump-terahertz Probe Nonlinearity by Nano Antenna Patterning

We design nano-antenna arrays, nanoresonators, that allow perfect transmission. Nanoresonators on VO2 thin films help amplify the available dynamic range for extinction and transmission when it undergoes insulator to metal phase transition.

1415-1430 **3430-CT-2**

Elmer Estacio¹, Christopher Que¹, Fritz Awitan², John Bugante², Chesca De Vera², Armando Somintac², Roland Sarmago², Arnel Salvador², Kohji Yamamoto¹, Masahiko Tani¹

1. Research Center for Development of Far-Infrared Region, University of Fukui, Japan
2. National Institute of Physics, University of the Philippines, Philippines

Femtosecond Laser Microfabrication (3460) *continued*

1400-1415 **3460-CT-1**

Fei He¹, Ya Cheng¹, Zhizhan Xu¹, Koji Sugioaka² and Katsumi Midorikawa²

1. Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China
2. Laser Technology Laboratory, RIKEN - Advanced Science Institute, Japan

Spatio-Temporal Manipulation Of Femtosecond Pulses For 3D Micro/Nano-Fabrication

We demonstrate achieving isotropic resolution in 3D space by spatio-temporal focusing of femtosecond pulses. In this way, homogeneous microfluidic channels and perfect on-chip microlens can be created in glass chips for novel optofluidic applications.

ACOFF Presentation

1415-1430 **3460-CT-2**

Lloyd M Davis^{1,2}, Joshua W Bradfield¹, Charles A Rohde¹, M Cather Simpson¹

1. The Photon Factory, University of Auckland, New Zealand
2. Center for Laser Applications, University of Tennessee Space Institute, USA

Machining of High-Aspect Micro/Nano-Channels With a Single Femtosecond Laser Pulse Focused To A Line

We report rapid fabrication of very high aspect (>400:1) micro/nano-channels and deep, micron-wide

Optical Information Processing and Computing (3450) *continued*

1400-1415 **3450-CT-1**

Sarun Sumridditchakajorn¹, Chakkrit Kamtongdee²

1. Intelligent Devices and Systems Research Unit, National Electronics and Computer Technology Center, Thailand
2. Department of Electrical Engineering, Faculty of Engineering, Khon Kaen University, Thailand

Highly-Accurate Light-Penetration based Silkworm Pupa Sex Identification System

This paper proposes and experimentally shows how we combine light penetration concept and simple image processing operations in order to identify gender of a silkworm pupa. Key features include low cost, fast, and high accuracy.

1415-1430 **3450-CT-2**

Bikash Nakarmi¹, M. Rakib-Uddin¹, Yong Hyub Won¹

1. Korea Advanced Institute of Science and Technology (KAIST), Korea

Demonstration of All-optical Half-adder Using Single Mode Fabry-Perot Laser Diode

We have demonstrated all-optical half-adder based on multi-injection locking and supporting beam principles. We observed output waveforms and eye diagrams with an extinction ratio of about 12 dB at the data rate of 10 Gbps.

Quantum Information 2 (3470) *continued*

1400-1430 **3470-IT-1**

INVITED SPEAKER

M Fujiwara¹, M Sasaki¹, H. Ishizuka¹, W Klaus¹, K Wakui¹, M Takeoka¹, S Miki¹, T. Yamashita¹, Z Wang¹, A. Tanaka², K. Yoshino³

1. Nambu³, S. Takahashi², A. Tajima², A. Tomita³, T. Hasegawa⁵, Y. Sakai⁵, H. Kobayashi⁶, T. Asai⁶, K. Shimizu⁵, T. Tokura⁵, T. Tsurumaru⁵, T. Honjo⁶, K. Tamaki⁶, H. Takesue⁶, Y. Tokura⁶, J.F. Dynes⁷, A. Dixon⁷, A.W. Sharpe⁷, A.J. Shields³, S. Uchikoga⁸, M. Legre⁸, S. Roby⁸, P. Trinkl⁸, L. Monat⁸, J.-B. Page⁸, T. Yamashita³, T. Domeki⁴, M. Matsui⁵, Z. L. Yuan⁷, G. Ribordy⁸, A. Poppe⁹, A. Allacher¹¹, O. Maurhart⁹, T. Länger⁹, M. Peev⁹, A. Zeilinger^{9,10,11}
2. National Institute of Information and Communication Technology, Japan
3. System Platforms Research Laboratories, NEC Corporation, Japan
4. Green Innovation Research Laboratories, NEC Corporation, Japan
5. Network Platform Business Division, NEC Communication Systems, Japan
6. Information Technology R&D Center, Mitsubishi Electric Corporation, Japan
7. NTT Basic Research Laboratories, NTT Corporation, Japan
8. Toshiba Research Europe Ltd
9. ID Quantique, Switzerland
10. Austrian Institute of Technology, Austria
11. Institute for Quantum Optics and Quantum Information, Austrian Academy of Science, Austria

11. Faculty of Physics, University of Vienna, Austria

Broadband, high power supercontinuum (450-1750 nm) is generated with a nanosecond Q-switched Nd:YAG laser and 15 m photonic crystal fiber for transient absorption spectroscopy.

1445-1500
3410-CT-3
Mitsuhiko Kono¹, Yabai He², Brian J. Orr², Kenneth G. H. Baldwin¹

1. *Research School of Physics and Engineering, The Australian National University, Australia*
2. *MQ Photonics Research Centre, Macquarie University, Australia*

Sub-Doppler Two-photon Excitation Spectroscopy of Atomic Xenon:

Observation of Diverse Isotope Shifts

Angular-momentum-dependent isotope shifts in nine high-energy Rydberg levels of xenon have been measured by sub-Doppler two-photon excitation spectroscopy, using narrowband nanosecond pulses of coherent ultraviolet light at 207-209 nm generated by nonlinear-optical conversion processes.

1500-1515
3410 -CT-4
Albert T Rosenberger¹, D. Garita¹, E. B. Dale¹

1. *Department of Physics, Oklahoma State University, USA*

Measuring Thermal Accommodation Coefficients Using a Whispering-Gallery Optical Microresonator

Thermal relaxation of whispering-gallery mode frequencies gives the thermal conductivity of the ambient gas. Measuring this at various pressures allows determination of the

astigmatic transformations of vortex beams into spiralling dipole azimuths accompanied by a nontrivial power-dependent charge-flipping of on-axis phase dislocations.

1430-1500
3420-IT-3
INVITED SPEAKER
Thomas Pertsch¹, Falk Eilenberger¹, Stefano Minardi¹, Yaroslav Kartashov², Alexander Szameit¹, Luis Torner², Hartmut Bartelt³, Stefan Nolte¹, Falk Lederer⁴, Andreas Tunnermann¹

1. *Institute of Applied Physics, Friedrich-Schiller-Universität Jena, Germany*
2. *ICFO - Institut de Ciències Fotoniques, and Universitat Politècnica de Catalunya, Spain*
3. *Institute of Photonic Technology, Germany*
4. *Institute of Cond. Mat. Theo. and Optics, Friedrich-Schiller-Universität Jena, Germany*

Light Bullets

Light Bullets are wavepackets that are self-confined in space-time by nonlinearity. Spatiotemporal cross-correlation measurements of fs-pulses in photonic lattices underline their solitary nature and reveal a new decay mechanism that is generic for high-dimensional solitary waves.

1500-1515
3420-CT-4
Kobayashi Takayoshi^{1,3,4,5}, Jun Liu^{1,2,3}

1. *Advanced Ultrafast Laser Research Center, University of Electro-Communications, Japan*
2. *State Key Laboratory of High Field Laser Physics, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China*

Terahertz Emission from Indium Oxide Films on MgO Substrates Excited at a Photon Energy Below the Bandgap

Terahertz emission was observed from indium oxide films on MgO substrates excited by laser pulses having photon energy under the bandgap. The actual emission mechanism is currently unverified but is temporarily attributed to defect states.

1430-1445
3430-CT-3
Christopher Que¹, Elmer Estacio¹, Cyril Sadia², Armando Somintac², Kohji Yamamoto¹, Arnel Salvador², Masahiko Tani¹

1. *Research Center for Development of Far-Infrared Region, University of Fuku, Japan*
2. *National Institute of Physics, University of the Philippines, Philippines*

Intense Terahertz Emission from GaAs and InAs Thin Films Grown on GaSb Substrates

Terahertz emission from n-GaAs/p-GaSb, using a 1550-nm laser excitation, and the effect of the n-GaAs film on the p-GaSb substrate is reported. The emission is attributed to the built-in-field at the interface of the sample.

1445-1500
3430-CT-4
Kazuo Kuroda¹, Takuya Satoh^{1,2}, Ryugo Iida¹, Tsutomu Shimura¹, Keisuke Mori¹

1. *Institute of Industrial Science, The University of Tokyo, Japan*
2. *PRESTO, Japan Science and Technology Agency (JST), Japan*

Terahertz Time-Domain Spectroscopy of

1445-1500
3440-CT-3
Juhao Li¹, Hui Yang¹, Bangjiang Lin¹, Song Jiang¹, Yongqi He¹, Zhangyuan Chen¹

1. *State Key Lab. of Advanced Optical Communication Systems & Networks, China*

Interleaved Frequency Division Multiple Access for upstream Transmission of Next-generation PON

Interleaved frequency division multiple access (FDMA) for upstream transmission of next-generation passive optical network is experimentally demonstrated. The scheme has low PAPR and low computation complexity for ONU transmitters. *ACoFT Presentation*

1500-1515
3440-CT-4
Wen-De Zhong¹, Fei Xiong¹, Hoon Kim²

1. *Network Technology Research Centre, Sch. of Electrical & Electronic Engineering, Singapore*
2. *Dept. of Electrical & Computer Engineering, National University of Singapore, Singapore*

A WDM-PON Enabling Broadcast Service Based on Polarization Multiplexing

A 2.5-Gb/s symmetric WDM-PON with broadcast capability based on polarization multiplexing is proposed and experimentally demonstrated. The depolarized polarization-multiplexed downlink signal is injected into a polarization-sensitive FP-LD and remodulated with uplink data.

trenches in a glass substrate by focusing a single 100-micrjoule, 100-femtosecond laser pulse to a narrow line.

1430-1445
3460-CT-3
Ricardas Buividas¹, Mindaugas Mikutis^{2,3}, Gintas Stekys², Saulius Juodkazis¹

1. *Centre for Micro-Photonics, Swinburne University of Technology, Australia*
2. *Altechna Co. Ltd, Lithuania*
3. *Laser Research Center, Department of Quantum Electronics, Vilnius University, Lithuania*

Surface and Volume Structuring by Ripples in Femtosecond Laser Fabrication

Femtosecond laser fabrication is used to make complex micro-/nano-scale structures: through-holes in optical fiber and textured indium tin oxide films. Formation mechanisms of ripples on the horizontal and vertical surfaces/walls are discussed.

1445-1500
3460-CT-4
Simon Gross¹, Michael J. Withford¹, Alexander Fuerbach¹

1. *CUDOS, MQ Photonics Research Centre, Macquarie University, Australia*

Direct Laser Inscription of 270 nm Period Waveguide Bragg Gratings

We report, to the best of our knowledge, the shortest period for a femtosecond direct-write waveguide Bragg grating. Waveguide Bragg-gratings with a period of 270 nm have been fabricated in boro-aluminosilicate glass showing a 5 dB strong 1st

1430-1500
3450-IT-3
INVITED SPEAKER
Takashi Kurokawa¹, Ken Kashiwagi¹

1. *Tokyo University of Agriculture and Technology, Japan*

Optical Short Pulse Synthesis and Its Applications

We review an optical pulse synthesizer (OPS) which has generated pico-second pulses with a variety of waveforms including Gaussian, sech², and parabolic pulses. Pump pulses synthesized by the OPS generate supercontinuum with a high mode-frequency over 10 GHz.

1500-1515
3450-CT-4
Xianji Piao¹, Sunkyu Yu¹, Namkyoo Park¹

1. *Seoul National University, EECS, Korea*

All-optical Half-adder Based on Photonic Mode Junction

We investigate the operation of all-optical multi-junction half-adder built upon photonic mode-orthogonal hetero-structures. With exceptional performance metrics, all-optical logic operations for half-adder are successfully derived with the bi-level dynamic mode-conversion across the junction.

1515-1530
3450-CT-5
Shuhan Hwei Lin¹, Vera Marinova^{1,2}, Ren Chung Liu³, Ken Y. Hsu³

1. *Department of Electrophysics, National Chiao Tung University, Taiwan*
2. *Institute of Optical Materials and Technologies, Bulgarian Academy of*

Field Demonstration of Quantum Key Distribution in the Tokyo QKD Network

A secure communication network with novel quantum key distribution systems in a metropolitan area is reported. Different QKD schemes are integrated to demonstrate key relay for secure TV conferencing over a distance 45 km.

1430-1445
3470-CT-2
Mahdi Hosseini¹, Geoff Campbell¹, Ben Sparkes¹, Ping Koy Lam¹, Ben Buchler¹

1. *COCOT, Department of Quantum Science, The Australian National University, Australia*

A Room Temperature Quantum Memory

We present experimental results of high efficiency quantum state storage in a warm rubidium vapour cell using the gradient echo memory (GEM) technique. Without conditional measurements, we show recall fidelity up to 98% for coherent pulses containing around one

1445-1500
3470-CT-3
Ben Sparkes¹, Mahdi Hosseini¹, Gabriel Hetet¹, Ping Koy Lam¹, Ben Buchler¹

1. *The National Australian University, Australia*

Spectral Manipulation of Optical Pulses Using the Gradient Echo Memory Scheme

Currently there exists a demand for quantum memories. One promising candidate is gradient echo memory (GEM). Here we investigate, both with modeling and experiments, the spectral manipulation properties of GEM.

Spectroscopy and Chemical Applications (3410) continued

accommodation coefficient of the gas on the microresonator's surface coating.

1515-1530 **3410-CT-5**

Joachim Knittel¹, Jon Swaim¹, George Brawley¹, Michael Taylor¹, Warwick Bowen¹

1. *University of Queensland, Australia*

Nanoparticle Detection and Characterization using Optical Microresonators

We discuss methods to characterize single nanoparticles simultaneously by polarisability, refractive index and mass using toroidal microresonators. A new technique to determine the refractive index via mode-splitting allows us to size the nanoparticles.

Applied Nonlinear Optics 3 (3420) continued

3. *Core Research for Evolutional Science and Technology (CREST), Japan Science and Technology Agency, Japan*

4. *Department of Electrophysics, National Chiao Tung University, Taiwan*

5. *Institute of Laser Engineering, Osaka University, Japan*

Femtosecond Pulse Cleaning and Measurement using Self-Diffraction Process

The self-diffraction effect was used to improve temporal contrast of femtosecond pulse by about four-order of magnitudes. This self-diffraction effect was also used to measure a 55fs pulse based on the self-referenced spectral interferometry method.

1515-1530 **3420-CT-5**

Yu-Ting Kuo¹, Yu-Han Lin¹, Yi-Ci Li¹, Tai-Huet Wei¹, Jaw-Luen Tang¹

1. *Department Of Physics, National Chung Cheng University, Taiwan*

Raman Excitation Induced Thermal Lensing Effect in Transparent Molecular Liquids

Thermal lensing effect of liquids C6H6, C6H5Cl, C6H5Br, and C6H5I was investigated, for the first to our knowledge, using the Z-scan technique with 82 MHz 35 fs laser pulses at 800 nm.

THz Sources (3430) continued

Antiferromagnetic Resonance in Orthoferrite

Antiferromagnetic resonance in orthoferrite NdFeO₃ has been investigated using terahertz time-domain spectroscopy. A resonance at 0.5 THz was detected which was assigned to the AF-mode of the antiferromagnetic spin precession

1500-1530 **3430-IT-5**

INVITED SPEAKER Takeshi Yasui¹

1. *University of Tokushima, Japan*

THz Color Scanner for Moving Object

Real-time THz color scanner was proposed based on two-dimensional spatio-temporal THz imaging. The proposed system has the potential to expand the application scope of THz spectral imaging based on its rapid image acquisition rate.

Passive Optical Networks (3440) continued

1515-1530 **3440-CT-5**

Yong-Yuk Won¹

Hyun-Seung Kim², Yong-Hwan Son², Sang-Kook Han^{1,2}

1. *Yonsei Institute of Convergence Technology, Yonsei University, Korea*

2. *Department of Electrical and Electronic Engineering, Yonsei University, Korea*

Gigabit Wireless/Wired Transmission over Full Colorless WDM-PON Platform using Optical Sideband Slicing

A new architecture, which is transmitting a gigabit millimeter-wave band data over wavelength division multiplexed-passive optical network (WDM-PON) platform, is proposed. Here, a sliced optical sideband based on a 50-GHz spaced arrayed waveguide grating (AWG) is used to generate a millimeter-wave band signal as well as a baseband one.

Optical Information Processing and Computing (3450) continued

Science, Bulgaria

3. *Institute of Electro-Optical Engineering & Department of Photonics, National Chiao Tung University, Taiwan*

Two-wavelength Holographic Recording in Ruthenium-doped Bi12SiO20 Crystal at Near-infrared Spectral Range

In this paper, we report our investigations on real-time holographic recording at 1064 nm in Ru-doped bismuth sillenite crystal with a green gating light at 532 nm. By using gating light significant improvement of the response time to 80 ms is achieved and the prolonged readout process of the recorded hologram is observed.

Quantum Information 2 (3470) continued

1500-1515 **3470-CT-4**

Uzma Akram¹, Gerard Milburn¹

1. *Department of Physics, School of Maths and Physics, The University of Queensland, Australia*

Single Photon Optomechanical Memory

We show how a single photon injected into a chain of optomechanical systems can be stored as a linear superposition over the array of mechanical resonators, hence building a single photon optomechanical memory.

1515-1530 **3470-CT-5**

Fumihiko Kaneda¹, Ryosuke Shimizu², Sathoshi Ishizaka³, Yasuyoshi Mitsumori¹, Hideo Kosaka¹, Keiichi Edamatsu¹

1. *Research Institute of Electrical Communication, Tohoku University, Japan*
2. *Center for Frontier Science and Engineering, University of Electro-Communication, Japan*
3. *Graduate School of Integrated Arts and Sciences, Hiroshima University, Japan*

Efficient Generation and Activation of Bound Entanglement in Optical Qubits

We report the efficient generation of a four-qubit bound entangled Smolin state by using photon polarization qubits. We also demonstrate the activation of the bound entanglement.

Room: Bayside Auditorium A	Room: Bayside 101	Room: Bayside 102	Room: Bayside 103	Room: Bayside 104	Room: Bayside 105	Room: Bayside 106
Long-Wavelength Fibre Lasers (3610)	Advanced Interferometry and Spectroscopy (3620)	Spatial Control of Solid State Lasers (3630)	Advanced Networking and Signal Monitoring (3640)	Laser Surface Nanostructuring (3650)	Fundamentals of Nonlinear Optics 1 (3660)	Mesoscopic Quantum Optics (3670)
Symposium 1 Chair: Ju Han Lee, University of Seoul, KOREA	Symposium 2 Chair: Shiv Sharma, Hawaii Institute of Geophysics. & Planetology, USA	Symposium 3 Chair: Judith Dawes, Macquarie University, AUSTRALIA	Symposium 4 Chair: Junichi Hamazaki, National Institute of Information and Communications Technology, JAPAN	Symposium 5 Chair: Barry Luther-Davies, Australian National University, AUSTRALIA	Symposium 6 Chair: Anatoly Zavats, King's College London, UK	Symposium 7 Chair: Warwick Bowen, The University of Queensland, AUSTRALIA
1600-1630 INVITED SPEAKER	1600-1630 INVITED SPEAKER	1600-1630 INVITED SPEAKER	1600-1630 INVITED SPEAKER	1600-1615 INVITED SPEAKER	1600-1615 INVITED SPEAKER	1600-1630 INVITED SPEAKER
Michael Oermann¹ , Helke Eberdorff-Heidepriem ¹ , David Ottaway ¹ , Peter Veitch ¹ , Tanya Monro ¹	Masaya Sakatsume¹ , Tatsutoshi Shioda ¹	Manasadevi P Thiruganasambandam¹ , Yuri Senatsky ² , Ken-ichi Ueda ¹	Vincent Chan¹	Kazuki Kubo¹ , Kota Okazaki ¹ , Teisuya Shimogaki ¹ , Koji Tsuta ¹ , Daisuke Nakamura ¹ , Mitsuhiro Higashihata ¹ , Tatsuo Okada ¹	Y Sheng¹ , T. Lukaszewicz ² , M. Swirkowicz ² , W. Krollkowski ¹ , A. Arie ³ , K. Koyrov ⁴	Markus Aspelmeier¹
1. <i>The University of Adelaide, Australia</i>	1. <i>Nagasaki University of Technology, Japan</i>	1. <i>Institute for Laser Science, University of Electro-Communications, Japan</i> 2. <i>P. N. Lebedev Physical Institute of the Russian Academy of Sciences, Russia</i>	1. <i>MIT, USA</i>	1. <i>Kyushu University, Japan</i>	1. <i>Laser Physics Center, Australian National University, Australia</i> 2. <i>Institute of Electronic Materials Technology, Poland</i> 3. <i>Department of Physical Electronics, Fleischman Faculty of Engineering, Israel</i> 4. <i>Max-Planck Institute for Polymer Research, Germany</i>	1. <i>VQ, University of Vienna, Austria</i>
Tellurite Glass for use in 2.3µm Thulium Fibre Lasers	Spatially Distinguished Spectroscopy and Tomography using Time domain Interferometer	High-Order Mode Selection in Yb:YAG Ceramic Laser	Optical Flow Switching	LLaser Irradiation Effect of ZnO Nanowires and GaN Thin Film for Fabrication of Hetero p-n Junction	Quantum Opto-Mechanics: Quantum Optical Control Of Massive Mechanical Resonators	Quantum Opto-Mechanics: Quantum Optical Control Of Massive Mechanical Resonators
The fabrication of extruded-microstructure tellurite glass fibers for erbium-doped fiber lasers has demonstrated the versatility of this fibre fabrication technique. We also show that tellurite glass should allow the development of Tm-doped fibre laser systems.	Novel calibration method for spatially resolved spectroscopy is proposed through a tomographic image obtained from time-domain interferometer. The operation principle was experimentally confirmed by measuring the thickness and reflectance of an optical resonator.	Selection in various families of axi-symmetric modes (Laguerre-Gaussian, cylindrical vector and Bessel-like modes with near-diffraction free propagation properties) in an Yb:YAG ceramic laser by manipulating the cavity stability conditions of a lens resonator is reported.	Present-day networks are challenged by dramatic increases in data rate demand of emerging applications. A new network architecture, incorporating "optical flow switching" will enable significant rate growth, power-efficiency and cost-effective scalability of next-generation networks.	We have investigated the laser nano-welding between n-type ZnO nanowires and the p-type GaN thin film for the realization of the hetero p-n junction with low thermal loading.	The toolbox of quantum optics allows to achieve coherent quantum control over massive mechanical resonators by using radiation pressure of light inside optical cavities. Only recently, cavity-assisted ground state cooling of mechanical motion has been achieved both in the micro- and in the nanomechanical domain [1, 2]. Together with the strong coupling regime [3], this opens up a new parameter regime for macroscopic quantum physics with respect to size and mass of the objects under investigation. I will discuss the prospects of generating macroscopic quantum superposition states [4] and quantum entanglement [5], both for micromechanical interfaces for quantum information processing and for new tests of the foundations of quantum physics.	The toolbox of quantum optics allows to achieve coherent quantum control over massive mechanical resonators by using radiation pressure of light inside optical cavities. Only recently, cavity-assisted ground state cooling of mechanical motion has been achieved both in the micro- and in the nanomechanical domain [1, 2]. Together with the strong coupling regime [3], this opens up a new parameter regime for macroscopic quantum physics with respect to size and mass of the objects under investigation. I will discuss the prospects of generating macroscopic quantum superposition states [4] and quantum entanglement [5], both for micromechanical interfaces for quantum information processing and for new tests of the foundations of quantum physics.
1630-1645 Stephen Dekker¹ , Alexander Judge ¹ , Ravi Pant ¹ , Itandehui Gris-Salchchez ² , Jonathan Knight ² , C. Martijn de Sterke ¹ , Benjamin Eggleton ¹	1615-1630 Yosuke Kasuya¹ , Shuto Kojima ¹ , Ken Kashiwagi ¹ , Takashi Kurokawa ¹	1630-1645 Ting-Hua Lu¹ , Y. C. Lin ²	1630-1645 Sie-Wook Jeon¹, Ki-Hee Song¹ , Youngbok Kim ¹ , Yong-Kyu Choi ¹ , Chang-Soo Park ¹	1615-1630 Koji Tsuta¹ , Teisuya Shimogaki ¹ , Kazuki Kubo ¹ , Yuki Ishida ¹ , Tatsuo Sugie ¹ , Kota Okazaki ¹ , Mitsuhiro Higashihata ¹ , Daisuke Nakamura ¹ , M.S.Ramachandra Rao ² , Tatsuo Okada ¹	1615-1630 Frank Setzpfandt¹ , Andrey A. Sukhrukov ² , Dragomir N. Meshev² , Roland Schliek ³ , Alexander S. Solntsev ² , Raimund Ricken ⁴ , YooHong Min ⁴ , Wolfgang Sohler ⁴ , Yuri S. Kivshar ² , Thomas Pertsch ¹	1615-1630 Frank Setzpfandt¹ , Andrey A. Sukhrukov ² , Dragomir N. Meshev² , Roland Schliek ³ , Alexander S. Solntsev ² , Raimund Ricken ⁴ , YooHong Min ⁴ , Wolfgang Sohler ⁴ , Yuri S. Kivshar ² , Thomas Pertsch ¹
1. <i>CUDOSIPOS, School of Physics, The University of Sydney, Australia</i> 2. <i>CPHM, Department of Physics, University of Bath, UK</i>	1. <i>Graduate School of Engineering, Tokyo University of Agriculture and Technology, Japan</i>	1. <i>Department of Physics, National Taiwan Normal University, Taiwan</i> 2. <i>Department of Electrophysics, National Chiao Tung University, Taiwan</i>	1. <i>School of Information and Communications, GIST, Korea</i>	1. <i>Kyushu University, Japan</i> 2. <i>Indian Institute of Technology, Madras, India</i>	1. <i>VQ, University of Vienna, Austria</i>	1. <i>VQ, University of Vienna, Austria</i>
2.04 µm Light Generation from a Ti:Sapphire Laser Using a Photonic Crystal Fiber with Low OH loss	Generation of High-order Coaxial and Multi-axial Laguerre-Gaussian Beams from Degenerate Laser Cavities	Monitoring Technique Using an Optically Tunable Mach-Zehnder Interferometer	A Wideband OSNR Monitoring Technique Using a Mach-Zehnder Interferometer was proposed. The monitoring error is <= 0.5 dB with tolerance to polarization-mode dispersion (PM D) at 1 and 10 Gb/s.	Combination of ZnO nanowire UV-LED and ZnO-SiO2 phosphor for fabrication of ZnO-based white LED		
We report on the generation of 2.04 µm light from an 801 nm	We have constructed a high-resolution interferometer with a broadband supercontinuum light source. The broadband	A wideband OSNR monitoring technique using a Mach-Zehnder interferometer was proposed. The monitoring error is <= 0.5 dB with tolerance to polarization-mode dispersion (PM D) at 1 and 10 Gb/s.				

<p>Long-Wavelength Fibre Lasers (3610) <i>continued</i></p>	<p>Ti:Sapphire source via soliton self-frequency shift and resonant dispersive wave emission in a PCF with low OH loss and broad anomalous dispersion region.</p>	<p>Advanced Interferometry and Spectroscopy (3620) <i>continued</i></p>	<p>characteristic of the interferometer achieved axial resolution of 2.16 µm at a center wavelength of 1550 nm.</p>	<p>Spatial Control of Solid State Lasers (3630) <i>continued</i></p>	<p>A mode converter was employed to transform optical modes emitted from degenerate laser cavities to coaxial and multi-axial Laguerre-Gaussian beams with optical orbital angular momentum. Theoretical analyses are in good agreement with experimental results.</p>	<p>Advanced Networking and Signal Monitoring (3640) <i>continued</i></p>	<p>1645-1700 3640-CT-3 Junsen Lai¹, Aiyang Yang¹, Yunan Sun¹ <i>1. School of Optoelectronic, Beijing Institute of Technology, China</i></p>	<p>Laser Surface Nanostructuring (3650) <i>continued</i></p>	<p>ZnO nanowires were employed in the fabrication of p-GaN film/n-ZnO nanowire heterojunction LED application. We excited the ZnO-SiO₂ phosphor by this and a broad emission band from 400 to 800 nm was observed.</p>	<p>Fundamentals of Nonlinear Optics 1 (3660) <i>continued</i></p>	<p>1. <i>Friedrich Schiller University Jena, Germany</i> 2. <i>Nonlinear Physics Centre, RSPF, Australian National University, Australia</i> 3. <i>University of Applied Sciences Regensburg, Germany</i> 4. <i>Applied Physics, University Paderborn, Germany</i></p>	<p>Mesoscopic Quantum Optics (3670) <i>continued</i></p>	<p>1630-1645 3670-CT-2 C Holmes¹, C Meaney¹, G Milburn¹ <i>1. School of Mathematical and Physical Sciences, The University of Queensland, Australia</i></p>
<p>1645-1700 3610-CT-3 Stuart Jackson¹, Darren Hudson¹, Luke Anderson¹, Eric Magi¹, Ben Eggleton¹, Laercio Gomes² <i>1. CUDOS and Institute of Photonics and Optical Science, School of Physics, Australia</i> <i>2. Center For Lasers and Applications, Paul, S. Brazil</i></p>	<p>Diode-Pumped Tunable Ho3+, Pr3+-Doped Fluoride Glass Double Clad Fibre Laser We present the tuning characteristics of a Ho3+, Pr3+-doped ZBLAN fibre laser that is diode pumped at 1150 nm.</p>	<p>1630-1645 3620-CT-3 Kohei Suzuki¹, Tatsutoshi Shioda¹ <i>1. Nagaoka University of Technology, Japan</i></p>	<p>Range Expansion of Single-Shot Surface Profilometry by Installing Optical Resonator into Interferometer. We have proposed to install an optical resonator into an optical interferometer for expanding measurement dynamic range of a single shot profilometry. 30 times range expansion was experimentally confirmed.</p>	<p>1645-1700 3630-CT-3 Takashi Okida^{1,2}, Koki Iwamatsu¹, Ara Minasian³, Michael J Damzen³ <i>1. Department of Information and Inage Sciences, Chiba University, Japan</i> <i>2. CREST Japan Science and Technology Agency, Japan</i> <i>3. Photonics, The Blackett Laboratory, Imperial College London, UK</i></p>	<p>Frequency-doubled Vortex Laser Based on a Side-pumped Nd:YVO4 Compact Stigmatic Bounce Amplifier Frequency doubled vortex laser based on the side-pumped Nd:YVO4 bounce laser was demonstrated, for the first time. Maximum powers of frequency-doubled vortex output in CW and Q-switched regimes reached 105 mW and 3.8 W, respectively.</p>	<p>1645-1700 3650-IT-3 INVITED SPEAKER Reinhart Poprawe^{1,2}, Arnold Gillner¹, Hans-Dieter Hoffmann¹, Peter Russbuehler¹, Jens Gottmann² <i>1. Fraunhofer Institute for Laser Technology, Aachen, Germany</i> <i>2. Chair for Lasertechnology RWTH Aachen University, Aachen, Germany</i></p>	<p>KW-Fs Laser Technology - Enabling A New Dimension Of Materials Processing Ultrashort laser sources with pulse durations of around a few or below 1 picosecond and average powers above 1 kW enable a new domain in precision machining. They enable extreme-precision cutting, ablation and drilling of even weakly absorbing materials, multi-component and multi-layer systems.</p>	<p>1630-1700 3660-CT-3 Neil Broderick¹, Max Lohé², Timothy Lee³, Shahram Afshar V.² <i>1. Department of Physics, University of Auckland, New Zealand</i> <i>2. Institute for Photonics and Advanced Sensing, University of Adelaide, Australia</i> <i>3. Optoelectronics Research Centre, University of Southampton, UK</i></p>	<p>Analytic Theory of Two Wave Interactions in a waveguide with a Kerr nonlinearity We examine analytically the general theory of two waves interacting at the fundamental and third harmonic in a waveguide with a Kerr</p>	<p>1630-1645 3660-CT-3 Multi-stability and Synchronization of many Nano-mechanical Resonators Coupled via a Cavity Field We describe the dynamics of nano-mechanical resonators inside a co-planar microwave cavity. We show that groups of identical resonators synchronize. We show a rich bifurcation structure dominated by periodic orbits that exhibit multi-stability.</p>	<p>1645-1700 3670-CT-3 Alex Szorkovszky¹, Andrew Doherty², Barbara Fairchild³, Glen Harris¹, Joachim Knittel¹, Andrew Greentree³, Warwick Bowen¹ <i>1. Centre for Engineered Quantum Systems, University of Queensland, Australia</i> <i>2. School of Physics, University of Sydney, Australia</i> <i>3. School of Physics, University of Melbourne, Australia</i></p>	<p>Optomechanics With Electromechanical Parametric Amplification Parametric amplification can be used to enhance measurement sensitivity and prepare quantum states of mechanical oscillators. We report progress towards an optomechanical system with the nonlinear driving and</p>	
<p>1700-1730 3610-IT-4 INVITED SPEAKER Nikita Simakov¹, Alex Hemming¹, Shayne Bennetts¹, John Haub¹ <i>1. EWRD, Defence Science and Technology Organisation, Australia</i></p>	<p>High-precision Interferometric Monitoring of Polymer Swelling in an One-dollar Optofluidic Sensor Swelling of poly-methylmethacrylate in water, ethanol and methanol was investigated by interferometry using an optimized in-expensive microfluidic sensor with Fabry-</p>	<p>1700-1715 3630-CT-4 Katsuhiko Miyamoto¹, Sachio Miyagi¹, Masaki Yamada¹, Masahito Okida¹, Nobuyuki Aoki¹, Takashi Okada^{1,2} <i>1. Centre for Micro-Photonics & CUDOS, Swinburne University of Technology, Australia</i> <i>2. CSIRO Materials Science and Engineering, Australia</i></p>	<p>1700-1715 3650-CT-4 Yaoyu Cao¹, Zongsong Gan¹, Baohua Jia¹, Richard A. Evans¹, Min Gu¹ <i>1. Centre for Micro-Photonics & CUDOS, Swinburne University of Technology, Australia</i> <i>2. CSIRO Materials Science and Engineering, Australia</i></p>	<p>1700-1715 3650-CT-4 Two Optical-8PSK Transmitter Schemes Based on Tandem IQ Modulators We propose two optical 8PSK transmitter schemes with the same optical frontend of two tandem IQ modulators: i) cascading IQ-modulator-based 450 phase-shifter and QPSK modulator; ii) cascading rectangular- and square-QPSK modulators.</p>	<p>1700-1715 3640-CT-4 Guo-Wei Lu¹, Takahide Sakamoto¹, Tetsuya Kawamishi¹ <i>1. National Institute of Information and Communications Technology (NICT), Japan</i></p>	<p>Power Scaling of 2 µm Sources for Frequency Conversion into the Mid-Infrared We present a pulsed master laser optimised for amplification in a large mode area thulium doped fibre with the aim to produce a high power pulsed 2 µm source for frequency conversion into the mid-IR.</p>							

Perot cavity, able to detect 20 nm change. Dynamics of polymer swelling over various time periods were obtained.

1700-1715
3620-CT-5
Tatsuo Shiina¹

1. *Graduate School of Advanced Integration Science, Chiba University, Japan*

Precision Evaluation of Portable OCT Scanner and its Application

The portable OCT scanner with the long path scanning mechanism has been developed for a decade. This time-domain typed OCT scanner has been applied to variety of application fields of industry, bio/food processing, and medical treatment.

1715-1730
3620-CT-6
Moriaki Koyama¹, Tatsuo Shiina¹

1. *Graduate School of Advanced Integration Science, Chiba University, Japan*

Development of LED mini-Lidar

A LED mini-lidar system for near-range measurements was developed. From the measurements, it can detect the hard target echoes (tree) in the range of 100m and also receive the atmospheric echoes in the near range of 50m.

1. *Department of Information and Image Sciences, Chiba University, Japan*

2. *GREST Japan Science and Technology Agency, Japan*

2 μm Optical Vortex Output from a Degenerated Optical Parametric Oscillator

The first demonstration of a 2-μm optical vortex output from a 1-μm optical vortex pumped degenerated optical parametric oscillator is presented. A 0.24-mJ, 2-μm vortex pulse with a topological charge of 1 was produced.

1715-1730
3630-CT-5
Purnawirman Purnawirman¹,
Poh Boon Phua^{1,2}

1. *Nanyang Technological University, Singapore*
2. *DSO National Laboratories, Singapore*

Femtosecond Laser Pumped by High Brightness Coherent Polarization Locked Diode

We demonstrate the use of coherent polarization locking of diode as the high brightness pump source in Yb: KYW laser. From 6 W pump, we obtained 203 fs pulse with average power of 175 mW.

1715-1730
3640-CT-5
Jong-In Song¹, **Minho Park¹**

1. *GIST, Korea*

EVM Performance of Quasi Optical Single Sideband Signal Generated by Coherent Population Oscillation Effects in a Semiconductor Optical Amplifier

Error vector magnitude performance of quasi optical single sideband signals with QPSK, 16 QAM, and 32 QAM data generated by coherent population oscillation effects in a semiconductor optical amplifier were investigated.

ACOFI Presentation

New Photoresist for Super-resolution Photo-inhibition Nanofabrication

New photoresist of high photosensitivity has been developed to improve the fabrication resolution to nano-scale in direct laser writing based on single-photon photoinhibited polymerisation. With two-photon initiator, the photoinhibited polymerisation was also demonstrated in two-photon fabrication.

1715-1730
3650-CT-5

Yoshiki Nakata¹, Kazuma Momoo¹, Noriaki Miyanaga¹, Takuya Hiromoto²

1. *Institute of Laser Engineering, Osaka university, Japan*
2. *Furukawa Electric Co., Ltd., Japan*

Generation of New Meta-Materials by Interfering Femtosecond Laser Processing with Phase Shift and Amplitude Difference Between the Beams

Interference pattern with phase shift and variation of amplitude between interfering laser beams are used to process metallic thin film. As a result, liquid and thermal processes are induced, and periodic nano-sized structures are generated.

nonlinearity. We show the existence of stationary points and discuss how they effect the general behaviour of the solutions.

1645-1700
3660-CT-4

Yi Xu^{1,2}, Andrey E. Miroschnichenko¹

1. *Nonlinear Physics Centre and CUDOS, Australian National University, Australia*
2. *Laboratory of Photonic Information Technology, South China Normal University, China*

Enhancement of the Nonlinear Response in Mach-Zehnder-Fano Interferometer

We demonstrate the enhancement of nonlinear response and bistable switching in the Mach-Zehnder interferometer with side coupled nonlinear defects. Such system is known to exhibit high-Q nonlinear Fano resonances. Based on the introduced figure of merit the enhancement up to two orders of magnitude can be achieved compared to standard geometries. We applied these results for photonic crystal platform which allow for enhanced optical bistable operation.

1700-1730
3660-IT-5

INVITED SPEAKER

Shiming Zhu¹

1. *National Laboratory of Solid State Microstructures & School of Physics, China*

Steering Light and Photon by Engineering Domains in Ferroelectric Crystals

sensitive measurement required to observe quantum behavior.

1700-1715
3670-CT-4

RE Schoften^{1,6}, L.P. McGuinness¹, Y. Yan³, A. Stacey¹, D.A. Simpson^{1,2}, L.T. Hall^{1,2}, D. Maclaurin^{1,2}, S.D. Praver^{1,2}, P. Mulvaney⁴, J. Wrachtrup⁵

1. *School of Physics, University of Melbourne, Australia*
2. *Centre for Quantum Computer Technology, School of Physics, University of Melbourne, Australia*
3. *Department of Chemical and Biomolecular Engineering, University of Melbourne, Australia*
4. *School of Chemistry, Bio21 Institute, University of Melbourne, Australia*
5. *Physikalisches Institut, University Stuttgart, Germany*
6. *Centre of Excellence for Coherent X-ray Science, University of Melbourne, Australia*

Quantum Measurement in Living Cells:

Fluorescent Diamond Nanocrystals for Biology

We have demonstrated optically detected magnetic resonance of individual fluorescent nanodiamond nitrogen-vacancy centres inside living human HeLa cells, and measured their spin levels and spin coherence times while tracking their location and orientation with nanoscale precision.

1715-1730
3670-CT-5

Takuya Kitagawa¹, Matthew Broome², **Alessandro Fedrizzi³**, Mark Rudner¹, Erez Berg¹, Ivan Kassal², Alan

Fundamentals of Nonlinear Optics 1 (3660) *continued*

In this talk, we report the recent progresses in steering light and photon by engineering domains in ferroelectric crystals according to quasi-phase-matching and their applications in nonlinear photonics, laser and quantum optics.

Mesoscopic Quantum Optics (3670) *continued*

Aspuru-Guzik^{2,3}, Eugene Demler¹, Andrew White³
1. *Department of Physics, Harvard University, USA*
2. *Department of Chemistry and Chemical Biology, Harvard University, USA*
3. *School of Mathematics and Physics, The University of Queensland, Australia*

Observation of Topologically Protected Bound States in Photonic Quantum Walks

Many emerging scientific developments are rooted in topology. We investigate one-dimensional topological phases in photonic quantum walks. We observe topologically protected bound states and reveal the existence of new topological phenomena unique to driven systems.

0830-1030

Plenary Session 3 (4050)

Room: Bayside Auditorium A

Chair: John Harvey, Dodd Walls Centre/University of Auckland, NEW ZEALAND

0830-0915

4050-PT-1

Ferenc Krausz

*Max-Planck-Institut für Quantenoptik, Garching, Germany
Ludwig-Maximilians-Universität München, Munich, Germany*

Attosecond Science: Symbiosis of Electrons and Light

Electrons transform light into biological energy during photosynthesis and into biological signals endowing us with the capability of seeing the world around us.

0915-1000

4100-PT-2

Christopher Barty

National Ignition Facility, Lawrence Livermore National Laboratory, USA

The National Ignition Campaign and Laser Fusion Energy

This talk provides an update of the NIC on the National Ignition Facility at the Lawrence Livermore National Laboratory and the roadmap to demonstrate laser fusion as a viable source of baseload carbon-free energy.

1000-1030

MORNING TEA - Bayside Gallery

1030-1230

Session 7

Room: Bayside Auditorium A

Room: Bayside 101

Novel Fibres and Fibre

Solid-State Laser Engineering (4220)

Characterisation (4210)

Symposium 2

Chair: Jesper Munch, Institute for Photonics & Advanced Sensing, AUSTRALIA

Chair: Tanya Monro, Institute for Photonics & Advanced Sensing, AUSTRALIA

1030-1100

4210-IT-1

INVITED SPEAKER
Johann Troles¹, Laurent Brilland²

*1. Glasses and ceramics group, UMR SCR, University of Rennes, France
2. PERFOS, France*

1030-1100

4220-IT-1

INVITED SPEAKER

Alexander Hemming¹, Jim Richards², Alan Davidson¹, Neil Carmody³, Shayne Bennetts¹, Nikita Simakov¹, Phil Davies¹, John Haub¹

*1. Defence Science and Technology Organisation, Australia
2. Bob Seymour and Associates, Australia*

Room: Bayside 102

Biomedical Applications (4250)

Symposium 5

Chair: Yoshiaki Yasuno, University of Tsukuba, JAPAN

1030-1100

4250-IT-1

INVITED SPEAKER

Benjamin Vakoc¹

*1. Harvard Medical School, USA
Using Optical Coherence Tomography to Image Tumor Blood Vessels*

In the development of cancer therapies, three-dimensional microvascular imaging technologies are essential. Here, we describe the operational principles of optical

Room: Bayside 103

Novel Photonic Devices (4240)

Symposium 4

Chair: Duk-Yong Choi, Australian National University, AUSTRALIA

1030-1045

4240-CT-1

Yasufumi Enami¹, Jianxun Hong¹, Cheng Zhang², Jingdong Luo³, Alex Jen³

*1. Research Institute for Nanodevice and Bio Systems, Hiroshima University, Japan
2. Department of Chemistry & Center for Materials Research, Norfolk State University, USA
3. Department of Materials Science and Engineering, University of Washington, USA*

Room: Bayside 104

Nanophotonics 2 (4230)

Symposium 3

Chair: Dmitri Gramotnev, University of Southern Denmark, DENMARK

1030-1045

4230-CT-1

Ivan Maksymov¹, Andrey Miroshnichenko¹

*1. The Australian National University, Nonlinear Physics Center and CUDDOS@ANU, Australia
Active All-Optical Spectral Tuning of Nanorod Plasmonic Nanoantennas*
We suggest a novel all-optical spectral tuning mechanism over subwavelength light focusing with a

Room: Bayside 105

Phase Stabilization and Pulse Characterisation (4260)

Symposium 6

Chair: Igor Litvinyuk, Griffith University, AUSTRALIA

1030-1045

4260-CT-1

Jae-hwan Lee¹, Eok Bong Kim¹, Chang Hee Nam¹

*1. Department of Physics and Coherent X-ray Research Center, KAIST, Korea
Long-term Carrier-Envelope-Phase Stabilization of a High-Power Femtosecond*

Room: Bayside 106

Quantum Science in Atoms, Molecules and Solids 1 (4270)

Symposium 7

Chair: Andrew Doherty, University of Sydney, AUSTRALIA

1030-1045

4270-CT-1

Brant Gibson¹, M. Henderson², H. Eberndorff-Heidepriem², K. Kuan², S. Afshar V², J. Orwa¹, S. Tomljenovic-Hanic¹, S. Praver¹, T. Monto², A. Greentree¹

*1. School of Physics, The University of Melbourne, Australia
2. Institute for Photonics & Advanced Sensing, The University of Adelaide, Australia*

Wednesday 31 August 2011

<p>Novel Fibres and Fibre Characterisation (4210) <i>continued</i></p>	<p>Solid-State Laser Engineering (4220) <i>continued</i></p>	<p>Biomedical Applications (4250) <i>continued</i></p>	<p>Novel Photonic Devices (4240) <i>continued</i></p>	<p>Nanophotonics 2 (4230) <i>continued</i></p>	<p>Phase Stabilization and Pulse Characterisation (4260) <i>continued</i></p>	<p>Quantum Science in Atoms, Molecules and Solids 1 (4270) <i>continued</i></p>
<p>New Chalcogenide Fibers Various chalcogenide MOFs were manufactured in order to associate the high non-linear and IR properties. For example, small core fibers have been drawn to enhance the non linearities for Wavelength conversion in IR.</p>	<p>A 27 W Mid-IR Laser Source We have demonstrated a 27W cascaded mid-IR laser system consisting of a thulium fibre laser, Ho:YAG solid state laser and a ZGP OPO. The system produces the highest published 3-5um output power of 27W with an M2<5.</p>	<p>coherence tomography based vascular imaging and present its use in broad-ranging cancer studies.</p>	<p>Polymeric Hybrid Waveguide Modulators with High Optical Stability and High Electro-Optic Coefficient The optical transmission for an optical input power of 30 mW at a wavelength of 1550 nm does not change for >1000 h. We also demonstrated high EO coefficient of >170pm/V at 1550nm in a short directional coupler switch.</p>	<p>plasmonic nanorod nanoantenna. The tunability originates from the manipulation of Fano resonances in an auxiliary intermediate resonator that couples the nanoantenna with a far-field light source.</p>	<p>We have stabilized the carrier-envelope phase (CEP) of a kHz femtosecond Ti:Sapphire laser by the direct locking method. The CEP jitter of amplified laser pulses was stabilized to 150 mrad with 10-shot integration for 3 hours.</p>	<p>We demonstrate single photon emission from nanodiamond containing isolated single nitrogen-vacancy quantum emitters, embedded within tellurite glass optical fibres. This hybrid diamond-glass material presents a platform for next generation quantum photonics applications.</p>
<p>1100-1115 4210-CT-2 Frederica Poli¹, Enrico Coscelli¹, Sidsel Petersen^{2,3}, Thomas Alkeskjold², Annamaria Cucinotta¹, Lasse Leick², Jes Broeng² <i>1. Information Engineering Department, University of Parma, Italy</i> <i>2. NKT Photonics AS, Denmark</i> <i>3. Department of Photonics Engineering, Technical University of Denmark, Denmark</i></p>	<p>1100-1115 4220-CT-2 Miftar Ganija¹, David Ottaway¹, Peter Veitch¹, Jesper Munch¹ <i>1. School of Chemistry and Physics, The University of Adelaide, Australia</i></p>	<p>1100-1115 4250-CT-2 Barry Vuong¹, Beau Standish¹, Barry Sun¹, Gary Tearney², Rasmus Kiehli³, Theodoros van der Kwast³, Jarley Koo⁴, Josaphat de Morais⁵, Leo de Costa⁶, Victor Yang¹ <i>1. Ryerson University, Canada</i> <i>2. Harvard University, USA</i> <i>3. University Health Network, Canada</i> <i>4. St. Michael's Hospital, Canada</i> <i>5. Hospital de Baileia, Brazil</i> <i>6. Sunnybrook Health Sciences Centre, Canada</i></p>	<p>1045-1100 4240-CT-2 Ji Ruiqiang¹, Tian Yonghui¹, Yang Lin¹, Zhang Lei¹, Ding Jianfeng¹, Chen Hongtao¹, Lu Yangyang¹, Zhou Ping¹ <i>1. Optoelectronic System Laboratory, Institute of Semiconductors, CAS, China</i></p>	<p>1045-1100 4230-CT-2 Ivan Maksymov¹, Artur Davoyan¹, Yuri Kiyshar¹ <i>1. The Australian National University, Nonlinear Physics Center and QUDOS@ANU, Australia</i></p>	<p>1045-1100 4260-CT-2 Dane Laban^{1,2}, William Wallace^{1,2}, Thijs Clevis^{1,2}, Navjyn Gaifney^{1,2}, Michael Pullen^{1,2}, Adam Palmer^{1,2}, Dansha Jiang³, Harry Quiney³, Igor Litvinyuk^{1,2}, Dave Klepinski^{1,2} <i>1. ARC Center of Excellence in Coherent X-Ray Science, Griffith University, Australia</i> <i>2. Australian Attosecond Science Facility, Griffith University, Australia</i> <i>3. ARC Center of Excellence in Coherent X-Ray Science, University of Melbourne, Australia</i></p>	<p>1045-1100 4270-CT-2 Carlo Braccac^{1,2,3}, Gaebel Torsten^{1,2,3}, Andrey Zvyagin^{1,2,3}, James Rabeau^{1,2,3} <i>1. ARC Centre of Excellence for Engineered Quantum Systems, Australia</i> <i>2. Centre for Quantum Science and Technology, Australia</i> <i>3. MQ Photonics Research Centre Department of Physics and Astronomy, Australia</i></p>
<p>Bending Properties of Anti-Symmetric Hybrid Photonic Crystal Fibers The bending properties of an anti-symmetric hybrid photonic crystal fiber have been numerically analyzed. The results show that the transmission band can be shifted or tailored by proper coiling.</p>	<p>1115-1130 4220-CT-3 Junji Kawanaka¹, Hiroaki Furuse², Daniel Albach^{1,3}, Yasuki Takeuchi^{1,4}, Akira Yoshida¹, Toshiyuki Kawashima⁴, Hirofumi Kar⁴ <i>1. Institute of Laser Engineering, Osaka University, Japan</i> <i>2. Institute for Laser Technology, Japan</i> <i>3. LULI, Ecole Polytechnique, France</i> <i>4. Hamamatsu Photonics K. K., Japan</i></p>	<p>Optical coherence tomography (OCT) is an established high resolution imaging modality with initial clinical success in ophthalmology, cardiology, gastroenterology and respiratory. We present methods of tissue sample preparation and comparative results with 3-dimensional OCT image sets correlated to digital pathology.</p>	<p>A four-port on-chip optical router based on microring resonators is reported. The router has the average power consumption about 10.37 mW and crosstalk less than -13 dB. Route functionality and signal integrity are verified by transmission experiments.</p>	<p>We suggest a novel principle design of a plasmonic Yagi-Uda nanoantennas for control over the angular light emission. We demonstrate that tapering of antenna elements enhances the antenna gain and allows multifrequency communication.</p>	<p>We present an interferometer that utilizes high-order harmonic generation and the Gouy phase shift to generate pairs of attosecond pulses. The timing resolution of the passively stabilized apparatus is measured to be better than 100zeptoseconds.</p>	<p>Nitrogen-Vacancy Centres in Nanodiamond: Effects of Size, Surface and Surrounding Environment on Luminescence We report new experimental measurements which may help to elucidate the effects of size, surface and surrounding environment on the optical behaviour of nitrogen vacancy (NV) centres in diamond nanocrystals.</p>
<p>1115-1130 4210-CT-3 Chad Carlson¹, Benjamin Ward¹, Justin Spring¹ <i>1. United States Air Force Academy, USA</i></p>	<p>1100-1115 4230-CT-3 Dmitri Gramotnev^{1,2}, Anders Pors¹, Sergey Bozhevolnyi¹ <i>1. University of Southern Denmark, Niels Bohrs Alle 1, Denmark</i> <i>2. Nanophotonics Pty Ltd, Australia</i></p>	<p>1115-1130 4250-CT-3 Yuri Kim¹, Joo Beom Eom^{2,3}, Sang Jin Lee², Eun Jung Min², Byeong Ha Lee^{1,2} <i>1. Graduate program of Medical System Engineering, GIST, Korea</i> <i>2. School of Information and Communications, GIST, Korea</i> <i>3. Korea Photonics Technology Institute, Korea</i></p>	<p>1100-1115 4240-CT-3 Huan Huan Liu^{1,2}, Chin Chong Yap^{1,2}, Dunlin Tan^{1,2}, Kin Kee Chow^{1,2}, Beng Kang Tay^{1,2} <i>1. School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore</i> <i>2. CNTRA CNRS/NTU/THALES, Singapore</i></p>	<p>1100-1130 4260-IT-3 INVITED SPEAKER Takayoshi Kobayashi^{1,2,3,4}, Kotaro Okamura^{1,2}</p>	<p>1100-1115 4270-CT-3 Faraz Inam^{1,2}, Torsten Gaebel^{1,2}, Carlo Braccac^{1,2}, Luke Stewart¹, Micheal Withford^{1,2},</p>	<p>1100-1115 4270-CT-3 Faraz Inam^{1,2}, Torsten Gaebel^{1,2}, Carlo Braccac^{1,2}, Luke Stewart¹, Micheal Withford^{1,2},</p>
<p>Large Mode Area Random Acoustically Microstructured Photonic Crystal Fibers For SBS Suppression</p>	<p>1100-1115 4260-IT-3 INVITED SPEAKER Takayoshi Kobayashi^{1,2,3,4}, Kotaro Okamura^{1,2}</p>	<p>Gap plasmon bow-tie nanoantennas are proposed, analyzed and optimized. Size effects are investigated including a transition from a nanoantenna with the fundamental mode excitation to a nanolens with plasmon focusing at optimal lens radius.</p>	<p>Gap plasmon bow-tie nanoantennas are proposed, analyzed and optimized. Size effects are investigated including a transition from a nanoantenna with the fundamental mode excitation to a nanolens with plasmon focusing at optimal lens radius.</p>	<p>Gap plasmon bow-tie nanoantennas are proposed, analyzed and optimized. Size effects are investigated including a transition from a nanoantenna with the fundamental mode excitation to a nanolens with plasmon focusing at optimal lens radius.</p>	<p>1100-1115 4270-CT-3 Faraz Inam^{1,2}, Torsten Gaebel^{1,2}, Carlo Braccac^{1,2}, Luke Stewart¹, Micheal Withford^{1,2},</p>	<p>1100-1115 4270-CT-3 Faraz Inam^{1,2}, Torsten Gaebel^{1,2}, Carlo Braccac^{1,2}, Luke Stewart¹, Micheal Withford^{1,2},</p>

Using a fully vectorial finite element method, we have calculated the Brillouin gain spectra of large mode area, random acoustically microstructured photonic crystal fibers for different acoustic domain sizes in the fiber core.

1130-1145 **4210-CT-4**

Minwan Jung¹, You Min Chang¹, Ju Han Lee¹

1. *School of Electrical and Computer Engineering, University of Seoul, Korea*

Paired-Induced Quenching in Bismuth Oxide-based Erbium-doped Fiber Amplifier

Pair-induced quenching effect in a highly doped, bismuth oxide-based erbium-doped fiber amplifier was theoretically and experimentally investigated. The relative number of paired ions in a highly doped, bismuth oxide-based EDF was estimated to be ~6.02%

1145-1200 **4210-CT-5**

Shailendra K. Varshney¹, Avik Dutt¹, Sudipta Mahapatra¹

1. *Department of E&ECE, Indian Institute of Technology, India*

Coupling Characteristics of Magnetic-Fluid Filled Three-Core Capillary Optical Fibers

Coupling characteristics of three-core optical fibers with magnetic-fluid-filled central resonator core are analyzed using finite-element-method and coupled-mode-theory. The fraction of power can be tuned by applying an external magnetic field.

1200-1215 **4210-CT-6**

Arismar Cerqueira^{1,2}, A. R. do Nascimento Jr^{1,2},

Joule-class Picosecond Amplifier by Using Cryogenic Yb:YAG Total-Reflection Active-Mirror

Our originally-designed cryogenic total-reflection active-mirrors with Yb:YAG ceramics have been proposed as picosecond power amplifiers. 3.5-mJ was obtained in a regenerative amplifier, which ensured 1.5-J/cm² in 460-ps. A main amplifier will achieve 1-J at 100-fs.

1130-1145 **4220-CT-4**

Alex Butler¹, David Spence¹, David Courts¹

1. *MQ Photonics, Macquarie University, Australia*

Generating Picosecond Pulses From Q-Switched Microchip Lasers

A Q-switched microchip laser with record 22 ps output pulses has been demonstrated experimentally. The 110 μm long Nd:YVO₄ laser was designed with the aid of a laser rate equation model incorporating a SESAM Q-switch

1145-1200 **4220-CT-5**

Jun Dong¹, Ying Cheng¹, Jian Ma¹, Ken-ichi Ueda², Alexander Kaminski³

1. *Department of Electronic Engineering, Xiamen University, China*

2. *University of Electro-Communications, Japan*

3. *Russian Academy of Sciences, Russia*

Efficient Continuous-wave and Q-switched Yb:LuAG Lasers

Efficient continuous-wave laser operation based on Yb:LuAG crystals has been obtained at 1030 and 1047 nm. Stable, subnanosecond passively

Development Fiber Optic Probe for Optical Coherence Tomography in Dentistry by Using Lensed-patch Cord

We propose a practical fiber optic probe, which uses a fiber patch cord and an anti-reflection coated ball lens for dental optical coherence tomography imaging. With the proposed probe, the dental image was successively obtained.

ACOPT Presentation

1130-1145 **4250-CT-4**

Hyun-Woo Jeong¹, Beop-Min Kim^{1,2}

1. *Department of Biomedical Engineering, Korea University, Korea*

2. *Research Institute of Health Sciences, Korea University, Korea*

High-speed Spectral Domain Optical Coherence Tomography with Dual Detection of the Retina and the Cornea

To the best of our knowledge we designed and fabricated a novel spectral domain OCT with dual detection of retina and cornea simultaneously using customized ultrahigh speed optical switch. Broadband SLD with a FWHM of 64nm centered at 830nm was used as a source. Measured axial resolution and sensitivity is 5μm near at zero depth and 105.7 dB, respectively.

1145-1200 **4250-CT-5**

Francesco Baldini¹, Ambra Giannetti¹, Cosimo Trono¹, Giampiero Porro², Luca Bolzoni²

1. *Institute of Applied Physics, National Research Council, Italy*

2. *Datamer srl, Italy*

The CAI Instrument: a Novel Optical Device for

Direct Synthesis of Vertically Aligned Carbon Nanotubes for Fiber-based Devices

We demonstrate direct synthesis of vertically-aligned carbon nanotubes on side-polished optical fibers for enhanced optical excitations. The deposition and alignment are verified by measuring the optical absorption and polarization dependent loss of the fiber device.

1115-1130 **4240-CT-4**

Yikun Liu¹, Mingneng Feng¹, Yongyao Li¹, Xiangsheng Xie¹, Yefeng Guan¹, Jianying Zhou¹

1. *State Key Laboratory of Optoelectronic Materials and Technologies, Sun Yat-sen University, Guangzhou 510275, China*

Functional Photonics with a Resonantly Absorbing Waveguide Array

A waveguide array consisting of resonantly absorbing molecules is designed, fabricated and characterized. Spatial, spectroscopic and temporal control of light field is demonstrated with the novel structure.

ACOPT Presentation

1130-1145 **4240-CT-5**

Hiroyuki Kubota¹, Soichiro Oomi¹, Hirofumi Watanabe¹, Yuji Oki¹

1. *Dept. of Electronics, Graduated School of I.S.E.E. Kyushu University, Japan*

Bending and Twisting Sensor using Multiple-Waveguide Solid-State Dye Lasers on a Plastic Optical Fiber

1115 -1130 **4230-CT-4**

Timothy Davis¹

1. *CSIRO Materials Science & Engineering, Australia*

Nanophotonic Circuits Using Localized Surface Plasmon Resonances in Metallic Nanostructures

Configurations of metal nanostructures supporting localized surface plasmon resonances behave like components in an optical circuit. The nanophotonic circuit concept is used to design a subwavelength structure that can detect optical phase differences.

1130-1200 **4230-IT-5**

INVITED SPEAKER

Fang-Fang Ren¹, Kah-Wee Ang², Mingbin Yu², Guo-Qiang Lo², Yi Shi¹

1. *School of Electronic Science and Engineering, Nanjing University, China*

2. *Institute of Microelectronics, A*STAR, Singapore*

Photoreponse Enhancement in Nanoscale Ge Photodetector Through Split Bull's Eye Shaped Plasmonic Antenna

We theoretically and experimentally exploited the novel design of split bull's eye antenna for a nanometer germanium photodetector with significant photoresponse enhancement at a standard communication wavelength of 1310 nm.

ACOPT Presentation

1200-1215 **4230-CT-6**

Lorenzo Rosa¹, Kai Sun², Ewa Kowalska³, Saulius Juodkazis¹

1. *Swinburne University of Technology, Australia*

1. *Advanced Ultratfast Laser Research Center, and Department of Engineering Science, Faculty of Informatics and Engineering, The University of Electro-Communications, 1-5-1, Chofugaoka, Chofu, Tokyo 182-8585 Japan*

2. *JST, ICORP, Ultrashort Pulse Laser Project, 4-1-8 Honcho, Kawaguchi, Saitama, 332-0012, Japan*

3. *Department of Electrophysics, National Chiao Tung University, Hsinchu 3005, Taiwan*

4. *Institute of Laser Engineering, Osaka University, 2-6 Yamada-oka, Suita, Osaka 565-0971, Japan*

Generation of CEP-Stabilized Sub-3-fs Pulses

Carrier-envelope phase stable sub-3-fs isolated pulse in visible-NIR region is generated. The light source is second-harmonic of non-collinear optical parametric amplifier and pulse compression is achieved through adaptive dispersion control using a deformable mirror.

1130-1145 **4260-CT-4**

H.S. Chan^{1,2}, Z.M. Hsieh², W.H. Liang², A.H. Kung^{1,2}, C.K. Lee³, C.J. Lai⁴, R.-P. Pan⁵, L.H. Peng⁶

1. *Institute of Photonics Technologies, National Tsing Hua University, Hsinchu, Taiwan*

2. *Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan*

3. *Department of Photonics, National Sun Yat Sen University, Kaohsiung, Taiwan*

4. *EECS Department, MIT, Cambridge, MA, USA*

5. *Department of Electrophysics, National Chiao Tung University, Hsinchu, Taiwan*

Judith Dawes¹, Micheal Steel^{1,2}, James Rabeau^{1,2}

1. *Center for Quantum Science and Technology, Macquarie University, Australia*

2. *MQPhotonics Research Center, Dept of Physics and Astronomy, Macquarie University, Australia*

Characterization of the Influence of Crystal Size and Dipole Orientation on the Spontaneous Emission Lifetime of Diamond NV Colour Centers

We measure the lifetime distribution of NV centers inside diamond crystals of varying sizes and for nanodiamonds placed on distinct surfaces. Results show the emission is strongly influenced by crystal size and dipole orientation.

1115-1130 **4270-CT-4**

M.R. Hush^{1,2}, S.S. Sziget^{1,2}, A.R.R. Carvalho^{1,2}, J.J. Hope^{1,2}

1. *Australian National University, Australia*

2. *Australian Research Council Centre of Excellence for Quantum-Atom Optics, Australia*

Number-Phase Wigner Representation for Scalable Stochastic Simulations of Controlled Quantum Systems

We demonstrate that applying a stochastic method based on the number-phase Wigner representation can converge over two orders of magnitude longer than it's coherent equivalent, providing a drastic improvement in the simulation of controlled many-body quantum systems.

<p>Novel Fibres and Fibre Characterisation (4210) <i>continued</i></p>	<p>Sr. G Lona^{3,2}, H. E. Hernandez-Figueroa^{3,2}, H.L. Fragnito⁵.</p> <ol style="list-style-type: none"> 1. Faculdade de Tecnologia (FT), UNICAMP, Brazil 2. Optics and Photonics Research Center, UNICAMP, Brazil 3. Faculdade de Engenharia Elétrica e de Computação, UNICAMP, Brazil 4. Instituto de Estudos Avançados - IEAv, Brazil 5. Instituto de Física Gleb Wataghin, UNICAMP, Brazil 	<p>1200-1215 4220-CT-6</p> <p>Jun Dong¹, Ying Cheng¹, Jian Ma¹, Ken-ichi Ueda², Alexander Kaminski³</p> <ol style="list-style-type: none"> 1. Department of Electronic Engineering, Xiamen University, China 2. University of Electro-Communications, Japan 3. Russian Academy of Sciences, Russia 	<p>Enhancement of Cr, Yb:YAG self-Q-switched Lasers by Bonding Yb:YAG Crystal</p> <p>Efficient laser-diode pumped Cr, Yb:YAG self-Q-switched laser by bonding Yb:YAG crystal to enhance inversion population have been demonstrated for the first time. Average output power of 1 W and optical-to-optical efficiency of 18.5% have been achieved.</p>	<p>1215-1230 4220-CT-7</p> <p>Masaki Tsunekane¹, Takunori Taira¹</p> <ol style="list-style-type: none"> 1. Institute for Molecular Science, Japan 	<p>Laser Performance of Composite Nd:YAG/Cr:YAG Ceramics for Laser Ignition</p> <p>Monolithic lasers of composite Nd:YAG/Cr:YAG ceramics with different Nd concentrations and cavity lengths were tested. A passively Q-switched pulse energy</p>	<p>1215-1230 4210-CT-7</p> <p>Heike Ehendorff-Heidepriem¹, David Lancaster¹, Kevin Kuan¹, Roger Moore¹, Samuil Sarker¹, Tanya Monro¹</p> <ol style="list-style-type: none"> 1. Institute of Photonics & Advanced Sensing, The University of Adelaide, Australia 	<p>Extruded Fluoride Fiber for 2.3µm Laser Application</p> <p>We report on a new and versatile technique to fabricate step-index fluoride fibers for laser applications. The fibers made were doped with Tm³⁺ to explore suitability for lasing at 2.3µm.</p>	<p>Biomedical Applications (4250) <i>continued</i></p> <p>Sepsis Analysis for POCT applications</p> <p>In the last years, there has been a strong request of the physicians for point-of-care testing (POCT) instrument. The present paper deals with the characterisation of a POCT optical instrument, the channel array interrogation (CA) device, developed for the simultaneous detection of biomarkers for sepsis. The portable device was optimized for the determination of procalcitonin (PCT) and C-reactive protein (CRP), the main biomarkers for sepsis. Limit of detection equal to 1.3 µg L⁻¹ and to 2 µg L⁻¹ for CRP and PCT, respectively were achieved.</p>	<p>1200-1215 4250-CT-6</p> <p>Shuhei Shibasato¹, Daisuke Nakamura¹, Tatsuo Okada¹, Yukiyasu Yoshinaga², Tokio Ueno³, Masahiko Kobayashi³, Hiroshi Enaida⁴, Tasturou Ishibashi⁴</p> <ol style="list-style-type: none"> 1. Graduate School of ISEE, Kyushu University, Japan 2. Graduate School of Design, Kyushu University, Japan 3. NIDEK CO. LTD., Japan 4. Graduate School of Medical Sciences, Kyushu University, Japan 	<p>High Resolution Imaging for Measurement of Oxygen Saturation in Human Retinal Vessels</p> <p>The high resolution oxygen saturation level measurement equipment was developed. Extraction the retinal vessels not only the large vessels but also the small vessels could be obtained due to the high resolution image.</p>	<p>Novel Photonic Devices (4240) <i>continued</i></p> <p>Bending and twisting sensors on optical fiber was demonstrated using waveguide dye laser mounted on the fiber. The lasing wavelength shift was observed via the fiber in which a pumping beam propagates. <i>ACOPT Presentation</i></p>	<p>1145-1200 4240-CT-6</p> <p>Markus Pollnau¹, Edward H Bernhard¹, Henk A G M van Wolferen¹, Kerstin Warhoff¹, Renae M de Ridder¹</p> <ol style="list-style-type: none"> 1. University of Twente, The Netherlands 	<p>Monolithic Distributed Bragg Reflector Cavities in Al2O3 with Quality Factors Exceeding One Million</p> <p>Monolithic distributed Bragg reflector (DBR) cavities with quality factors exceeding one million have been realized in aluminum oxide channel waveguides. This technology enabled the successful demonstration of the first DBR laser in this waveguide platform.</p>	<p>1200-1230 4240-IT-7</p> <p>INVITED SPEAKER</p> <p>Markus Pollnau¹, Lasse J Kauppinen¹, Shahina M.C. Abdulla¹, Meindert Dijkstra¹, Renae M de Ridder¹, Meint J de Boer¹, Erwin Berenschoot¹, Gijs J M Krijnen¹</p> <ol style="list-style-type: none"> 1. University of Twente, The Netherlands 	<p>Micromechanically Tuned Ring Resonator in Silicon on Insulator</p>	<p>Novel Photonics 2 (4230) <i>continued</i></p> <ol style="list-style-type: none"> 2. Harbin Institute of Technology, China 3. Friedrich-Alexander University of Erlangen-Nuremberg, Germany 	<p>Novel Plasmonic Applications in Physics and Chemistry</p> <p>We present novel plasmonic methodologies combining electron- and ion-beam lithography for fabrication of wideband fractal nano-antennas and slotted gold nano-particles. Performance of such patterns with nanometric-size grooves, and functionalized gold-titania substrates for photocatalysis, are demonstrated.</p>	<p>1215-1230 4230-CT-7</p> <p>Dayan Handapangoda¹, Malin Premaratne¹, Ivan Rukhlenko¹</p> <ol style="list-style-type: none"> 1. Department of Electrical and Computer Systems Engineering, Monash University, Australia 	<p>Optimum Design of Single-Core Nanowaveguide for Surface Plasmon Polaritons</p> <p>We show that an optimal dielectric cladding thickness exists, at which the losses in a metallic nanowire can be entirely compensated with minimal gain. We also propose design guidelines that ensure strong confinement of SPPs. <i>ACOPT Presentation</i></p>	<p>1200-1215 4260-CT-5</p> <p>Chur Kim¹, Kwangyun Jung¹, Hyoiji Kim¹, Youjian Song¹, Jungwon Kim¹</p> <ol style="list-style-type: none"> 1. KAIST, South Korea 	<p>Ultra-low Timing and Intensity Noise from Mode-locked Yb-fiber Lasers at Close-to-Zero Intra-cavity Dispersion</p> <p>We demonstrate ultra-low timing and intensity noise from mode-locked Yb-fiber lasers. The measured rms timing jitter and relative intensity noise are 187 attoseconds and 0.057 % , respectively, integrated from 10 kHz to 40 MHz.</p>	<p>1200-1215 4260-CT-6</p> <p>Han-Sung Chan^{1,2}, Zhi-Ming Hsieh¹, A.H. Kung^{1,2}</p> <ol style="list-style-type: none"> 1. Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan 2. Institute of Photonics Technologies, National Tsing Hua University, Hsinchu, Taiwan 	<p>Phase Stabilization and Pulse Characterisation (4260) continued</p>	<p>6. EE Department and Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taipei, Taiwan</p>	<p>Synthesis and Measurement of Ultrafast Optical Waveforms</p> <p>Periodic femtosecond and subfemtosecond optical waveforms whose instantaneous electric fields are shaped in the form of sawtooth, square, or sub-cycle cosine and sine pulses are synthesized and are verified by a novel correlation technique.</p>	<p>1145-1200 4260-CT-5</p> <p>Chur Kim¹, Kwangyun Jung¹, Hyoiji Kim¹, Youjian Song¹, Jungwon Kim¹</p> <ol style="list-style-type: none"> 1. KAIST, South Korea 	<p>Ultra-low Timing and Intensity Noise from Mode-locked Yb-fiber Lasers at Close-to-Zero Intra-cavity Dispersion</p> <p>We demonstrate ultra-low timing and intensity noise from mode-locked Yb-fiber lasers. The measured rms timing jitter and relative intensity noise are 187 attoseconds and 0.057 % , respectively, integrated from 10 kHz to 40 MHz.</p>	<p>1200-1215 4270-CT-6</p> <p>Laura McKemmish¹, David Kedziora², Graham White², Noel Hush³, Jeffrey Reimers¹</p> <ol style="list-style-type: none"> 1. School of Chemistry, University of Sydney, Australia 2. School of Physics, University of Sydney, Australia 3. School of Molecular Biosciences, University of Sydney, Australia 	<p>Molecular Design Principles for Linearly Scalable, Frequency-Based, Universal Quantum Computers</p> <p>Minimizing of the number of strong couplings between qubits is shown to facilitate frequency-based universal quantum computers with two-qubit-gate construction difficulty that scales linearly with increasing register size, matching that known already for one-qubit gates.</p>	<p>Quantum Science in Atoms, Molecules and Solids 1 (4270) <i>continued</i></p> <p>1130-1200 4270-IT-5</p> <p>INVITED SPEAKER</p> <p>Mikkel F. Andersen¹, Tzahi Grunzweig¹, Andrew Hilliard¹, Matthew McGovern¹, Yih H. Fung¹</p> <ol style="list-style-type: none"> 1. Jack Dodd Centre, Department of Physics, University of Otago, New Zealand 	<p>Consistent Isolation Of Individual Atoms Using Cold Collisions</p> <p>We will present our results on detecting and manipulating individual atoms. These include counting of neutral atoms in optical microtraps at high densities and how to prepare individual atoms in a microtrap utilizing light-assisted collisions</p>
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of 1.7mJ with a duration of 313ps was obtained from a Nd:YAG laser doped ceramic.

1215-1230

4250-CT-7

Antonio Lauto¹, Damia Mawad²

1. *University of Western Sydney, BENS and SBHS, Australia*
2. *University of Wollongong, IPRI, Australia*

Monolithic integration of a micromechanical cantilever with an optical ring resonator in silicon on insulator is demonstrated. The ring is tuned over a 120 pm wavelength range by applying 9 V, without affecting its Q-factor.

A Compact Optical Waveform Synthesizer and Measurement System

1215-1230

4270-CT-7

Laura McKemmish¹, Ross McKenzie², Noel Hush³, **Jeffrey Reimers¹**

1. *School of Chemistry, The University of Sydney, Australia*
2. *School of Mathematics and Physics, The University of Queensland, Australia*
3. *School of Molecular Biosciences, The University of Sydney, Australia*

We use a nonlinear photonic crystal and an ultrabroad band acoustic-optic modulator to demonstrate optical waveform synthesis. The resulting system represents a major step toward the construction of a portable optical waveform synthesizer.

Chitosan-ECM Bandages for Photochemical Tissue Repair

Extracellular matrices (ECMs) are currently anchored to tissue with sutures to enhance wound healing in several reconstructive surgical procedures. We have recently developed a new laser-activated adhesive bandage to fix ECM on tissue without sutures.

1230-1245

4250-CT-8

Takeshi Namita¹, Masafumi Otani¹, Yuji Kato¹, Koichi Shimizu¹

1. *Graduate School of Information Science and Technology, Hokkaido University, Japan*

New Technique to Estimate Non-absorbing Temporal Point Spread Function for Diffuse Optical Tomography using Backscattered Light

To reconstruct cross-sectional absorption distribution of diffuse medium, a new technique to estimate non-absorbing temporal point spread function in time-resolved measurement was developed. The feasibility and effectiveness were verified in Monte Carlo simulation.
ACOFI Presentation

Electron-Vibration Quantum Entanglement in Chemical Bonding

A simple model for chemical reactions is applied to examine electron-vibration entanglement in terms of both its potential usefulness for quantum computation and what it reveals about basic chemical processes.

1215-1230

4260-CT-7

Goery Genty¹, Mikko Närhi¹, Minna Surakka², Jari Turunen², Ari Friberg³

1. *Tampere University of Technology, Optics Laboratory, Finland*
2. *University of Eastern Finland, Department of Physics and Mathematics, Finland*
3. *Aalto University, Department of Applied Physics, Finland*

Second-order Coherence Properties of Supercontinuum

Using second-order coherence theory of non-stationary light, we examine in detail the coherence properties of supercontinuum radiation generated in nonlinear fibers.

1. *School of Mathematics and Physics, University of Queensland, Australia*
 2. *Physik Department, TU Muenchen, Germany*

Optomechanical Magnetometer with nano-Tesla Sensitivity

We demonstrate an optomechanical magnetometer based on microtoroidal resonators that combines the giant magnetostriction of Terfenol-D with the ultrahigh optical transduction sensitivity of microtoroids and achieves detection sensitivities in the range of nT Hz^{-1/2}.

1500-1515 **4410-CT-4**

Wen-Fung Liu², Guei-Ru Lin¹, En-Chiang Chang², Pei-Ping Wu², Hai-Tao Sun², Hao-Jan Sheng², Ming-Yue Fu³

1. *Ph.D. Program in Electrical and Communications Engineering, Feng Chia University, Taiwan*
 2. *Department of Electrical Engineering of Feng Chia University, Taiwan*
 3. *Department of Avionics Engineering, Air Force Academy, Taiwan*

We discuss upgrades currently underway at Sandia National Labs Z-Becklighter facility. Among them: A new OPCPA front end, 94 cm X 42 cm MLD gratings, laser beam combination studies, advanced debris mitigation techniques, and a major target area expansion.

1430-1500 **4450-IT-3**

INVITED SPEAKER

Noriaki Miyanaga¹, LFEEX Team¹, GEKKO EXA Design Team¹

1. *Institute of Laser Engineering, Osaka University, Japan*

Construction of LFEEX PW Laser and Conceptual Design of Sub EW Laser at Osaka University

This talk discusses technologies of high-energy PW laser, e.g. OPCPA, spectral phase modulator, arrayed glass amplifier with multi-pass architecture, newly designed pulse compressor with dielectric gratings. Design of OPCPA of 0.1 EW/beam is also presented.

1500-1515 **4450-CT-4**

Feng Jing¹, WanJun Dai¹, Dongxia Hu¹, Deen Wang¹, Lanqin Liu¹, Wei Zhou¹, Xin Zhang¹, Wu Deng¹, Kun Zhang¹

1. *Reserch Center of Laser Fusion, CAEP, China*

Beam Wavefront

Correction Scheme for Application in a Multi-Pass Amplifier System

We proposed a beam wavefront correction scheme applicable for different configurations of multi-pass amplification systems. The scheme will be employed to correct wavefront aberrations in the SG-III laser facility which is under construction.

microscope by a factor of two beyond the diffraction limit. We apply this technique to the study of living yeast cells.

1445-1500 **4430-CT-3**

Young-Joo Hong^{1,2}, Shuichi Makita^{1,2}, Myeong-Jin Ju³, Byeong-Ha Lee³, Masahiro Miura^{2,4}, **Yoshiaki Yasuno^{1,2}**

1. *Computational Optics Group, University of Tsukuba, Japan*
 2. *Computational Optics and Ophthalmology Group, Japan*
 3. *School of Information and Communications, GIST, Korea*
 4. *Ibaraki Medical Center, Tokyo Medical University, Japan*

Non-Invasive Three-Dimensional Angiography of Human Eye by Doppler Optical Coherence Tomography

High-speed and high-penetration swept-source optical coherence tomography (HSWP-SS-OCT) system is developed based on 1- μ m short cavity laser. Doppler OCT processing is applied with custom made OCT phase stabilization algorithm which doesn't sacrifice measurement range not as like a conventional phase stabilization mirror. The bidirectional blood flow in deep choroid was successfully obtained.

1500-1515 **4430-CT-4**

Anna Yang¹, **Frédérique Vanholsbeeck¹**, Stéphane Coen¹, Jochen Schroeder²

1. *Department of Physics, The University of Auckland, New Zealand*
 2. *IPOS, The University of Sydney, Sydney, Australia*

Phase and Amplitude Optimization in an Optical Coherence Tomography System using a

technology. Simultaneously transmission of 4x12.5Gbps down-link and 800Mbps up-link has been successfully achieved with error-free operation.

1445-1500 **4440-CT-3**

Alexander Argyros², Richard Provo¹, Stuart Murdoch¹, John Harvey¹, Richard Lwin², Sergio Leon-Saxal²

1. *Department of Physics, The University of Auckland, New Zealand*
 2. *IPOS, School of Physics, The University of Sydney, Australia*

Error Free 9.5 Gb/s Transmission over 50 m of Multimode Microstructured Polymer Optical Fibre

We demonstrate error free data transmission at 9.5 Gb/s at 636 nm through a record length of 50 m of microstructured polymer optical fiber. We observe minimal modal dispersion and a power penalty of 1dB.

1500-1515 **4440-CT-4**

Hyun-Seung Kim¹, Deok-Rae Kim¹, Se-Hoon Yang¹, Yong-Hwan Son¹, Sang-Kook Han^{1,2}

1. *Department of Electrical and Electronic Engineering, Yonsei University, Korea*
 2. *Yonsei Institute of Convergence Technology, Yonsei University, Korea*

Indoor Positioning System Based on Carrier Allocation Visible Light Communication

The indoor optical positioning system utilizing visible light communication with the modulation method of carrier allocation is proposed. The accuracy of 6-cm positioning error is experimentally achieved using normalization method. *ACOFI Presentation*

possessing strong magnetic responses in the 100GHz range. We characterize different arrays of such fibers, observing magnetic resonances between 100-200GHz.

1430-1500 **4420-IT-3**

INVITED SPEAKER

Hideaki Ongaki¹

1. *Institute of Advanced Energy, Kyoto University, Japan*

Accelerator Based Photon Beams,

Generation and Applications at Kyoto University

In Kyoto University studies on generation and application of accelerator based photon beams, Free Electron Lasers, covering from MIR to THz are presented.

1500-1515 **4420-CT-4**

Y. H. Ahn¹, J. T. Hong¹, Soonil Lee¹

1. *Division of Energy Systems Research, Ajou University, Korea*

Terahertz Optical Devices by using Single-walled Carbon Nanotube Network Films

We demonstrate terahertz optical devices such as attenuation filters, polarizers, and plasmonic filters based on highly conductive single-walled carbon nanotube films. They are fabricated by laser-machining and photolithographic method, and characterized by time-domain terahertz spectroscopy.

1515-1530 **4420-CT-5**

Jiro Kitagawa^{1,2}, Mitsuhiko Kodama¹, Yusaku Nishifuji¹, Damien Armand^{1,2}, Yutaka Kadoyai^{1,2}

Observation of a Temporal Symmetry Breaking Instability in a Synchronously-Pumped Passive Fibre Ring Cavity

With an optical fibre ring cavity, we observe experimentally a spontaneous temporal symmetry breaking. Intracavity pulses acquire a completely asymmetric profile, with a peak strongly off-centre with respect to the symmetric pump pulses.

1430-1445 **4460-CT-3**

P. Hansinger¹, G. Maleshkov², I. Garanovich³, D. Skryabin¹, **D.N. Neshev³**, Yu. S. Kivshar³, A. Dreischuh², G.G. Paulus¹

1. *Institute of Optics and Quantum Electronics, Friedrich-Schiller-University, Germany*
 2. *Department of Quantum Electronics, Faculty of Physics, Sofia University, Bulgaria*
 3. *Nonlinear Physics Center, Research School of Physics and Engineering, Australian National University, Australia*
 4. *Centre for Photonics and Photonic Materials, University of Bath, UK*

Generation of White-Light Optical Vortices through Cascaded Four-Wave Mixing

We study numerically and experimentally the process of cascaded four-wave mixing of a vortex beam imposed on short laser pulses propagating in a gas cell. We demonstrate that such cascaded nonlinear process leads to the generation of white-light optical vortices with well preserved vortex phase profile.

1445-1500 **4460-CT-4**

Miro Erkintalo¹, G. Genty¹, Minna Surakka², Jari Turunen², Ari T. Friberg^{2,3}.

Parametric Instability Barrier

Parametric instability severely degrades the sensitivity of optomechanical systems. We demonstrate characterization of this degradation in addition to feedback suppression of parametric instability leading to enhanced sensitivity.

1445-1500 **4470-CT-3**

Sarah Beavan¹, Jevon Longdell², Matthew Sellers¹

1. *Centre for Quantum Computation and Communication Technology, RSPE, ANU, Australia*
 2. *Dodd Centre for Photonics and Ultra-Cold Atoms, University of Otago, New Zealand*

Rephasing Spontaneous Emission in a Rare-Earth Ion-Doped Solid

We have experimentally generated a photon-echo of a spontaneous emission event in a rare-earth ion-doped crystal.

1500-1515 **4470-CT-4**

INVITED SPEAKER

Jevon Longdell¹, David McAuslan¹, Dmitry Korystov¹

1. *University of Otago, New Zealand*

Spectral Properties of Rare-Earth-Ion Doped Whispering Gallery Mode Resonators

The coherent properties of praseodymium ions doped into cryogenic whispering gallery mode resonator were studied. Photon echoes allowed direct measurement of the cavity QED parameters. The prospects for reaching the strong coupling regime are discussed.

High Power Laser Installation
(4450) *continued*

- 1515-1530 **4450-CT-5**
Li Zhaoyang¹, Xu Guang²,
 Wang Tao¹, Dai Yaping¹
 1. *Shanghai Institute of Laser and
 Plasma, China*
 2. *Shanghai Institute of Optics and
 Fine Mechanics, China*

**Object-image Grating
 Self-tiling Technology
 and Related Compressor
 Design for Petawatt
 Laser Systems**

To meet the need of fast ignition inertial confinement fusion (ICF), a new grating tiling concept is proposed. And based on this tiling technology, a related grating-tiling compressor design is given.

Microscopic Imaging and
Tomography (4430) *continued*

**Programmable Spectral
 Filter**

We demonstrate the use of a WaveShaper to compensate all orders of chromatic dispersion in an all-fibre FD-OCT system at 1550 nm. The PSF, originally 58 µm wide, asymmetric, with strong sidelobes, is successfully made symmetric and recompressed to 38 µm.

1515-1530 **4430-CT-5**

- B. I. Akca¹, V. D. Nguyen², J. Kalkman², T. G. van Leeuwen^{2,3}, K. Wörhoff¹, R. M. de Ridder¹, **M. Polnau¹**

1. *Integrated Optical MicroSystems Group, MESA+ Institute for Nanotechnology, University of Twente, The Netherlands*
 2. *Biomedical Engineering & Physics University of Amsterdam, Academic Medical Center, The Netherlands*
 3. *Biomedical Technology Institute, Biophysical Engineering, University of Twente, The Netherlands*

**Towards Spectral-
 domain Optical
 Coherence Tomography
 on a Silicon Chip**

We present experimental results of a spectral-domain optical coherence tomography system that includes an integrated spectrometer. A depth range of 1 mm and axial resolution of 19 µm was measured. A layered phantom was imaged.

In-Building and Green Networks
(4440) *continued*

1515-1530 **4440-CT-5**

- Ke Wang^{1,2}**, Ampalavanapillai Nirmalathas^{1,2}, Christina Lim², Efstratios Skafidas^{1,2}

1. *National ICT Australia - Victoria Research Laboratory (NICTA-VRL), Australia*
 2. *Department of Electrical and Electronic Engineering, The University of Melbourne, VIC 3010, Australia*

**Experimental
 Demonstration of a Novel
 Indoor Optical Wireless
 Localization System for
 Tracking Multiple Users**

In this paper we experimentally demonstrate a novel indoor localization system based on optical wireless technique. Results show that a high-speed localization capable of supporting multiple users with an average error <15cm can be achieved.

Guiding THz (4420) *continued*

1. *Department of Quantum Matter, ADSM, Hiroshima University, Japan*
 2. *CREST, Japan Science and Technology Agency, Japan*

**New Design of Terahertz
 Metallic Photonic Crystal
 with Mechanically
 Tunable Photonic-Band-
 Gap**

A new design of THz metallic photonic crystal the photonic band gap of which is mechanically controllable is proposed. The THz properties were studied by a finite-difference time-domain simulation and a THz time-domain spectroscopy measurement.
ACOFT Presentation

Fundamentals of Nonlinear
Optics 2 (4460) *continued*

1. *Tampere University of Technology, Optics Laboratory, Finland*
 2. *University of Eastern Finland, Department of Physics and Mathematics, Finland*
 3. *Aalto University, Department of Applied Physics, Finland*

**Coherent-Mode
 Representation of
 Supercontinuum Light**

A coherent-mode representation is used to characterize the statistical properties of supercontinuum light generated in nonlinear fibers.

1500-1530 **4460-IT-5**

INVITED SPEAKER

- Philip Russell¹**, A. Abdolvand¹, W. Chang¹, N. Y. Joly¹, A. Nazarkin¹, J.C. Travers¹

1. *Max Planck Institute for the Science of Light, Erlangen, Germany*

**Gas-based Nonlinear
 Optics in Hollow Core
 Photonic Crystal Fibre**

Hollow-core PCF filled with gas offers many opportunities for precise studies of reconfigurable nonlinear light-gas interactions. Recent results on Raman scattering in molecular gases and efficient tunable deep-UV generation in atomic gases will be reviewed.

1530-1545 **4460-CT-6**

- Robert Boyd¹**, Sonja Franke-Arnold², Graham Gibson², Miles Padgett²

1. *University of Ottawa, Canada*
 2. *University of Glasgow, UK*

**An Image as Viewed
 Through a Spinning**

Quantum Science in Atoms,
Molecules and Solids 2 (4470)
continued

1515-1545 **4470-IT-5**
INVITED SPEAKER

- T.F. Heinz¹**, K. F. Mak¹, C.H. Lui¹, L.M. Malard¹, H.G. Yan¹, Z.Q. Li¹, D. Boschetto^{1,2}, M. Steir³, J.A. Misewich³, J. Shan^{1,4},

1. *Columbia University, USA*
 2. *Laboratoire D'Optique Appliquée, ENSTA/Ecole Polytechnique, France*
 3. *Brookhaven National Laboratory, Upton, USA*
 4. *Case Western Reserve University, Cleveland, USA*

**Probing Electronic States
 and Dynamics in
 Graphene by Optical
 Spectroscopy**

Graphene presents many distinctive optical properties that complement its attractive electronic and mechanical characteristics. We review some of the recent progress in understanding the electronic transitions and ultrafast dynamics in single and few-layer graphene crystals.

1530-1545 **4430-CT-6**

Shutaro Ishida¹, Northiko Nishizawa¹

1. Nagoya University, Japan

Quantitative Comparison of Scattering Coefficient with Ultrahigh Resolution Optical Coherence Tomography

Realization of ultrahigh resolution and deeper imaging is one of key problems in OCT. We have quantitatively confirmed the improvement of imaging depth in 1700 nm ultrahigh resolution OCT compared with the other wavelength regions.

Window: Image Rotation Enhanced by a Slow Light Medium

Theory predicts that an image as viewed through a rotating window will be rotated in the direction of rotation of the window. This effect has never been previously observed experimentally due to the smallness of the effect for conventional materials. The predicted rotation angle has a contribution that is inversely proportional to the group velocity, and thus the rotation is expected to increase dramatically in a slow light medium. Using a spinning ruby rod under conditions for coherent population oscillations, we induce an effective group index of about one million, leading to a rotation angle large enough to be observed by eye. The possibility to switch between different rotation states may offer new opportunities for controlled image encoding.

1530-1600

AFTERNOON TEA - Bayside Gallery

1600-1730

Session 9

Room: Bayside Auditorium A
Fibre Sensors 2 (4610)

Symposium 1

Chair: Shahraam Afshar, Institute for Photonics & Advanced Sensing, AUSTRALIA

1600-1630

INVITED SPEAKER

Shahraam Afshar V¹,

Matthew R. Henderson¹, Andrew D. Greentree², Tanya M. Monro²

1. Institute for Photonics & Advanced Sensing, School of Chemistry & Physics, University of Adelaide, Australia

Room: Bayside 101

High Power Laser Physics (4640)

Symposium 4

Chair: Almantas Galvanauskas, University of Michigan, USA

1600-1630

INVITED SPEAKER

Sudeep Banerjee¹, Serguei

Kalmykov¹, Nathan Powers¹, Violya Ramanathan¹, Nate Smith¹, Kevin Brown¹, S Chen¹, Anand Moorti¹, Isaac Ghebregziabher¹, Donald Umstadter¹

1. Department of Physics and Astronomy, University of Nebraska, USA

Room: Bayside 102

High Resolution Spectroscopy (4620)

Symposium 2

Chair: Esa Jaatinen, QUT, AUSTRALIA

1600-1615

Jiqiao Liu¹, Xiaopeng Zhu¹,

Jun Zhou¹, Huaqiao Zang¹, Yan He¹, Dan Liu¹, Weibiao¹

1. Shanghai Institute Of Optics & Fine Mechanics, CAS, China

Development of a Coherent Doppler Lidar to Measure atmosphere windshear

Room: Bayside 103

Sources and Amplifiers (4630)

Symposium 3

Chair: Chunle Xiong, The University of Sydney, AUSTRALIA

1600-1615

4630-CT-1

J. Yang¹, T. Lamprecht², K. Wörhoff¹, A. Driessen¹, F. Horst², B.J. Offrein², F. Ay¹, **M. Pollnau**¹

1. Integrated Optical MicroSystems Group, MESA+ Institute for Nanotechnology, University of Twente, The Netherlands

2. IBM Research GmbH, Zurich Research Laboratory, 8803 Rüschlikon, Switzerland

Room: Bayside 104

Optical Storage (4650)

Symposium 5

Chair: Sarun Sumritdechakajom National Electronics and Computer Technology Center, THAILAND

1600-1615

4650-CT-1

Ting-Yu Lin¹, Wei-Ting Hsu¹,

Yu-Chueh Hung¹

1. Institute of Photonics Technologies, National Tsing Hua University, Taiwan

Photoinduced DNA Biopolymer Nanocomposite for Organic Memory Devices

Room: Bayside 105

Fundamentals of Nonlinear Optics 3 (4660)

Symposium 6

Chair: Philip Russell, Max Planck Institute: Science Of Light, GERMANY

1600-1630

4660-IT-1

INVITED SPEAKER

Andrey Sukhorukov¹

1. Australian National University, Australia

Optical Phase Transitions and Quantum Walks in Nonlinear Waveguide Arrays

Room: Bayside 106

Novel Systems: Photons, Ions, Molecules and Atoms (4670)

Symposium 7

Chair: Kristian Helmerson, Monash University, AUSTRALIA

1600-1630

4670-IT-1

INVITED SPEAKER

Jan Klaers¹, Julian Schmitt¹, Tobias Damm¹, Frank Vewinger¹, Martin Weitz¹

1. Institute for Applied Physics, University of Bonn, Wegelestr, Germany

Fibre Sensors 2 (4610) *continued*

2. *School of Physics, University of Melbourne, Australia*

Optical Fibre Coated with Diamond Nanocrystal:

Novel Sensing Architecture

Theoretical model of power radiated by a nanodiamond crystal located at the surface of a fiber shows narrow peaks that are extremely sensitive to the refractive-index of the surrounding environment suggesting an architecture for efficient refractive-index sensing.

1630 - 1645 **4610-CT-2**

Guei-Ru Lin¹, Jiang-Chiou Mau¹, Pei-Tsung Tsai², Hai-Tao Sun², Hao-Jan Sheng², Ming-Yue Fu³, Wen-Fung Liu²

1. *Ph.D. Program in Electrical and Communications Engineering, Feng-Chia University, Taiwan*
2. *Department of Electrical Engineering of Feng Chia University, Taiwan*
3. *Department of Avionics Engineering, Air Force Academy, Taiwan*

Refractive Index Sensor Base on Hetero-Core-Structure Fiber

A high-sensitivity refractive index sensor composed of a short piece of no-core fiber spliced between two single-mode fibers is experimentally demonstrated with the sensitivity of 7792.85 nm/RIU.

1645-1700 **4610-CT-3**

Kwang Jo Lee¹, Boris T. Kuhlmeiy¹, Sergio G. Leon-Saval¹, Alexander Argyros¹

High Power Laser Physics (4640) *continued*

2. *CEA, DAM, DIF, France*
3. *Tech-X Corporation, USA*

Background-Free, Quasi-Monoenergetic Electron Beams from a Self-Injected Laser Wakefield Accelerator

Stable 200-400-MeV quasi-monoenergetic electron bunches ($\Delta E/E < 10\%$), ~ 10 -pC charge, and no dark-current are produced when a self-injected laser plasma accelerator is optimized. PIC simulations demonstrate these beams are produced near the threshold for self-injection.

1630-1645 **4640-CT-2**

George H. Miley¹, Xiaoling Yang¹, Kirk Flippo², Sandrine A. Gailard², Dustin Offermann², Juan Fernandez², **Heinrich Hora³**

1. *Department of Nuclear, Plasma and Radiological Engineering, University of Illinois, USA*
2. *P-24 Plasma Physics, Los Alamos National Laboratory, Los Alamos, USA*
3. *Department of Theoretical Physics, University of New South Wales, Australia*

Experimental Studies for Ultrahigh Laser Intensity Interaction with Targets with New Cluster Loading

Experimental results and related arrangements are reported from application of the TRIDENT laser with pulses of 250TW power and about 500fs duration interacting with targets with cluster loading at extremely high contrast ratio.

High Resolution Spectroscopy (4620) *continued*

A pulsed coherent Doppler lidar for wind speed measurements was presented. Experiments of speed calibration and atmosphere Line-of-sight wind velocity measurements in 500m range with 40m range bin were implemented. Speed measurement accuracy of 0.23m/s was demonstrated.

1615-1630 **4620-CT-2**

Yutaro Noguchi¹, Tatsuo Shina¹, Kazuo Noguuchi², Tetsuo Fukuchi³, Hideki Ninomiya⁴, Ipppei Asahi⁴, Sachio Sugimoto⁴, Yuzo Shimamoto⁴

1. *Graduate School of advanced Integration Science, Chiba University, Japan*
2. *Chiba Institute of technology, Japan*
3. *Central Research Institute of Electric Power Industry, Japan*
4. *Shikoku Research Institute, Japan*

Detection of Low Concentration Hydrogen Gas by Compact Raman Lidar

An in-line typed compact Raman lidar system for leaked hydrogen gas detection was developed. In this study, the signal gain was improved to detect low concentration hydrogen gas. The improved lidar could detect Raman scattering light of atmospheric nitrogen up to a range of 50 m. Raman scattering light by hydrogen gas in a gas cell could be detected for concentrations of 13% to 100%

Sources and Amplifiers (4630) *continued*

Integrated Waveguide Amplifiers for Optical Backplanes

Amplifier performance of Nd3+-doped polymer and Al2O3 channel waveguides at 880 nm is investigated. Tapered amplifiers are embedded between optical backplane waveguides, and a maximum 0.21 dB net gain is demonstrated.

1615-1630 **4630-CT-2**

Khu Vu¹, Steve Madden¹

1. *Laser Physics Centre, Research School of Physics and Engineering, Australia*

Erbium Doped Tellurium Dioxide Planar Waveguide Amplifiers with 2.8dB/cm Internal Gain

We report the first Erbium doped Tellurium dioxide single-mode waveguide amplifiers with net fibre to fibre gain, >40 nm gain bandwidth, and a record gain of 2.8dB/cm with 1480nm pumping and potential 5.4dB/cm for 980nm pumping.

ACOFF Presentation

1630-1645 **4630-CT-3**

Tomohiro Amemiya¹, Takahiko Shindo², Daisuke Takahashi², Seiji Myoga², Nobuhiko Nishiyama², Shigeitsa Arai^{1,2}

1. *Quantum Nanoelectronics Research Center, Tokyo Institute of Technology, Japan*
2. *Department of Electrical and Electronic Engineering, Tokyo Institute of Technology, Japan*

Optical Storage (4650) *continued*

We report a photoinduced technique to fabricate nanocomposite comprised of silver nanoparticles and DNA biopolymer for organic memory device with on/off ratio of 103. Such technique can find broad applications in photoinduced gratings and optical storage.

1615-1630 **4650-CT-2**

Tzu-Hsiang Lan¹, Xiangping Li², Chung-Hao Tien¹, Min Gu²

1. *National Chiao Tung University, Taiwan*
2. *Swinburne University of Technology, Australia*

Two-Photon Induced Photoluminance of Gold Nanorods Using Cylindrical Vector Beams

Photoluminance of gold nanorods has been studied via two-photon excitation using cylindrical vector beams (CVBs). CVBs cannot only be used for fast determining the three-dimensional orientation of gold nanorods, but also facilitate omnidirectional polarisation recording.

1630-1700 **4650-IT-3**

INVITED SPEAKER

Lambertus Hesselink¹

Fundamental Principles Underlying Near Field Transducers For Data Storage

We discuss fundamental issues related to understanding and optimization of near field transducers using topological visualization of Poynting vector flow. Applications include optical and magnetic data storage. Optimized designs producing sub 20 nm spots are discussed.

Fundamentals of Nonlinear Optics 3 (4660) *continued*

We predict and demonstrate experimentally a phase transition associated with frequency mixing in arrays of quadratic waveguides, and reveal new features of quantum walks for photon pairs generated through spontaneous down-conversion inside the nonlinear array.

1630-1645 **4660-CT-2**

Yue Sun^{1,2}, Thomas White^{1,2}, Andrey Sukhorukov¹

1. *Nonlinear Physics Centre and CUDOS, The Australian National University, Australia*
2. *Laser Physics Centre and CUDOS, The Australian National University, Australia*

Slow-light Enhanced Optomechanical Interactions Between Shifted Photonic-crystal Waveguides

We investigate slow light enhanced optical forces between parallel periodic waveguides when one waveguide is shifted longitudinally relative to the other. We show that changes to the waveguide symmetry properties can modify the transverse force from repulsive to attractive while also introducing a longitudinal force which is absent in unshifted structures.

ACOFF Presentation

1645-1700 **4660-CT-3**

Terry McRae¹, Warwick Bowen¹

1. *Centre for Engineered Quantum Systems University of Queensland, Australia*

Novel Systems: Photons, Ions, Molecules and Atoms (4670) *continued*

Bose-Einstein condensation of paraxial light

We have experimentally demonstrated the Bose-Einstein condensation of a two-dimensional photon gas that is thermally coupled to a dye microcavity at room temperature.

1630-1645 **4670-CT-2**

E.W. Streed¹, A. Jechow¹, B.G. Norton¹, M.J. Petrasunas¹, D. Kielpinski¹

1. *Centre for Quantum Dynamics, Griffith University, Australia*

Single-Atom Absorption Imaging

We demonstrate the first absorption imaging of a single atom. Absorption depths of up to 2.6(2)% were observed for laser cooled 174Yb+ ions illuminated at 369.5 nm and imaged with a phase Fresnel lens.

1645-1700 **4670-CT-3**

Benjamin Norton¹, Erik Streed¹, Andreas Jechow¹, Matthew Petrasunas¹, David Kielpinski¹

1. *Centre for Quantum Dynamics, Griffith University, Australia*

Imaging the Temperature of Ions

We demonstrate milli-Kelvin precision thermometry of laser cooled trapped ions using high-resolution imaging. This steady state approach can be used to investigate ion temperatures even when the laser cooling dynamics are highly anisotropic.

1. *Institute of Photonics and Optical Science (IPOS), University of Sydney, Australia*

Composite Fiber Refractive Index Sensor Based on Directional Couplers Near Cutoff

Using a three-material composite polymer microstructured optical fiber, refractive index sensing of fluids based on directional couplers can be greatly simplified, avoiding the need for selective filling and enabling sensing of low refractive indices.

ACOFI Presentation

1700-1715 **4610-CT-4**

Kyung Su Kim¹, Yosuke Mizuno¹, Masayuki Nakano², Seichi Onoda², Kentaro Nakamura¹

1. *Precision and Intelligence Laboratory/Tokyo Institute of Technology, Japan*
2. *R&D division/Watanabe, Co. Ltd, Japan*

Refractive Index Sensor for Liquids and Solids Using Dielectric Multilayer Films Deposited on Optical Fiber End Surface

We propose a novel fiber-optic refractive index sensor using dielectric multilayer thin films deposited on an optical fiber end surface. This sensor has high spatial resolution and can be applied not only fluids but solids.

1715-1730 **4610 CT-5**

Dong-Seok Choi¹, Tae-Jung Ahn¹, Hoe-Seok Jeong¹, Chan-Young Kim¹, Hyun-Kyoung Kim², Su Nam Lee³

1. *Dept. Photonic Engineering, Chosun Univ., Gwangju, Korea*

1645-1700

4640-CT-3

INVITED SPEAKER

Brent Le Cornu¹, Reynaldo Castillo¹, Timothy Slait-Gardner¹, Heinrich Hora²

1. *University of Western Sydney, Australia*
2. *University of Sydney, Australia*

Strong-Field Laser- Plasma Interaction Analysed By Noncanonical Hamiltonians

Nonlinear effects in laser-plasma interaction are of particular interest in the study of nuclear fusion. The nonlinear force is derived using symplectic geometry for the Hamiltonian formulation of the force density as gradients of the energy density.

1700 -1715 **4640-CT-4**

Heinrich Hora¹, George H. Miley², Paraskevas Lalouis³, Kirk Filippo⁴, Sandrine A. Gailard⁴, Dustin Offemann⁴, Juan Fernandez⁴, Xiaoling Yang², Masakatsu Murakami⁵, Reynaldo Castillo⁶, Timothy Slait-Gardner⁶, Brent Le Cornu⁶, Julio Pozo⁷

1. *Department of Theoretical Physics, University of New South Wales, Australia*
2. *Department of Nuclear, Plasma and Radiological Engineering, University of Illinois, USA*
3. *Institute of Electronic Structures and Lasers FORTH, Greece*
4. *P-24 Plasma Physics, Los Alamos National Laboratory, USA*
5. *Institute of Laser Engineering, Osaka University, Suita, Osaka, Japan*
6. *BN/Sci. University of Western Sydney, Campbelltown, Australia*
7. *Basic Science Institute, Diego Portales University, Santiago, Chile*

Ultrahigh Acceleration of

1630-1700

4620-IT-3

INVITED SPEAKER

Shiv Sharma¹, Paul Lucey¹, Anupam Misra¹

1. *Hawaii Institute of Geophysics & Planatology, University of Hawaii, USA*

Raman Spectroscopy and Its Applications in Earth And Planetary Science

We present remote Raman spectroscopic systems capable of detecting minerals, inorganic and organic chemicals, and biogenic materials during daytime and nighttime to radial distances in the range 1 to 120 nm.

1700-1715 **4620-CT-4**

Philip Light¹, Christopher Perrella¹, Fetah Benabid², Tom Stace³, Andre Luiten¹

1. *Department of Physics, University of Western Australia, Australia*
2. *Centre for Photonics and Photonic Materials, University of Bath, UK*
3. *Department of Physics, University of Queensland, Australia*

High Resolution Optical Spectroscopy in Hollow Core Fibre for Use in Atomic Clocks

We present high resolution measurements of Doppler free features within a Rubidium filled hollow core fibre and spectroscopy of the '5S-5D' two-photon transition within the fibre to be used to create a compact frequency standard.

1715-1730 **4620-CT-5**

Brian Orr¹, Yabai He^{1,2}, Ruiteng Kan³, Wenqing Liu³

1. *MQ Photonics Research Centre, Macquarie University, Australia*
2. *National Measurement Institute, Australia*

1700-1630

4650-IT-4

INVITED SPEAKER

Matthew Foreman¹, Peter Torok¹

1. *Imperial College London, UK*

Analysis of Optical Resolution in Data Storage and Beyond

Data capacity in optical data storage (ODS) is limited by system noise and not optical resolution. Such limits are investigated in a new ODS system using information theory. Similarities in detection allow study beyond ODS.

1700 - 1730 **4660-IT-4**

INVITED SPEAKER

Anatoly Zayats¹

1. *King's College London, UK*

Nonlinear Nanophotonics

In this talk we will discuss principles of nanoscale nonlinear optics and various realisations of all-optical active and tuneable nanophotonic components based on plasmonic waveguides as well as plasmonic metamaterials.

1700-1715

4670-CT-4

Optomechanical Backaction Amplifier near Threshold

We demonstrate an on chip backaction amplifier working in the below threshold regime using radiation pressure induced parametric oscillation in a microtoroid cavity, with an optical Q of 1.2 10⁷ and a mechanical Q of 480.

1700 - 1730 **4660-IT-4**

INVITED SPEAKER

Anatoly Zayats¹

1. *King's College London, UK*

Nonlinear Nanophotonics

In this talk we will discuss principles of nanoscale nonlinear optics and various realisations of all-optical active and tuneable nanophotonic components based on plasmonic waveguides as well as plasmonic metamaterials.

1700-1715

4670-CT-4

Mirco Siercke^{1,2}, Bo Zhang^{1,2}, Kin Sung Chan¹, Michael J. Lim³, Rainer Dumke^{1,2}

1. *Nanyang Technological University, Singapore*
2. *Center for Quantum Technology, Singapore*
3. *Rowan University, USA*

Superconducting Atom Chips

Superconducting Atom Chips are highly attractive for future miniaturization and integration of atom optical devices with distinctive advantages over classical chip structures. I will present the experimental realization and theoretical characterization of our vortex based superconducting chip experiment.

1715-1730

4670-CT-5

Eric Hudson¹, Wade Rellergert¹, Svetlana Kotochigova², Scott Sullivan¹, Steven Schowalter¹, Kuang Chen¹, Alexander Petrov²

1. *Department of Physics and Astronomy, University of California, USA*
2. *Department of Physics, Temple University, USA*

Chemical Reaction of Ultracold Atoms and Ions

We will present measurements and theoretical calculations of a surprisingly fast chemical reaction observed between ultracold ¹⁷⁴Yb⁺ ions and ⁴⁰Ca atoms held in a hybrid MOTION trap, which was constructed to produce ultracold molecular ions.

Wednesday 31 August 2011

Fibre Sensors 2 (4610) *continued*

2. Dept. Polymer Science and Engineering, Chosun Univ., Gwangju, Korea

3. Optonest Inc., 958-6, Daechon-dong, Buk-gu, Gwangju, 500-470, Korea

Characterization of Azobenzene-Coated FBG UV sensor

Recently, an ultraviolet (UV) sensor based on a photomechanical responsible material and a fiber Bragg grating has been proposed. Here we suppress the thermal effect and analyze wavelength-dependent UV sensitivity of the sensor.

High Power Laser Physics (4640) *continued*

Plasma Blocks from Direct Converting Laser Energy into Motion by Nonlinear Forces

In contrast to thermal pressure, 100,000 times higher acceleration of plasma blocks was predicted and measured by using nonlinear (ponderomotive) forces. This permits side-on ignition of uncompressed solid fusion fuel deuterium-tritium and hydrogen-boron¹¹.

ACOFI Presentation

1715-1730 **4640-GT-5**

Yun Liu¹, Chuming Huang¹, Alexander Aleksandrov¹

1. Spallation Neutron Source, Oak Ridge National Laboratory, Oak Ridge, USA

Laser Optics Development for the Laser Assisted H-Beam Stripping at Spallation Neutron Source

This paper reports the development of a macropulse mode laser system and a power recycling dual-wavelength optical cavity which provides picosecond MW peak power UV pulses for the laser assisted hydrogen ion beam stripping at the Spallation Neutron Source.

ACOFI Presentation

High Resolution Spectroscopy (4620) *continued*

3. Anhui Institute of Optics & Fine Mechanics, Chinese Academy of Sciences, China

Remote Sensing of Trace Gases by a Rapidly Swept, Fiber-optical, Continuous-wave Cavity-ringdown Spectrometer

A rapidly-swept cavity-ringdown spectroscopy technique has been applied to remote sensing of trace gases by means of a fiber-coupled instrument with a single-ended transmitter/receiver configuration.

This sensitive portable instrument is useful for environmental monitoring.

Sources and Amplifiers (4630) *continued*

Photonic Crystal Nanocavities Toward Low-Power

Nanophotonics On Chip

Nanophotonic Devices

Photonic crystal nanocavities are expected to greatly reduce the size and energy consumption of various optical devices. We have demonstrated this feature in all-optical switches, random access memories, and nanolasers for on-chip nanophotonic integration.

1730-1930

Poster Session 3 - Bayside Terrace, Level 2

Full listing of poster presentations including summaries can be found on page 93.

1930

Conference Dinner - Dockside

0830-0915

Plenary Session 4 (5100)

Room: Bayside Auditorium A

Chair: Martijn de Sterke, University of Sydney, AUSTRALIA

5100-PT-1

Joss Bland-Hawthorn

*Institute of Photonics & Optical Science, School of Physics, University of Sydney, Australia
Sydney Institute for Astronomy, School of Physics, University of Sydney, Australia*

Space Photonics: A New Era of Space Instrumentation

Recent developments in astrophotonics are now being extended and adapted to space-borne instrumentation over the coming decade. We are focusing our efforts on the extremes of the UV to mid-infrared (0.15-15µm) window that is increasingly becoming more accessible to photonic technologies.
ACOPT Presentation

0920-1005

Session 10

Room: Bayside Auditorium A

Room: Bayside 101

Broadband Fibre Sources (5210)

Symposium 1

Chair: Heike Ebendorff-Heidepriem, Institute for Photonics & Advanced Sensing, AUSTRALIA

0920-0935 5210-CT-1

Richard White¹, Tanya Monro¹

1. The University of Adelaide, Australia

Broadband Mid-Infrared Source Based on Cascaded Raman Scattering in an As₂Se₃ Optical Fibre

We report efficient generation of broad-bandwidth mid-infrared radiation by cascaded Raman scattering of nanosecond pulses in large-core (65-µm diameter) As₂Se₃ optical fibre. With 2.5-µm pump pulses, four cascaded Raman Stokes peaks are observed.

Room: Bayside 102

LEDs (5240)

Symposium 4

Chair: Martin Hill, Eindhoven University Of Technology, THE NETHERLANDS

0920-0935 5240-CT-1

Hsin-Chu Chen¹, Kuo-Ju Chen¹, Cheng-Wei Hung¹, Chao-Hsun Wang¹, Chien-Chung Lin², Hao-Chung Kuo¹

*1. Department of Photonic & Institute of Electro-Optical Engineering, National Chia, Taiwan
2. Institute of Photonic System, National Chiao Tung University, Taiwan*

Improvement of Reducing Color Deviation by Patterned Structure of Phosphor Remote for White LEDs

High efficiency white light-emitting diodes with superior color-mixing have been investigated. The CCT deviation could be reduced from 1320 K to 266 K by this patterned remote phosphor method.

Room Bayside 103

Optical Nanoscopy (5220)

Symposium 2

Chair: Xu Lei, Fudan University, CHINA

0920-0935 5220-CT-1

Xiangsheng Xie¹, Yongzhu Chen¹, Yefeng Guan¹, **Jianying Zhou¹**

1. State Key Laboratory of optoelectronic Materials and Technologies, Sun Yat-sen University, China

Adaptive Light Field Transmission through a Hollow Tapered Metallic Probe

Lightwave transmission through a sub-100 nm apex inside a tapered metallic guiding structure is enhanced substantially with controlled wavefront modulation via an adaptive algorithm. The efficient delivery is satisfactorily explained with numerical simulations.

Room: Bayside 104

Short-Pulse Characterisation (5250)

Symposium 5

Chair: Norihiko Nishizawa, Nagoya University, JAPAN

0920-0935 5250-CT-1

Eiji Shiraki¹, Norihiko Nishizawa¹

1. Department of Electrical Engineering and Computer Science, Nagoya Univ., Japan

Characteristics of Ultrashort Pulse Generation from Incoherent Light by Trapped Pulse Amplification in Birefringent Fibers

We investigated characteristics of ultrashort pulse generated from an incoherent light using pulse trapping and amplification. Coherent, sect₂-shaped, ultrashort pulses with constant intensity were

Room: Bayside 105

Single Photon Sources and Interference (5260)

Symposium 6

Chair: Ping Koy Lam, Australian National University, AUSTRALIA

0920-0935 5260-CT-1

Robert Maiwald^{1,2}, Andrea Golla^{1,2}, Martin Fischer^{1,2}, Benoit Chalopin^{1,2}, Marianne Bader^{1,2}, Simon Heugel^{1,2}, Vladimir Eiman^{1,2}, Alessandro S. Villar^{1,2}, Markus Sondermann^{1,2}, **Gerd Leuchs^{1,2}**

*1. Institute of Optics, Information and Photonics, University of Erlangen-Nuremberg, Staudtstr. 7/ B2, Germany
2. Max Planck Institute For The Science of Light, Günther-Scharowsky-Str. 1, Building 24, 91058, Germany*

Photonic Components for Quantum Information Science

New photonic components are required to exploit the integrated architecture for Quantum information science. We

Room: Bayside 106

Application of Correlated Photons (5270)

Symposium 7

Chair: Howard Carmichael, University of Auckland, NEW ZEALAND

0920-0935 5270-CT-1

Alberto Politi¹, Jonathan C.F. Matthews¹, Anthony Laing¹, Alberto Peruzzo¹, Konstantinos Poulios¹, Jasmin Meinecke¹, Mirko Lobino¹, Terry Rudolph², Mark G. Thompson¹, **Jeremy L. O'Brien¹**

*1. Centre for Quantum Photonics, University of Bristol, UK
2. Institute for Mathematical Sciences, Imperial College London, UK*

New photonic components are required to exploit the integrated architecture for Quantum information science. We

A Single Ion Headlight

We report on progress towards achieving a full 4pi solid angle

Broadband Fibre Sources (5210) continued

0935-0950 **5210-CT-2**
Feng Li¹, Xinhuan Feng^{1,2}, Chao Lu¹, H.Y. Tam¹, P.K.A. Wai¹

1. The Hong Kong Polytechnic University, China
2. Jinan University, China

Spectrum Engineering of Multiwavelength Erbium Doped Fiber Lasers with Intensity-dependent Loss

We studied multiwavelength erbium-doped fiber lasers with intensity-dependent loss using rate equations. Pump power, cavity loss and the parameters of the intensity-dependent loss are varied to engineer the lasing spectrum. Experiments agree with simulation results.

0950-1005 **5410-CT-3**
Min Yong Jeon^{1,4}, Namje Kim², Sang Pil Han², Hyunung Ko², Young Ahn Leem², Han-Cheol Ryu², Dae-Su Yee³, Kyung Hyun Park²

1. Department of Physics, Chungnam National University, Daejeon, Korea
2. Photonic/Wireless Convergence Components Department, ETRI, Daejeon, Korea
3. Center for Safety Measurement, KRASS, Daejeon, Korea

High-Speed Frequency-Scanning Optical Beat Source for Continuous THz Wave Generation

We propose a high-speed frequency-scanning optical beat source using a wavelength swept laser and a tunable laser for continuous THz wave generation.

Holography (5230) continued

1. Center for Optical Research and Education (CORE), Utsunomiya University, Japan

Holographic Femtosecond Laser Processing System with Adaptive Waveform Control

Adaptive waveform control gives the advantages of precision and efficiency to holographic femtosecond laser processing. We demonstrated a novel method of optimizing a computer-generated hologram while compensating a waveform aberration.

0950-1005 **5230-CT-3**
Zulficar Ali¹, Jae-Hyeung Park¹, Kwan-Hee Yoo¹, Nam Kim¹

1. Chungbuk National University, Korea

Principle Fringe Patterns Analysis for Efficient Digital Hologram Synthesis

In this paper, we have analyzed the effects of the discretization steps on principle fringe patterns variations and its effect on performance and memory requirements in digital hologram synthesis process using novel look-up table method.

LEDs (5240) continued

0935-0950 **5240-CT-2**
Chao-Hsun Wang¹, W.T. Chang¹, S.P. Chang¹, J.C. Li¹, H.C. Kuo¹, T.C. Lu¹, S.C. Wang¹

1. Department of Photonics & Institute of Electro-Optical Engineering, National Chia, Taiwan

Efficiency Droop Improvement in InGaN/GaN Light-emitting Diodes by Graded-composition Electron Blocking Layer

InGaN/GaN LED with a graded-composition electron blocking layer has superior hole injection and electron confinement by simulation. Experiment results demonstrated that such GEBL exhibited better electrical characteristics, and higher output power at high current density.

0950-1005 **5240-CT-3**
Ching-Hsueh Chiu¹, Chien-Chung Lin², Hao-Wei Han², Da-Wei Lin¹, Yan-Hao Chen¹, Hao-Chung Kuo¹, Tien-Chang Lu¹, Shing-Chung Wang¹

1. Department of Photonics/National Chiao-Tung University, Taiwan
2. Institute of Photonics System, College of Photonics/National Chiao-Tung University, Taiwan

Enhanced Extraction and efficiency of blue GaN based LEDs with embedded micro air voids and SiO₂ nanomask

We fabricated high efficiency LEDs with embedded micro-scale air

Optical Nanoscopy (5220) continued

0935-0950 **5220-CT-2**
Norihiko Hayazawa^{1,2,3}, Kentaro Furusawa^{1,2}, Satoshi Kawata^{1,2,3,4}

2. Near-field Nanophotonics Research Team, RIKEN, Japan
3. JST-CREST, Japan
4. Osaka University, Japan

Broadband Near-field Nonlinear Raman Spectroscopy and Nanoscopy

We develop nonlinear optical spectroscopy for nanoscale chemical identification. Combining the femtosecond light sources with a metallic tip generates a highly localized and intense field at the tip, which is used for variety of spectroscopy.

0950-1005 **5220-CT-3**
Prateek Mehrotra¹, Richard Blaikie²

1. The MacDiarmid Institute for Advanced Materials and Nanotechnology, New Zealand
2. The MacDiarmid Institute for Advanced Materials and Nanotechnology, New Zealand

Using Reflection Resonances to Improve Depth of Field for Imaging at Ultra-High Numerical Apertures

Imaging at ultra-high numerical apertures imposes severe constraints on the depth of field. We show how reflection resonances from underlayers can enhance DOF in this regime and present an Equivalent Reflectance Approach (EPA) as a versatile design tool.

Short-Pulse Characterisation (5250) continued

generated due to the output saturation and soliton effect.

0935-0950 **5250-CT-2**
Keiron Boyd^{1,2}, Jesper Munch^{1,2}

1. Institute for Photonics & Advanced Sensing (IPAS), Australia
2. School of Chemistry and Physics, Australia

Measuring the Evolution of Femtosecond Pulses in Fibre Optic Tapers by Interferometric Reflectometry

We have developed an interferometric reflectometry technique to measure the phase and intensity of femtosecond pulses as a function of displacement along an optical fibre taper giving sub-millimeter resolution. ACOFT Presentation

0950-1005 **5250-CT-3**
You Min Chang¹, Junsu Lee¹, **Ju Han Lee¹**

1. School of Electrical and Computer Engineering, University of Seoul, Korea

Monocycle Pulse Generation Based on Cross-Phase Modulation in Bismuth Oxide Nonlinear Fiber

We experimentally demonstrate the use of a bismuth-oxide-based nonlinear optical fiber (Bi-NLF) for the generation of ultra-wideband (UWB) monocycle pulses. It is shown that UWB monocycle pulses can be successfully generated using cross-phase modulation in a

Single Photon Sources and Interference (5260) continued

strong coupling between a single trapped ion and a light field using a deep parabolic mirror enabling both efficient photon collection and ion excitation.

0935-0950 **5260-CT-2**
Hans Bachor¹, Jean Francois Morizur², Seiji Armstrong¹, Mary Ann Go¹, Vincent Daria¹, Jiri Janousek¹, Warwick Bowen³, Nicolas Treps², Boris Hage¹

1. Australian National University, Australia
2. Laboratoire Kastler Brossel, France
3. University of Queensland, Australia

From Entanglement to Neuroscience: New Uses for Laser Beams Shaped by Spatial Light Modulators

The state of the art in spatial beam modulation is changing the way we can use laser beams. This talk will present several impressive new results in quite diverse areas of laser applications, all using the latest advances controlled spatial phase modulation.

0950-1005 **5260-CT-3**
Geoff Campbell¹, Boris Hage¹, Ben Buchler¹, Ping Koy Lam¹

1. CQC2T, The Australian National University, Australia

High-Order Optical Vortices from Directly Machined Spiral Phase Mirrors

We report on the production of diffractive mirrors, which generate high-order optical vortices. The

Application of Correlated Photons (5270) continued

demonstrate quantum interference in MMI couplers and two-particle quantum walks in coupled waveguides, showing unique quantum behaviour.

0935-0950 **5270-CT-2**
Alexander Solntsev¹, Andrey Sukhorukov¹, Dragomir Neshev¹, Yuri Kivshar¹

1. The Australian National University, Australia

Photon Pair Generation and Quantum Walks in Quadratic Nonlinear Waveguide Arrays

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.

0950-1005 **5270-CT-3**
Franck Ferreyrol^{1,2}, Marco Barbieri¹, Rémi Blandino¹, Rosa Tualle-Brouart¹, Philippe Grangier¹

1. Groupe d'Optique Quantique, Laboratoire Charles Fabry, Institut d'Optique, CNRS, Université Paris-Sud, Campus Polytechnique, RD 128, 91127 Palaiseau cedex, France
2. Centre for Quantum Dynamics, Griffith University, Australia

Implementation of a Non-Deterministic Optical Noiseless Amplifier

Quantum Physics imposes that any phase independent amplification introduces excess noise.

The beat frequency is scanned at 1 kHz over a range with a 2.16 THz width.

voids and SiO₂ nanomask exhibit smaller reverse-bias current and great enhancement of the light output (65% at 20mA) compared with the conventional LEDs.

Bi-NLF followed by phase modulation-to-intensity modulation conversion.

mirrors are produced by direct machining with a diamond tool and are shown to generate high-quality optical vortices ranging in charge from 1 to 1000 at a wavelength of 532 nm.

Nevertheless this limitation could be ignored with conditioning. We report fully characterization with homodyne tomography of a non-deterministic noiseless amplification of a coherent state.

ACOPT Presentation

1005-1030 MORNING TEA - Bayside Gallery

1030-1230 Session 11

Room: Bayside Auditorium A

Room: Bayside 101

Room: Bayside 102

Room: Bayside 103

Room: Bayside 104

Room: Bayside 105

Room: Bayside 106

IR Astrophotonics (5410)

Symposium 1
Chair: Jess Bland-Hawthorn, University of Sydney, AUSTRALIA

1030-1100 5410-IT-1

INVITED SPEAKER

Frank Tittel¹, Lei Dong¹, Longwen Gong², Robin Griffin², Ratal Lewicki¹, Kun Liu¹, Vincenzo Spagnolo³

1. *Electrical & Computer Engineering Department, Rice University, USA*
2. *Department of Civil and Environmental Engineering, Rice University, USA*
3. *Physics Department, Bari Politecnico, Italy*

Quantum Cascade Laser Based Trace Gas Sensor Technologies: Recent Advances and Applications

Recent advances of quantum cascade laser based trace sensors for the sensitive and selective detection and monitoring of trace gas species as well as their application to environmental monitoring and medical diagnostics will be described.

ACOPT Presentation

Waveguide Lasers (5420)

Symposium 2
Chair: Michael Withford, Macquarie University, AUSTRALIA

1030-1100 5420-IT-1

INVITED SPEAKER

David Lancaster¹, Simon Gross², Sebastian Ng¹, Heike Ebendorff-Heidepriem¹, Tanva Monro¹, Alex Fuerbach², Mick Withford²

1. *IPAS, School of Chemistry & Physics, University of Adelaide, Australia*
2. *CUDOS, MQ Photonics Research Centre, Macquarie University, Australia*

A New Class of 2um Waveguide Lasers Produced by fs Direct-writing of Tm3+ and Ho3+ doped ZBLAN Glass

We report Tm3+ and Ho3+ doped ZBLAN waveguide lasers that operate at 1880 nm and 2046 nm, respectively. The Tm3+ laser achieved 49mW with a 50% slope efficiency, and we report the first lasing of a Ho3+ waveguide laser in any form.

Photonic Crystals and Nano-Crystals (5430)

Symposium 3
Chair: Laurie Faraone, University of Western Australia, AUSTRALIA

1030-1045 5430-CT-1

C.K.Tseng¹, H.W.Hung¹, J.R. Huang¹, K.Y. Lee¹, G.R.Lin², J.M.Shieh³, M.C.M.Lee¹

1. *Institute of Photonics Technologies, National Tsing Hua University, Taiwan*
2. *Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taiwan*
3. *National Nano Device Laboratories, Taiwan*

Silicon-Nanocrystal Resonant-Cavity Light-Emitting Devices for Color Tailoring

A silicon-nanocrystal resonant-cavity light-emitting device is presented. Through microcavity effect, the external-quantum-efficiency increases by 3.5 times and the emission spectra narrows by 1/8. Green, yellow, orange and red colors are emitted by tuning cavity length

Nanophotonics 3 (5440)

Symposium 4
Chair: Warwick Bowen, The University of Queensland, AUSTRALIA

1030-1045 5440-CT-1

Andrey Miroshnichenko¹, Boris Luk'yanchuk², Stefan Maier³, Yuri Kivshar¹

1. *Nonlinear Physics Centre and CUDOS, Australian National University, Australia*
2. *Data Storage Institute, Agency for Science, Technology and Research, Singapore*
3. *Department of Physics, Imperial College London, UK*

Antiferromagnetic Response Of Dielectric Nanoparticles Coupled To Split-Ring Resonators

We analyze optically-induced antiferromagnetic response of a novel hybrid metal/dielectric structure consisting of a silicon nanoparticle coupled to multilayer stacks of split-ring resonators, and observe a strong antiferromagnetic resonance with a staggered pattern of the induced magnetization field.

Optical Trapping and Tweezers (5450)

Symposium 5
Chair: Nicholas Smith, Biophotonics Lab, JAPAN

1030-1100 5450-IT-1

INVITED SPEAKER

A.V. Rode¹, N. Eckerskorn¹, N. Zeng^{1,2}, V.G. Shvedov¹, W. Krolikowski¹, E.G. Gamaly¹

1. *Laser Physics Centre, Research School of Physics and Engineering, Australian National University, Australia*
2. *CSIRO Materials Science and Engineering, Australia*

Influence of Polarisation on Optical Trapping Forces in Air-Transport of Spherical Particles

We show, both theoretically and experimentally, that light polarization affects the driving forces through the change in absorption, and thus the speed of transport of spherical particles in air with counter-propagating optical vortex beams.

1100-1115 5450-CT-2

Alexander Stilgoe¹, Halina Rubinsztein-Dunlop¹, Norman Heckenberg¹, Timo Nieminen¹

1. *The University of Queensland, Australia*

Dimensionality and Non-Equilibrium Phenomena (5460)

Symposium 6
Chair: Andrew Truscott, Australian National University, AUSTRALIA

1030-1045 5460-CT-1

Tod Wright¹, Christopher Foster¹, Matthew Davis¹

1. *School of Mathematics and Physics, The University of Queensland, Australia*

Superfluidity and Anomalous Correlations in a Two-Dimensional Bose Gas

We present results on superfluidity and condensation in two-dimensional Bose gases, focussing on signatures of coherence in the system, and apply our findings to the nonequilibrium dynamics of a metastable superflow in two dimensions.

1045-1100 5460-CT-2

S. Hoinka¹, M. Delehaye¹, E.D. Kuhlke¹, P. Dyke¹, M. Lingham¹, K. Fenech¹, H. Hu¹, P. Hannaford¹, C.J. Vale¹

1. *Centre for Atom Optics and Ultrafast Spectroscopy, Swinburne University of Technology, Australia*

Precision Measurements and Fundamental Tests (5470)

Symposium 7
Chair: Andre Luiten, University of Western Australia, AUSTRALIA

1030-1045 5470-CT-1

Maarten Hoogerland^{3,1}, Rob van Rooij¹, Joe Borbely¹, Juliette Simonet^{2,1}, Kjeld Eikema¹, Roel Rozendaal¹, Wim Vassen¹

1. *LaserLab Vrije Universiteit, The Netherlands*
2. *Ecole Normale Supérieure, Laboratoire Kastler-Brossel, Australia*
3. *Department of Physics, University of Auckland, New Zealand*

Frequency Metrology in Quantum Degenerate Helium

We report the first direct observation and high precision measurement of the triplet to singlet transition between the metastable states of helium.

<p>IR Astrophotonics (5410) <i>continued</i></p>	<p>Waveguide Lasers (5420) <i>continued</i></p>	<p>Photonic Crystals and Nanocrystals (5430) <i>continued</i></p>	<p>Nanophotonics 3 (5440) <i>continued</i></p>	<p>Optical Trapping and Tweezers (5450) <i>continued</i></p>	<p>Dimensionality and Non-Equilibrium Phenomena (5460) <i>continued</i></p>	<p>Precision Measurements and Fundamental Tests (5470) <i>continued</i></p>
<p>1100-1115 Fangxin Li¹, Stuart Jackson¹, Eric Magi¹, Christian Grillet¹, Steve Madden³, Yash Moghe², Peter Antanackovic², Steven Duvall², Ben Eggleton¹, David Moss¹</p>	<p>1. <i>CUDOS, School of Physics, University of Sydney, Australia</i> 2. <i>Siliana Pty Ltd, Australia</i> 3. <i>CUDOS, Australian National University, Australia</i></p>	<p>1045-1100 Kota Okazaki¹, Daisuke Nakamura¹, Mitsuhiko Higashihata¹, Tatsuo Okada¹</p>	<p>1045-1100 Neil G. R. Broderick², Timothy Lee¹, Gilberto Brambilla¹</p>	<p>1045-1100 Julian Berengut¹, Victor Flambaum¹</p>	<p>1045-1100 Julian Berengut¹, Victor Flambaum¹</p>	<p>1045-1100 Julian Berengut¹, Victor Flambaum¹</p>
<p>1. <i>CUDOS, School of Physics, University of Sydney, Australia</i> 2. <i>Siliana Pty Ltd, Australia</i> 3. <i>CUDOS, Australian National University, Australia</i></p>	<p>1. <i>Graduate School of Information Science and Electrical Engineering, Japan</i></p>	<p>1. <i>Optoelectronics Research Centre, University of Southampton, UK</i> 2. <i>Department of Physics, University of Auckland, New Zealand</i></p>	<p>1. <i>Optoelectronics Research Centre, University of Southampton, UK</i> 2. <i>Department of Physics, University of Auckland, New Zealand</i></p>	<p>We report measurements showing the universal behaviour of the static structure factor and both the temperature and interaction dependence of pair correlations in a strongly interacting Fermi gas.</p>	<p>We report on recent progress in finding new reference transitions for atomic clocks that exhibit strongly enhanced sensitivity to potential variation of fundamental constants.</p>	<p>We report on recent progress in finding new reference transitions for atomic clocks that exhibit strongly enhanced sensitivity to potential variation of fundamental constants.</p>
<p>Low Propagation Loss Silicon-on-sapphire Nanowires for the mid-IR</p>	<p>We report low loss silicon-on-sapphire nanowires for applications to mid infrared optics. We achieve propagation losses of < 1dB/cm at $\lambda = 1550\text{nm}$ and < 2dB/cm at $\lambda = 2.08\ \mu\text{m}$ and $\lambda = 5.18\ \mu\text{m}$, the latter representing a factor of 2 reduction in loss over the best previous results. <i>ACOFT Presentation</i></p>	<p>Current method of suppressing self-pulsing in Tm:YAO3 using AOMs is not viable for high power. We demonstrate the first reported pulse suppression in Tm:YAO3 using a feedback loop with current directly injected into the diode.</p>	<p>1100-1115 Ka S. Wu¹, Jesper Munch¹, Peter J. Veitch¹, David J. Ottaway¹</p>	<p>1100-1130 INVITED SPEAKER</p>	<p>1100-1130 INVITED SPEAKER</p>	<p>1100-1130 INVITED SPEAKER</p>
<p>1. <i>Institute for Photonics & Advanced Sensing (IPAS), The University of Adelaide, Australia</i></p>	<p>1. <i>Applied Optics and Nanotechnology, Discipline of Physics, QUT, Australia</i> 2. <i>MQ Photonics Research Centre, CUDOS, Dept. of Physics and Astronomy, Macquarie University, Australia</i></p>	<p>1. <i>DTU Fotonik-Department of Photonics Engineering, Denmark</i></p>	<p>1100-1115 Jon Swalm¹, Joachim Knittel¹, Warwick Bowen^{1,2}</p>	<p>1. <i>College of Optical Sciences, University of Arizona, USA</i> 2. <i>National Institute of Standards and Technology (NIST), USA</i> 3. <i>Department of Physics, University of Otago, New Zealand</i> 4. <i>Mathematics Institute, University of Warwick, UK</i> 5. <i>Dept. of Mathematics and Statistics, San Diego State University, USA</i> 6. <i>Department of Mathematics and Statistics, University of Massachusetts, USA</i> 7. <i>School of Mathematics and Physics, University of Queensland, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>
<p>Suppression of Self-pulsing Behaviour in Tm:YAO3 Lasers via Pump Diode-current Feedback</p>	<p>1. <i>DTU Fotonik-Department of Photonics Engineering, Denmark</i> 2. <i>MQ Photonics Research Centre, CUDOS, Dept. of Physics and Astronomy, Macquarie University, Australia</i></p>	<p>We experimentally demonstrate enhanced gain in the slow-light regime of quantum dot photonic crystal waveguide slabs. These are promising results for future compact devices for terabit/s communication, such as compact optical amplifiers and mode-locked lasers.</p>	<p>1100-1115 Jon Swalm¹, Joachim Knittel¹, Warwick Bowen^{1,2}</p>	<p>We demonstrate that micron-sized light-absorbing particles can be trapped and transported photophoretically in air using an optical bottle formed inside the focal volume of a lens with a controlled amount of spherical aberration.</p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>
<p>Intensity Pulsations in Distributed Feedback Yb:Phosphate Waveguide Lasers</p>	<p>We show that intensity pulsations in a Yb:phosphate waveguide laser occur because of the coupling of the two orthogonal polarization modes through the two photon process of cooperative luminescence.</p>	<p>1100-1115 E. Jaatinen¹, P. Dekker², M. Ams², G. Marshall^{1,2}, M. Withford²</p>	<p>1100-1115 W. Krolikowski¹, V.G. Shvedov¹, C. Hnatovsky¹, A.V. Rodé¹</p>	<p>1100-1130 INVITED SPEAKER</p>	<p>1100-1130 INVITED SPEAKER</p>	<p>1100-1130 INVITED SPEAKER</p>
<p>1. <i>CUDOS, School of Physics, University of Sydney, Australia</i> 2. <i>Siliana Pty Ltd, Australia</i> 3. <i>CUDOS, Australian National University, Australia</i></p>	<p>1. <i>Applied Optics and Nanotechnology, Discipline of Physics, QUT, Australia</i> 2. <i>MQ Photonics Research Centre, CUDOS, Dept. of Physics and Astronomy, Macquarie University, Australia</i></p>	<p>1. <i>DTU Fotonik-Department of Photonics Engineering, Denmark</i></p>	<p>1. <i>Laser Physics Centre and Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Australia</i></p>	<p>1. <i>College of Optical Sciences, University of Arizona, USA</i> 2. <i>National Institute of Standards and Technology (NIST), USA</i> 3. <i>Department of Physics, University of Otago, New Zealand</i> 4. <i>Mathematics Institute, University of Warwick, UK</i> 5. <i>Dept. of Mathematics and Statistics, San Diego State University, USA</i> 6. <i>Department of Mathematics and Statistics, University of Massachusetts, USA</i> 7. <i>School of Mathematics and Physics, University of Queensland, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>
<p>Thermally Guided Mid-IR Optical Parametric Oscillator</p>	<p>We report a watt-level, single-frequency, mid-infrared, continuous-wave singly resonant OPO with a thermal-induced waveguide in its gain crystal. The waveguide, with a NA of 0.0062, doubled the parametric efficiency and made the OPO insensitive to alignment</p>	<p>1100-1115 Sara Ek¹, Per Lunneemann¹, Elizaveta S. Semenova¹, Kresten Vind¹, Jesper Mørk¹</p>	<p>1. <i>Laser Physics Centre and Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Australia</i></p>	<p>1. <i>College of Optical Sciences, University of Arizona, USA</i> 2. <i>National Institute of Standards and Technology (NIST), USA</i> 3. <i>Department of Physics, University of Otago, New Zealand</i> 4. <i>Mathematics Institute, University of Warwick, UK</i> 5. <i>Dept. of Mathematics and Statistics, San Diego State University, USA</i> 6. <i>Department of Mathematics and Statistics, University of Massachusetts, USA</i> 7. <i>School of Mathematics and Physics, University of Queensland, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>
<p>Enhanced Gain in Slow-Light Photonic Crystal Waveguides with Embedded Quantum Dots</p>	<p>We experimentally demonstrate enhanced gain in the slow-light regime of quantum dot photonic crystal waveguide slabs. These are promising results for future compact devices for terabit/s communication, such as compact optical amplifiers and mode-locked lasers.</p>	<p>1100-1115 Sara Ek¹, Per Lunneemann¹, Elizaveta S. Semenova¹, Kresten Vind¹, Jesper Mørk¹</p>	<p>1. <i>Laser Physics Centre and Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Australia</i></p>	<p>1. <i>College of Optical Sciences, University of Arizona, USA</i> 2. <i>National Institute of Standards and Technology (NIST), USA</i> 3. <i>Department of Physics, University of Otago, New Zealand</i> 4. <i>Mathematics Institute, University of Warwick, UK</i> 5. <i>Dept. of Mathematics and Statistics, San Diego State University, USA</i> 6. <i>Department of Mathematics and Statistics, University of Massachusetts, USA</i> 7. <i>School of Mathematics and Physics, University of Queensland, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>
<p>Suppression of Self-pulsing Behaviour in Tm:YAO3 Lasers via Pump Diode-current Feedback</p>	<p>Current method of suppressing self-pulsing in Tm:YAO3 using AOMs is not viable for high power. We demonstrate the first reported pulse suppression in Tm:YAO3 using a feedback loop with current directly injected into the diode.</p>	<p>1100-1115 Sara Ek¹, Per Lunneemann¹, Elizaveta S. Semenova¹, Kresten Vind¹, Jesper Mørk¹</p>	<p>1100-1115 W. Krolikowski¹, V.G. Shvedov¹, C. Hnatovsky¹, A.V. Rodé¹</p>	<p>1100-1130 INVITED SPEAKER</p>	<p>1100-1130 INVITED SPEAKER</p>	<p>1100-1130 INVITED SPEAKER</p>
<p>Intensity Pulsations in Distributed Feedback Yb:Phosphate Waveguide Lasers</p>	<p>We show that intensity pulsations in a Yb:phosphate waveguide laser occur because of the coupling of the two orthogonal polarization modes through the two photon process of cooperative luminescence.</p>	<p>1100-1115 Sara Ek¹, Per Lunneemann¹, Elizaveta S. Semenova¹, Kresten Vind¹, Jesper Mørk¹</p>	<p>1. <i>Laser Physics Centre and Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Australia</i></p>	<p>1. <i>College of Optical Sciences, University of Arizona, USA</i> 2. <i>National Institute of Standards and Technology (NIST), USA</i> 3. <i>Department of Physics, University of Otago, New Zealand</i> 4. <i>Mathematics Institute, University of Warwick, UK</i> 5. <i>Dept. of Mathematics and Statistics, San Diego State University, USA</i> 6. <i>Department of Mathematics and Statistics, University of Massachusetts, USA</i> 7. <i>School of Mathematics and Physics, University of Queensland, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>
<p>Thermally Guided Mid-IR Optical Parametric Oscillator</p>	<p>We report a watt-level, single-frequency, mid-infrared, continuous-wave singly resonant OPO with a thermal-induced waveguide in its gain crystal. The waveguide, with a NA of 0.0062, doubled the parametric efficiency and made the OPO insensitive to alignment</p>	<p>1100-1115 Sara Ek¹, Per Lunneemann¹, Elizaveta S. Semenova¹, Kresten Vind¹, Jesper Mørk¹</p>	<p>1. <i>Laser Physics Centre and Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Australia</i></p>	<p>1. <i>College of Optical Sciences, University of Arizona, USA</i> 2. <i>National Institute of Standards and Technology (NIST), USA</i> 3. <i>Department of Physics, University of Otago, New Zealand</i> 4. <i>Mathematics Institute, University of Warwick, UK</i> 5. <i>Dept. of Mathematics and Statistics, San Diego State University, USA</i> 6. <i>Department of Mathematics and Statistics, University of Massachusetts, USA</i> 7. <i>School of Mathematics and Physics, University of Queensland, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>
<p>Enhanced Gain in Slow-Light Photonic Crystal Waveguides with Embedded Quantum Dots</p>	<p>We experimentally demonstrate enhanced gain in the slow-light regime of quantum dot photonic crystal waveguide slabs. These are promising results for future compact devices for terabit/s communication, such as compact optical amplifiers and mode-locked lasers.</p>	<p>1100-1115 Sara Ek¹, Per Lunneemann¹, Elizaveta S. Semenova¹, Kresten Vind¹, Jesper Mørk¹</p>	<p>1. <i>Laser Physics Centre and Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Australia</i></p>	<p>1. <i>College of Optical Sciences, University of Arizona, USA</i> 2. <i>National Institute of Standards and Technology (NIST), USA</i> 3. <i>Department of Physics, University of Otago, New Zealand</i> 4. <i>Mathematics Institute, University of Warwick, UK</i> 5. <i>Dept. of Mathematics and Statistics, San Diego State University, USA</i> 6. <i>Department of Mathematics and Statistics, University of Massachusetts, USA</i> 7. <i>School of Mathematics and Physics, University of Queensland, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>
<p>Suppression of Self-pulsing Behaviour in Tm:YAO3 Lasers via Pump Diode-current Feedback</p>	<p>Current method of suppressing self-pulsing in Tm:YAO3 using AOMs is not viable for high power. We demonstrate the first reported pulse suppression in Tm:YAO3 using a feedback loop with current directly injected into the diode.</p>	<p>1100-1115 Sara Ek¹, Per Lunneemann¹, Elizaveta S. Semenova¹, Kresten Vind¹, Jesper Mørk¹</p>	<p>1. <i>Laser Physics Centre and Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Australia</i></p>	<p>1. <i>College of Optical Sciences, University of Arizona, USA</i> 2. <i>National Institute of Standards and Technology (NIST), USA</i> 3. <i>Department of Physics, University of Otago, New Zealand</i> 4. <i>Mathematics Institute, University of Warwick, UK</i> 5. <i>Dept. of Mathematics and Statistics, San Diego State University, USA</i> 6. <i>Department of Mathematics and Statistics, University of Massachusetts, USA</i> 7. <i>School of Mathematics and Physics, University of Queensland, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>
<p>Intensity Pulsations in Distributed Feedback Yb:Phosphate Waveguide Lasers</p>	<p>We show that intensity pulsations in a Yb:phosphate waveguide laser occur because of the coupling of the two orthogonal polarization modes through the two photon process of cooperative luminescence.</p>	<p>1100-1115 Sara Ek¹, Per Lunneemann¹, Elizaveta S. Semenova¹, Kresten Vind¹, Jesper Mørk¹</p>	<p>1. <i>Laser Physics Centre and Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Australia</i></p>	<p>1. <i>College of Optical Sciences, University of Arizona, USA</i> 2. <i>National Institute of Standards and Technology (NIST), USA</i> 3. <i>Department of Physics, University of Otago, New Zealand</i> 4. <i>Mathematics Institute, University of Warwick, UK</i> 5. <i>Dept. of Mathematics and Statistics, San Diego State University, USA</i> 6. <i>Department of Mathematics and Statistics, University of Massachusetts, USA</i> 7. <i>School of Mathematics and Physics, University of Queensland, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>	<p>1. <i>School of Physics, University of New South Wales, Australia</i></p>

1130-1145 **5410-CT-4**

B Norris¹, N. Jovanovic^{2,3,4}, P. Tufhill¹, S. Lacour⁵, S. Gross⁶, M. Ams^{2,6}, P. Stewart¹, J. Lawrence^{2,3,4}, N. Charles¹

1. *Sydney Institute for Astronomy (SIFA), School of Physics, University of Sydney, Australia*

2. *MQ Photonics research centre, Dept. of Physics and Astronomy, Macquarie University, Australia*

3. *Centre for Astronomy, Astrophysics and Astrophotonics, Macquarie University, Australia*

4. *Australian Astronomical Observatory, Australia*

5. *Observatoire de Paris, 5 place Jules Janssen, Meudon, France*

6. *Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), Australia*

Challenges in Photonic

Pupil Remapping for

Optical Stellar

Interferometry

Interferometry using photonic pupil remapping holds great promise in stellar astronomy and in the detection of exoplanets. However the development of this novel technique has revealed new challenges in the use of photonic devices.

1145-1200 **5410-CT-5**

Izabela Spaleniak^{1,3}
Nemanja Jovanovic^{1,3,4}, Simon Gross^{1,2}, Michael Ireland^{1,3,4}, Jon Lawrence^{1,3,4},
Michael Withford^{1,2}

1. *MQ Photonics Research Centre, Department of Physics and Astronomy, Australia*

2. *Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), Australia*

3. *Center for Astronomy, Astrophysics and Astrophotonics, Australia*

4. *Australian Astronomical Observatory (AAO), Australia, Australia*

1130-1145 **5420-CT-4**

M. Pollnau¹, K. van Dalen¹, P. Geskus¹, F. Ay, K. Wörhoff¹, S. Aravazhi¹

1. *Integrated Optical MicroSystems group, MESA+ Institute for NanoTechnology, University of Twente, The Netherlands*

High-power Yb- and Tm-doped Double Tungstate Channel Waveguide Lasers

K(YGdLu)(WO₄)₂ channel waveguide lasers demonstrated 650 mW output power and 72% slope efficiency at 981 nm for Yb³⁺ doping. For Tm³⁺ doping, 149 mW output power and 31.5% slope efficiency at 1846 nm were obtained.

1145-1200 **5420-CT-5**

M. Pollnau¹, L. Agazzi¹, J.D.B. Bradley¹, K. Wörhoff¹

1. *Integrated Optical Microsystems Group, MESA+ Institute for Nanotechnology, University of Twente, The Netherlands*

Al₂O₃:Er³⁺ Amplifiers: The Impact of Fast Spectroscopic Quenching Processes

We report a number of recently demonstrated integrated Al₂O₃:Er³⁺ devices and present spectroscopic investigations revealing the presence of a fast quenching mechanism “undetected in typical luminescence decay measurements” which limits the Al₂O₃:Er³⁺-amplifier performance.

1200-1215 **5420-CT-6**

M. Pollnau¹, E.H. Bernhardt¹, H.A.G.M. van Wolferen², K. Wörhoff¹, R.M. de Ridder¹

1. *Integrated Optical MicroSystems Group, MESA+ Institute for*

significantly improving the detection sensitivity as a biological sensor.

1115-1130 **5440-CT-4**

Otje Wang¹, Changling Yan², Nantang Yu³, Christian Plügg³, Laurent Diehl³, Federico Capasso³, Julia Unterminnhofen⁴, Jan Wiersig⁴, Tadataka Edamura⁵, Masamichi Yamaniishi⁵

1. *School of Electrical and Electronic Engineering, Nanyang Technological Univ, Singapore*

2. *Changchun University of Science and Technology, China*

3. *School of Engineering and Applied Sciences, Harvard University, USA*

4. *Institut für Theoretische Physik, Universität Magdeburg, Germany*

5. *Central Research Laboratories, Hamamatsu Photonics K. K. Japan*

Highly Unidirectional Whispering Gallery Mode Lasers

We report elliptical resonators with a wavelength-size notch at the boundary, which supports in-plane highly unidirectional laser emission from whispering gallery modes. Using injection quantum cascade lasers as a model system, a unidirectional in-plane beam divergence of 6 degrees has been demonstrated.

1130-1145 **5440-CT-5**

Dai-Sik Kim¹, H.W. Kihm¹, Q.H. Kim¹, J.E. Kihm¹, W.S. Bak¹, **S.H. Eah¹**, S.M. Koo², N.K. Park², P. Nordlander³, C. Lienau⁴, H. Kim⁵, N.J. Halas⁶

1. *Center for Subwavelength Optics, Department of Physics and Astronomy, Seoul National University, Korea*

2. *Photonic Systems Laboratory, School of EECOS, Seoul National University, Korea*

The angular momentum of light beams has been widely used in optical tweezers applications. Spin angular momentum has been used to rotate birefringent objects such a Vaterite microspheres, while orbital angular momentum has been used to rotate trains of particles around a central beam axis. However, while orbital angular momentum can be used to turn micro scale objects, the exact amount of torque created in a set of optical tweezers is not well known. The spin and orbital components of torque become hard to separate in highly focused beams. We evaluate the torques created in highly focused light beams in order to resolve this difficulty we use a Spatial Light Modulator based Shack-Hartmann system to examine the torques exerted on glass microrods.

1145-1200 **5450-CT-5**

Te-Chang Chen¹, Yao-Tsu Yang¹, Shao-Yu Wang², Wei-chao Chiu¹, Li-Chung Hsu¹, Chieh-Yang Huang¹, Da-Wei Shen¹, Ming-Chang M Lee^{1,2}

1. *Institute of Photonics Technologies, National Tsing Hua University, Taiwan*

2. *Department of Electrical Engineering, National Tsing Hua University, Taiwan*

Optical Propulsion and Manipulation of Micro-particles by Integrated Photonics

We present the design and fabrication of directional couplers and multi-mode interferometers (MMI) for realizing micro-particle optical propulsion and manipulation. The evanescent field of waveguide directional couplers and MMI is able to drive a particle to flow and control the position of particle, according to the optical mode field

vortex dynamics and energy spectra are studied with corresponding numerical simulations. We find characteristics in close correspondence with those of two-dimensional classical fluid turbulence.

1130-1145 **5460-CT-4**

Olsen Murray¹, Chianca Cinthya¹

1. *University of Queensland, Australia*

Quantum Phase-Space Analysis Of Equilibration In Multi-Well Bose-Hubbard Systems

We present results regarding the equilibration of multi-well Bose-Hubbard models to states of maximal entropy. Calculation and possible measurement of an effective entropy makes these models attractive for further study.

1145-1200 **5460-CT-5**

Matthew Davis¹, Tod Wright¹, Tapio Simula², Chao Feng¹, Michael Garrett¹

1. *The University of Queensland, Australia*

2. *Monash University, Australia*

Non-equilibrium Flows and Superfluid Turbulence in Finite Temperature Dilute Gas Bose-Einstein Condensates

We generate and analyse steady state non-equilibrium flows in a dilute gas Bose-Einstein condensates at finite temperature by establishing gradients in their thermodynamic parameters by coupling to two reservoirs. In certain regimes superfluid turbulence occurs.

3. *Centre for Energy, School of Mechanical and Chemical Engineering, UWA, Australia*

Precision Laser Absorption Spectroscopy for Primary Thermometry

Using quantitative laser spectroscopy to precisely measure the Doppler broadening of atomic transitions in rubidium and cesium vapors, we have determined the Boltzmann constant with a relative uncertainty of 1.4E-4.

1130-1200 **5470-IT-5**

INVITED SPEAKER

Pierre Clade¹, Rym Bouchendra¹, Saïda Guellati^{1,2}, François Nez¹, François Biraben¹

1. *Laboratoire Kastler Brossel, UPMC, CNRS, ENS, France*

2. *Conservatoire National des des Arts et Métiers, France*

New Determination of the Fine Structure Constant and Test of the Quantum Electrodynamics

We report a new measurement of the fine structure constant using atom interferometry with a relative uncertainty of 0.66 ppb: $\alpha^{-1} = 137.03599037(91)$. The comparison of this values with the electron anomaly provides the most stringent test of the QED.

1200-1215 **5470-CT-6**

Douglas Little¹, Deb Kane¹

1. *MQ Photonics Research Centre, Macquarie University, Australia*

Measuring the Refractive Index of Spider Silks using Image-contrast Immersion Methods

Refractive-index measurements of spider silks using image-contrast immersion methods are presented,

IR Astrophotonics (5410)
continued

Exploration of Integrated Photonic Lanterns Fabricated by Femtosecond Laser Inscription

We are using a femtosecond laser to inscribe a series of integrated photonic lanterns that have a range of refractive index contrasts and geometry parameters in order to determine the ideal format for optimising the single-mode to multimode transition efficiency.

1200-1215 **5410-CT-6**

Jon Lawrence^{1,2}, **Simon Ellis**^{1,3}, Joss Bland-Hawthorn³, Julia Bryant³, Scott Case¹, Luke Gers¹, Roger Haynes⁴, Anthony Horton¹, Sergio Leon-Saval³, Hans H. Loehmannsroeben⁴
1. *Australian Astronomical Observatory, Australia*
2. *Department of Physics and Astronomy, Macquarie University, Australia*
3. *Sydney Institute for Astronomy, School of Physics, University of Sydney, Australia*
4. *inoF-SPEC - Astrophysikalisches Institut Potsdam, Germany*

Atmospheric OH Suppression with GNOSIS at the Anglo-Australian Telescope

GNOSIS is an instrument currently being commissioned at the Anglo-Australian Telescope that is designed to suppress atmospheric OH emission using fibre Bragg gratings. Here we present an outline of the GNOSIS instrument and the first on-telescope results from this new technology concept.

Photonic Crystals and Nanocrystals (5430) continued

1200-1215 **5430-CT-6**

Chih-Kuo Tseng¹, Jun Ru Huang¹, Hau-Wei Hung¹, Yao-Tsu Yang¹, Kun-Yu Lee¹, Ting-Hsiao Wu¹, Gong-Ru Lin², Jia-Min Shieh³, Ming-Chang M. Lee¹

1. *Institute of Photonics Technologies, National Tsing Hua University, Hsinchu, Taiwan, ROC*
2. *Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taipei, Taiwan, ROC*
3. *National Nano Device Laboratories, Hsinchu, Taiwan, ROC*

Resonance-Enhanced Surface Emission of Silicon Nanocrystal by 2nd-order Distribution Feedback Structures

Silicon-nanocrystal embedded within a 2nd order distribution-feedback device for surface light emission was demonstrated. By incorporating this distributed-feedback device, the FWHM and peak intensity of photoluminescence were narrowed and amplified, respectively, showing significant resonance-enhanced emission

1215-1230 **5430-CT-7**

Li Shen¹, Qing Ye¹, Guofeng Xin¹, Haiwen Cai¹, Zujie Fang¹, Ronghui Qu¹
1. *Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China*

Mode-hop-free Electro-optically Tuned External-cavity Diode Laser with a Volume Bragg Grating

Nanophotonics 3 (5440) continued

3. *Department of Physics and Astronomy, Rice University, USA*
4. *Institut für Physik, Carl von Ossietzky Universität, Germany*
5. *Department of Electronics and Information Engineering, Korea University, Korea*
6. *Department of Electrical and Computer Engineering, Rice University, USA*

A Polarizer for the Magnetic Component of Light

We experimentally establish the optical magnetic field polarization as a separate entity from the electric field polarization by showing that subwavelength circular metallic apertures predominantly sense the magnetic field component of light.

1145-1200 **5440-CT-6**

Anton Samusev^{1,2}, Alexander Khanikaev³, Mikhail Limonov^{1,2}, Mikhail Rybin^{1,2}
1. *National Research University of Information Technologies, Mechanics and Optics, Russia*
2. *Ioffe Physical Technical Institute, Russia*
3. *Department of Physics, The University of Texas at Austin, USA*

Disorder-induced Fano Resonance in 1D Photonic Crystals

For 1D photonic structures it was shown that the Fano resonance between disorder-induced Fabry-Perot continuum and narrow Bragg bands leads to inverting of photonic band structure: with increase of disorder Bragg dips turn into Bragg peaks.

Optical Trapping and Tweezers (5450) continued

distributed inside the devices.
ACOPT Presentation

1200- 1215 **5450-CT-6**

Chau-Hwang Lee^{1,2}, Tze-Hsuan Liu³, Jian-Long Xiao^{1,2}, Jiunn-Yuan Lin³
1. *Institute of Biophotonics, National Yang-Ming University, Taiwan*
2. *Research Center for Applied Sciences, Academia Sinica, Taiwan*
3. *Department of Physics, National Chung Cheng University, Taiwan*

Using Differential Confocal Microscopy to Measure the Membrane Rigidity of a Lipid Vesicle in Optical Trap

We use laser tweezers to trap a lipid vesicle and differential confocal microscopy to measure the out-of-plane fluctuations of the membrane. Bending rigidities of fluidic- and gel-phase membranes are obtained from the measured fluctuation amplitudes

1215-1230 **5450-CT-7**

Daryl Preece¹, Itia Favre-Bulle¹, Timo A. Nieminen¹, Norman Heckenberg¹, Halina Rubinsztein-Dunlop¹
1. *The University of Queensland, St Lucia, Queensland, Australia*

High-speed Camera System for Biological Applications in Optical Tweezing

High-speed particle tracking using CCD cameras or photo-diodes is crucial in optical tweezers experiments. However it can be limiting. We discuss a new system,

Dimensionality and Non-Equilibrium Phenomena (5460) continued

1200-1215 **5460-CT-6**

Peter Drummond¹, Shi-Guo Peng¹, Hui Hui¹, Xia-Ji Liu¹
1. *Swinburne University of Technology, Australia*

Anharmonic Confinement Induced Resonances: Theory vs Experiment

We develop the theory of anharmonic confinement-induced resonances in which there is a coupling between the center of mass (COM) and the relative motion. The resulting resonances agree well with recent experiments.

1215-1230 **5460-CT-7**

Ashton Bradley¹, Kyle Wright¹
1. *University of Otago, New Zealand*

Dark soliton decay in a Bose-Einstein condensate

An analytical treatment of dark soliton decay is compared with numerical simulations of the stochastic Gross-Pitaevskii equation, showing excellent agreement for low temperatures, and that thermal fluctuations increase the soliton stability at high temperatures.

Precision Measurements and Fundamental Tests (5470) continued

with a precision twenty times greater than has previously been attained. Dispersion and birefringence measurements of the spider silks are also realised.
ACOPT Presentation

1215-1230 **5470-CT-7**

Adil A. Gangati¹, Tom M. Stace¹, Gerard J. Milburn¹
1. *The University of Queensland, Australia*

Phonon Number Quantum Jumps in an Optomechanical System

We analyse the generic case of an optomechanical system with coupling quadratic in the mechanical displacement. Using the stochastic master equation formalism, we establish constraints necessary to observe quantum jumps in the phonon number.

1215-1230 **5410-CT-7**

Simon Ellis^{1,2}, Antoine
Crouzier^{1,3}, Joss Bland-
Hawthorn², Jon Lawrence¹

1. *Australian Astronomical
Observatory, Australia*
2. *The University of Sydney,
Australia*
3. *Universite de Strasbourg, France*

Potential Applications of Ring Resonators for Astronomical Instrumentation

Ring resonators have significant potential benefit for astronomical instrumentation. They can provide frequency combs for high accuracy wavelength calibration of spectra. They can provide high Q filters to suppress atmospheric emission lines.

1200-1230

INVITED SPEAKER

Kirsty Hannam¹, David A
Powell¹, Ilya Shadrivov¹, Yuri
Kivshar¹

1. *Nonlinear Physics Center,
Australian National University,
Australia*

Tuning Linear and Nonlinear Properties of Broadside-Coupled Resonators

We investigate the tunability of various linear and nonlinear properties of two coupled split ring resonators (SRRs), and find that we can significantly control both linear and nonlinear properties of the system.

potentially capable of measuring multiple particles at MHz frame rates.

5440-IT-7

INVITED SPEAKER

Kirsty Hannam¹, David A
Powell¹, Ilya Shadrivov¹, Yuri
Kivshar¹

1. *Nonlinear Physics Center,
Australian National University,
Australia*

Tuning Linear and Nonlinear Properties of Broadside-Coupled Resonators

We investigate the tunability of various linear and nonlinear properties of two coupled split ring resonators (SRRs), and find that we can significantly control both linear and nonlinear properties of the system.

A novel electro-optically tuned external-cavity diode laser with volume Bragg grating is proposed and demonstrated experimentally. By adjusting the voltage applied to PLZT, a single mode tuning range of 2.5G without mode hopping is achieved.

1200-1230

INVITED SPEAKER

Kirsty Hannam¹, David A
Powell¹, Ilya Shadrivov¹, Yuri
Kivshar¹

1. *Nonlinear Physics Center,
Australian National University,
Australia*

Tuning Linear and Nonlinear Properties of Broadside-Coupled Resonators

We investigate the tunability of various linear and nonlinear properties of two coupled split ring resonators (SRRs), and find that we can significantly control both linear and nonlinear properties of the system.

1230-1400 LUNCH - Bayside Gallery

1400-1530 Session 12

Room: Bayside Auditorium A

Nanophotonic Fabrication (5610)

Symposium 1
Chair: Ning Dai, Shanghai Institute of Technical Physics, CHINA

1400-1430 **5610-IT-1**

INVITED SPEAKER

Min Gu¹, Xiangqing Li¹, Yaoyu Cao¹
1. *Centre for Micro-Photonics,
Swinburne University of
Technology, Australia*

Super-Resolution Nanolithography in Photoreduction Polymers

In this paper we present our recent progress on far-field super-resolution enabled nanofabrication in photoreduction polymers. Pupil

Room: Bayside 101

Frequency and Temporal Control of Solid State Lasers (5620)

Symposium 2

Chair: Takashige Omatsu, Chiba University, JAPAN

1400-1430 **5620-IT-1**

INVITED SPEAKER

Peter Shardlow¹
1. *Imperial College London, UK*

Coherent Beam Combining Of Self- Adaptive Lasers

We report on coherent combination of self-starting self-adaptive modules which offer a novel route to power scaling as the lack of

Room: Bayside 102

Semiconductors / Thin Films (5630)

Symposium 3

Chair: Yasu Arakawa, University of Tokyo, JAPAN

1400-1430 **5630-IT-1**

INVITED SPEAKER

Robert Rehm¹, Martin Walthert¹,
Frank Rutz¹, Johannes Schmitz¹,
Wolfgang Luppold¹, Matthias
Wauro¹, Jasmin Niemasz¹,
Andreas Wort¹, Ralf Scheibner²,
Johann Ziegler²

1. *Fraunhofer-Institute for Applied
Solid State Physics, Germany*
2. *AIM Infrarot-Module GmbH,
Germany*

Dual-Color InAs/GaSb Superlattice Infrared Imagers

Room: Bayside 103

Symposium on Green Photonics (5640)

Symposium 4

Chair: Rod Tucker, University of Melbourne, AUSTRALIA

1400-1415 **5640-CT-1**

INVITED SPEAKER

Ajay Pandey¹, Muihsen
Aljada¹, Marappan Velusamy¹,
Paul Burr¹, Paul Meredith¹
1. *Centre for Organic Photonics and
Electronics, The University of
Queensland, Australia*

Nano-structured Organic- Metal Interface for High Efficiency Organic Solar Cells

High bimolecular recombination has been identified as a performance limiting parameter in organic solar

Room: Bayside 104

Novel Sources (5650)

Symposium 5

Chair: David Lancaster, Institute for Photonics & Advanced Sensing, AUSTRALIA

1400-1430 **5650-IT-1**

INVITED SPEAKER

Kyunghwan Oh¹, Jongki
Kim¹, Sung Rae Lee¹
1. *Institute of Physics and Applied
Physics, Yonsei University,
Seodaemun-gu, Korea*

Bessel-beam Crossings for 3D Optical Transport of Microscopic Particles

Utilizing multimode interference along a coreless fiber segment, a Bessel-like beam was successfully generated in as single strand of

Room: Bayside 105

Ultrafast Optics of the Solid State (5660)

Symposium 6

Chair: Chang Hee Nam, Kaist, KOREA

1400-1415 **5660-CT-1**

INVITED SPEAKER

In Hyung Baek¹, Sun Young
Choi¹, Hiwang Woon Lee¹,
Valentin Petrov², Antonio
Agnesi³, Valdas Pasiskevicius⁴,
Dong-Il Yeom¹, Kihong Kim¹,
Byung Hee Hong⁵, Fabian
Rotermund¹

1. *Division of Energy Systems
Research, Ajou University, Korea*
2. *Max Born Institute for Nonlinear
Optics & Ultrafast Spectroscopy,
Germany*

Room: Bayside 106

CPT + Equivalence Principle Tests (5670)

Symposium 7

Chair: Victor Flambaum, UNSW, AUSTRALIA

1400-1430 **5670-IT-1**

INVITED SPEAKER

Jeffrey Hangst¹
1. *Aarhus University, Denmark*

Trapping Antihydrogen for Tests of CPT Invariance

<p>Nanophotonic Fabrication (5610) <i>continued</i></p>	<p>engineering and spatial photoinduction-inhibited methods will be employed to break the diffraction limit of the beam. The far-field super-resolution provides a revolutionary tool for three-dimensional (3D) imaging, lithography and optical storage</p>	<p>Semiconductors /Thin Films (5630) <i>continued</i></p>	<p>cells. To counter this issue, we introduce a structured-junction device architecture for efficient photogeneration and extraction leading to power conversion efficiencies in excess of 6% .</p>	<p>Ultrafast Optics of the Solid State (5660) <i>continued</i></p>	<p>1430-1500 INVITED SPEAKER Achim Peters for the QUANTUS Team¹ 1. <i>Humboldt-Universität zu Berlin, Institut für Physik, Germany</i></p>
<p>Frequency and Temporal Control of Solid State Lasers (5620) <i>continued</i></p>	<p>predefined resonator modes allows power scaling beyond the usual limits of self-organised coherent combination.</p>	<p>High-performance dual-color infrared imaging systems have been realized with InAs/GaSb type II superlattices. The detectors offer a spatial resolution of 288x384 pixels with a simultaneous, co-located detection at 3-4 - μm(blue channel) and 4-5 μm (red channel), respectively. Against a 300 K background, a thermal resolution of 18 mK in the blue and 10 mK in the red channel has been achieved. The detectors are well suited for low-false alarm imaging of hot carbon dioxide signatures on a millisecond time scale.</p>	<p>1415-1430 5640-CT-2 Kwan H. Lee¹, Paul E. Schwenn¹, Arthur R.G. Smith¹, Hamish Cavaye¹, Paul E. Shaw¹, Michael James^{2,3}, Karsten B. Krueger¹, Ian R. Gentle⁴, Paul Meredith¹, Paul L. Burn¹ 1. <i>Centre for Organic Photonics and Electronics, University of Queensland, Australia</i> 2. <i>Bragg Institute, Australian Nuclear Science and Technology Organisation, Australia</i> 3. <i>School of Chemistry, University of New South Wales, Australia</i> 4. <i>School of Chemistry and Molecular Biosciences, University of Queensland, Australia</i></p>	<p>1430-1500 5670-IT-2 INVITED SPEAKER Achim Peters for the QUANTUS Team¹ 1. <i>Humboldt-Universität zu Berlin, Institut für Physik, Germany</i></p>	
<p>INVITED SPEAKER Dragov Neshev Light Control in Plasmonic Structures and Metamaterials</p>	<p>1430-1500 5610-IT-2 INVITED SPEAKER Dragov Neshev Light Control in Plasmonic Structures and Metamaterials</p>	<p>1430-1445 5630-CT-2 Tatsuya Ishimaru¹, Miral Ieda¹, Hiroshi Kamitsaka¹, Zamri Yusop¹, Masaki Tanemura¹, Shingo Ono¹, Tomohito Nagami², Noriaki Kawaguchi², Sumito Ishizu², Kentaro Fukuda², Toshihisa Suyama², Yuui Yokota², Takayuki Yanagida³, Akira Yoshikawa³ 1. <i>Nagoya Institute of Technology, Japan</i> 2. <i>Tokuyama Corporation, Japan</i> 3. <i>Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Japan</i></p>	<p>1430-1445 5650-CT-2 Meng Jiang¹, Bo Lin¹, Ping Shum¹, Swee Chuan Tjin¹, Xinyong Dong² 1. <i>School of Electrical and Electronics Engineering, Nanyang Technological University, Singapore</i> 2. <i>Institute of Optoelectronic Technology, China Jiliang University, China</i></p>	<p>1430-1500 5670-IT-2 INVITED SPEAKER Achim Peters for the QUANTUS Team¹ 1. <i>Humboldt-Universität zu Berlin, Institut für Physik, Germany</i></p>	
<p>1430-1515 Igor Aharonovich¹, Jonathan Lee¹, Andrew Magyar¹, Evelyn Hu¹ 1. <i>School of Engineering and Applied Sciences, Harvard University, USA</i></p>	<p>1430-1515 5610-CT-3 Igor Aharonovich¹, Jonathan Lee¹, Andrew Magyar¹, Evelyn Hu¹ 1. <i>School of Engineering and Applied Sciences, Harvard University, USA</i></p>	<p>1445-1500 5620-CT-3 Chandrajit Basu^{1,2}, Oliver Puncken¹, Lutz Winkelmann¹, Maik Frede³, Bastian Schulz³, Peter Weibels^{1,2}, Jörg Neumann^{1,2}, Dietmar Kracht^{1,2} 1. <i>Laser Zentrum Hannover, Germany</i> 2. <i>QUEST - Centre for Quantum Engineering and Space-Time Research, Germany</i> 3. <i>neOLASE GmbH, Germany</i></p>	<p>1430-1445 5640-CT-3 H.C. Chen¹, C.C. Lin³, H.W. Wang², M.A. Tsai², Peichen Yu¹, and H.C. Kuo¹ 1. <i>Department of Photonics & Institute of Electro-Optical</i></p>	<p>1430-1500 5660-IT-3 INVITED SPEAKER Fabian Rotermund¹ 1. <i>Ajou University, Korea</i></p>	
<p>1430-1515 Fred Baynes¹, Michael Tobar¹, Andre Luiten¹ 1. <i>University of Western Australia, Australia</i></p>	<p>1430-1515 5670-CT-3 Fred Baynes¹, Michael Tobar¹, Andre Luiten¹ 1. <i>University of Western Australia, Australia</i></p>	<p>1445-1500 5650-CT-3 Zohreh Lali-Dasjerdji¹, Toke Lund-Hansen¹, Karsten Rottwitt¹, Michele Galli¹, Christophe Peucheret¹ 1. <i>Fotonik, Department of Photonics Engineering, Technical University of Denmark</i></p>	<p>1430-1445 5640-CT-3 H.C. Chen¹, C.C. Lin³, H.W. Wang², M.A. Tsai², Peichen Yu¹, and H.C. Kuo¹ 1. <i>Department of Photonics & Institute of Electro-Optical</i></p>	<p>1430-1500 5660-IT-3 INVITED SPEAKER Fabian Rotermund¹ 1. <i>Ajou University, Korea</i></p>	
<p>The realization of quantum information processing requires sophisticated fabrication methodologies of its constituents. In this work we demonstrate the fabrication of micron size diamond microdisks from single crystal diamond. Photoluminescence measurements confirm the presence of nitrogen vacancy centers and show the propagation of whispering gallery modes. Such structures are promising for the realization of diamond integrated quantum photonics devices.</p>	<p>The realization of quantum information processing requires sophisticated fabrication methodologies of its constituents. In this work we demonstrate the fabrication of micron size diamond microdisks from single crystal diamond. Photoluminescence measurements confirm the presence of nitrogen vacancy centers and show the propagation of whispering gallery modes. Such structures are promising for the realization of diamond integrated quantum photonics devices.</p>	<p>Using a combination of techniques, including neutron reflectometry, and correlating it with device performance, we have investigated the vertical morphology in a P3HT/PCBM sequentially solution processed (bilayerTM) organic solar cell.</p>	<p>1430-1445 5640-CT-3 H.C. Chen¹, C.C. Lin³, H.W. Wang², M.A. Tsai², Peichen Yu¹, and H.C. Kuo¹ 1. <i>Department of Photonics & Institute of Electro-Optical</i></p>	<p>1430-1500 5670-IT-3 INVITED SPEAKER Fabian Rotermund¹ 1. <i>Ajou University, Korea</i></p>	
<p>1500-1515 5670-CT-3 Fred Baynes¹, Michael Tobar¹, Andre Luiten¹ 1. <i>University of Western Australia, Australia</i></p>	<p>1500-1515 5670-CT-3 Fred Baynes¹, Michael Tobar¹, Andre Luiten¹ 1. <i>University of Western Australia, Australia</i></p>	<p>1445-1500 5650-CT-3 Zohreh Lali-Dasjerdji¹, Toke Lund-Hansen¹, Karsten Rottwitt¹, Michele Galli¹, Christophe Peucheret¹ 1. <i>Fotonik, Department of Photonics Engineering, Technical University of Denmark</i></p>	<p>1430-1445 5640-CT-3 H.C. Chen¹, C.C. Lin³, H.W. Wang², M.A. Tsai², Peichen Yu¹, and H.C. Kuo¹ 1. <i>Department of Photonics & Institute of Electro-Optical</i></p>	<p>1430-1500 5670-IT-3 INVITED SPEAKER Fabian Rotermund¹ 1. <i>Ajou University, Korea</i></p>	
<p>1500-1515 5670-CT-3 Fred Baynes¹, Michael Tobar¹, Andre Luiten¹ 1. <i>University of Western Australia, Australia</i></p>	<p>1500-1515 5670-CT-3 Fred Baynes¹, Michael Tobar¹, Andre Luiten¹ 1. <i>University of Western Australia, Australia</i></p>	<p>1445-1500 5650-CT-3 Zohreh Lali-Dasjerdji¹, Toke Lund-Hansen¹, Karsten Rottwitt¹, Michele Galli¹, Christophe Peucheret¹ 1. <i>Fotonik, Department of Photonics Engineering, Technical University of Denmark</i></p>	<p>1430-1445 5640-CT-3 H.C. Chen¹, C.C. Lin³, H.W. Wang², M.A. Tsai², Peichen Yu¹, and H.C. Kuo¹ 1. <i>Department of Photonics & Institute of Electro-Optical</i></p>	<p>1430-1500 5670-IT-3 INVITED SPEAKER Fabian Rotermund¹ 1. <i>Ajou University, Korea</i></p>	
<p>1500-1515 5670-CT-3 Fred Baynes¹, Michael Tobar¹, Andre Luiten¹ 1. <i>University of Western Australia, Australia</i></p>	<p>1500-1515 5670-CT-3 Fred Baynes¹, Michael Tobar¹, Andre Luiten¹ 1. <i>University of Western Australia, Australia</i></p>	<p>1445-1500 5650-CT-3 Zohreh Lali-Dasjerdji¹, Toke Lund-Hansen¹, Karsten Rottwitt¹, Michele Galli¹, Christophe Peucheret¹ 1. <i>Fotonik, Department of Photonics Engineering, Technical University of Denmark</i></p>	<p>1430-1445 5640-CT-3 H.C. Chen¹, C.C. Lin³, H.W. Wang², M.A. Tsai², Peichen Yu¹, and H.C. Kuo¹ 1. <i>Department of Photonics & Institute of Electro-Optical</i></p>	<p>1430-1500 5670-IT-3 INVITED SPEAKER Fabian Rotermund¹ 1. <i>Ajou University, Korea</i></p>	
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1515-1530

5610-CT-4

Elisa Nicoletti¹, Douglas Bulla², Barry Luther-Davies², Min Gu¹

1. *Centre for Micro-Photonics & CUDOS, Swinburne University of Technology, Australia*
2. *Laser Physics Centre & CUDOS, Australian National University, Australia*

High Resolution Fabrication in Chalcogenide Glasses

We studied the influence of the laser repetition rate on the direct laser fabrication in chalcogenide glasses. Nanowires with dimensions down to $\approx \sqrt{12}$ have been for the first time fabricated in As₂S₃.

polarized output and 83.5% TEM00 mode content. This power scaling approach is promising for the 3rd generation gravitational wave detectors.

1500-1530

5620-IT-4

INVITED SPEAKER

Peter Veitch¹

1. *The University of Adelaide, Australia*

High Power 'Single Frequency' Lasers

High-power solid-state lasers producing diffraction-limited TEM00 beams with precisely controlled spectral content are required for a wide variety of remote sensing applications. I shall review the development of lasers for some of these applications.

1445-1500

5630-CT-3

Ikuo Suemune^{1,2}, HirotaKa Sasakura^{1,2}, Claus Hermannstadtler¹, J.-H. Huh^{1,2}, Yasuhiro Asano³, Kazunori Tanaka^{2,4}, Tatsushi Akazaki^{2,5}, Hidekazu Kumano^{1,2}

1. *Research Institute for Electronic Science, Hokkaido University, Japan*
2. *CREST, Japan Science and Technology Agency, Japan*
3. *Graduate School of Engineering, Hokkaido University, Japan*
4. *Central Research Laboratory, Hamamatsu Photonics, Japan*
5. *NTT Basic Research Laboratories, Japan*

Drastic Enhancement of Interband Optical Transition Probability with Electron Pairing in Semiconductors

Interband optical transition probability (usually given as the B coefficient) is normally fixed for a given semiconductor structure. Here we will show the B coefficient can be drastically enhanced effectively with electron injection in paired states.

1500-1515

5630-CT-4

Haruhiko Kuwatsuka¹,

Ryouchi Akimoto¹, Shinichiro Gozu¹, Teruo Mozume¹, Toshifumi Hasama¹, Hiroshi Ishikawa¹

1. *National Institute of Advanced Industrial Science and Technology, Japan*

Propagation of FWM Interacting Waves in InGaAs/AlAsSb ISBT Optical Waveguide for Wavelength Converter

The propagation of interacting waves of FWM in InGaAs/AlAsSb ISBT optical waveguides is discussed. The sufficient FWM conversion efficiencies for realizing

Engineering, National Chiao Tung University, Taiwan

2. *Department of Electro-physics, National Chiao Tung University, Taiwan*

3. *Institute of Photonic System, National Chiao Tung University, Taiwan*

Enhanced Conversion Efficiency for c-Si Solar Cell via Photon Down-Conversion and Antireflection of CdS Quantum Dots

The enhanced efficiency of the crystalline silicon (c-Si) with nanopillar arrays (NPAs) solar cell by quantum dots (QDs) was demonstrated. The device with CdS quantum dots shows the higher power conversion efficiency about 33%
ACOFF Presentation

1445-1500

5640-CT-4

Björn C.P. Sturmberg¹, Kokou B. Dossou², Lindsay C. Botten², Ara A. Asatryan², Christopher G. Poulton², C. Martijn de Sterke¹, Ross C. McPhedran¹

1. *CUDOS and IPOS, School of Physics, University of Sydney, Australia*
2. *CUDOS and School of Mathematical Science, University of Technology Sydney, Australia*

Analysis of Enhanced Absorption in Dense Silicon Nanowire Arrays

We develop a novel, semi-analytic technique to analyze the absorption mechanism, by which dense silicon nanowire arrays achieve high photovoltaic energy conversion efficiencies. We find a few modes to be responsible and study their properties.

Pump-to-Signal Intensity Modulation Transfer in Saturated-Gain Fiber Optical Parametric Amplifiers

The pump-to-signal intensity modulation transfer in saturated degenerate FOPAs is numerically investigated over the whole gain bandwidth. The intensity modulation transfer decreases and the OSNR improves when the amplifier operates in the saturation regime.
ACOFF Presentation

1500-1515

Jin Xue¹, Nanxi Li¹, Kan Wu¹, Jia Haur Wong¹, Sheel Aditya¹, Ping Shum¹

1. *School of Electrical & Electronic Engineering, Nanyang Technological University, Singapore*

Analysis and Evaluation of Phase Noise Suppression by Incoherent Addition for a Passive Mode-Locked Fiber Laser

The effectiveness of phase noise suppression by incoherent addition for a passive mode-locked fiber laser system is investigated. Results are presented and compared for two different types of interferometers and different background phase noise levels.

1515-1530

5650-CT-5

Chun-Lin Chang¹, Yen-Yin Li¹, Yi-Ping Lai¹, Sheng-Lung Huang^{1,2}

1. *Institute of Photonics and Optoelectronics, National Taiwan University, Taiwan*
2. *Department of Electrical Engineering, National Taiwan University, Taiwan*

Progress in Carbon Nanotube Mode-Locked Ultrastat Solid-State Lasers

Carbon nanotubes were successfully applied for mode-locking ultrastat bulk solid-state lasers. In this talk, important characteristics of saturable absorbers based on single-walled carbon nanotubes and their applications for mode-locking in a wide spectral range will be presented.

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1500-1530

5660-CT-4

A. Fuerbach¹, S. Gross¹, C. Miese¹, G. Palmer¹, N. Jovanovic^{1,2}, W. Koehler³, T. Ganz⁴, D. Lancaster⁵, T. Monro⁵, M. Withford¹

1. *MQ Photonics Research Centre, CUDOS, Macquarie University, Australia*
2. *Australian Astronomical Observatory, Australia*
3. *Femtolasers Produktions GmbH, Optics and Ludwig-Maximilians-Universität München, Germany*
4. *Max-Planck-Institute of Quantum Optics and Ludwig-Maximilians-Universität München, Germany*
5. *School of Chemistry and Physics, IPAS, University of Adelaide, Australia*

Femtosecond Chirped Pulse Oscillators for High-Speed Photonic Device Fabrication

Chirped Pulse Oscillators (CPOs) allow the generation of high-energy femtosecond laser pulses at MHz repetition rates. We present advances in CPO development and report on our capabilities to utilize those sources to fabricate photonic devices.

1. *School of Physics, The University of Western Australia, Australia*

2. *Institut für Physik, Humboldt-Universität zu Berlin, Germany*

Rotating Microwave Cryogenic Sapphire Oscillators for Tests of Lorentz Invariance

Lorentz Invariance is a fundamental component of General Relativity and the Standard Model of Particle Physics. We describe the details of our latest Michelson-Morley experiment that tests Lorentz invariance by searching for an orientation dependent change in the speed of light.

Thursday 1 September 2011

Semiconductors /Thin Films (5630) *continued*

coherent wavelength converters were obtained theoretically and experimentally.

1515-1530

5630-CT-5

Naokatsu Yamamoto¹,

Kouichi Akanane¹, Tetsuya

Kawanishi¹, Yuki Yoshioka²,

Hiroshi Takai²

1. National Institute of Information

and Communications Technology,

Japan

2. Tokyo Denki University, Japan

Narrow Line-width 1.3-

µm Wavelength Tunable

InAs/InGaAs Quantum Dot

based Bench-top Light

Source using Sandwiched

Sub-Nano Separator

Growth Technique

Using sandwiched sub-nano

separator technique, we

successfully developed a

narrowlinewidth broadband 1.3- µm

wavelength tunable quantum dot

based bench-top light source,

which can be useful for coherent

photonic transport in O-band.

Symposium on Green Photonics (5640) *continued*

1500-1530

5640-IT-5

INVITED SPEAKER

Pavlos Lagoudakis¹

UPAP Young Scientist Prize Winner

1. University of Southampton, UK

Hybrid Optoelectronics

for light harvesting and

light emission

applications

We engineer resonance energy

transfer into hybrid organic/

inorganic and colloidal/epitaxial

semiconductor nanostructures and

utilise it as an efficient mechanism

Novel Sources (5650) *continued*

Investigation of Parasitic

Stimulated Emission in a

Nanosecond Diode-

seeded High Gain Fiber

Pre amplifier

Parasitic stimulated emission

produces a front spike in a pulsed

fiber MQPA system at a gain

threshold of ~11.5 dB. Mitigation of

the parasitic stimulated emission

can enable high gain for diode-

seeded fiber pre-amplifier.

ACOPT Presentation

1530-1600

AFTERNOON TEA - Bayside Gallery

1600-1700

Post Deadline Sessions

A timetable for these three sessions is provided in a separate document and the abstracts are available to view on the Conference Proceedings CD.

1705-1750

Plenary Session 5 (5850)

Room: Bayside Auditorium A

Chair: Ken Baldwin, Australian National University, AUSTRALIA

5850-PT-1

Oskar Painter

California Institute of Technology, USA

The Light and Sound Fantastic: Optomechanics at the Nanoscale

In this talk I will describe recent efforts in the field of cavity optomechanics to utilize radiation pressure for the detection and control of mesoscopic mechanical objects in the quantum regime.

1750-1800

Conference Closing and Student Prizes Ceremony