



Thank you

The Organizing and Programme Committees of the joint 2011 International Quantum Electronics Conference / Conference on Lasers and Electro-Optics Pacific Rim would like to thank everyone involved – including you the delegates – for making this conference a great success.

This is the first time that CLEO Pacific Rim has been held in Australia, and just the second time that IQEC has been held here. With a total of 1,016 delegates the conference broke numerous records, being the largest conference on lasers and their applications to be held in Australia and in the Southern Hemisphere. It was also the largest gathering of Australian participants in this field, the largest CLEO Pacific Rim conference, and only slightly smaller than the largest joint conference with IQEC (that being in Tokyo in 2005).

We hope that you enjoyed your conference experience in Sydney, and look forward to meeting you again at CLEO Pacific Rim 2013 in Kyoto, and at IQEC 2013 in Munich.

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About the Conference

IQEC/CLEO Pacific Rim 2011 combined four major meetings in the field of lasers and their scientific and technological applications:

- The International Quantum Electronics Conference (IQEC)
- The Conference on Lasers and Electro-Optics (CLEO) Pacific Rim
- The Australasian Conference on Optics, Lasers and Spectroscopy (ACOLS)
- The Australian Conference on Optical Fibre Technology (ACOFT)

This meeting brought together international research leaders who span the spectrum of laser development, optical devices, and photonics, with applications to such fields as optical communications, laser spectroscopy, ultrafast optics, nonlinear optics, high field physics and quantum/atom optics.

IQEC rotates between Europe, North America and the Pacific Rim every two years, while CLEO Pacific Rim is held on a similar frequency within the Asia-Pacific Region. The conjunction of these two major international conferences in Sydney in 2011, together with the two major local conferences in this field, made this the most significant meeting in lasers and their applications ever to have been held in Australia.

HOST BODIES

- Australian Optical Society
- Australian Institute of Physics
- Engineers Australia

IQEC/CLEO Pacific Rim 2011 - in co-operation with:

- The Optical Society
- The Electronics Society of the Institute of Electronics, Information and Communication Engineers
- The Communications Society of the Institute of Electronics, Information and Communication Engineers
- The Japan Society of Applied Physics
- The Optical Society of Korea
- The Photonics Society of the Institute of Electrical and Electronics Engineers

Programme

E1 Statement

“All contributed papers in their entirety (i.e. not merely an abstract or extract) were peer reviewed for their significance, innovation, and quality by independent members of the Technical Program Committee, and then rated.”

Symposium

- **Green Photonics**

Topics include but are not limited to: low power lighting; integrated organic photonics and electronics; energy conversion and improved light harvesting; photonics is next generation sustainable sensing platforms; hybrid organic-inorganic integrated photonics

Workshops

The following half day workshops will be held on Sunday 28 August. Expert panels will present the issues for each workshop topic, and much of the session will be devoted to open debate, with vigorous participation of the audience strongly encouraged.

- **Modulation formats and signal processing techniques to approach the Shannon limit**
- **Metamaterials for cloaking: fundamental curiosity or breakthrough technology?**
- **Platforms for quantum computing – which way forward?**
- **Will guided-wave parametric processing ever move out of the lab?**
- **Introduction into fabrication for optics and photonics**

Program topics

CLEO Pacific Rim topics:

Applied nonlinear optics
Fiber amplifiers, lasers, sensors and devices
High power laser technology and high energy density physics
Information optics, optical storage and displays
Infrared and THz technology, and astrophotonics
Integrated and guided-wave optics and thin film optics
Laser chemistry, biophotonics and applications
Laser metrology and remote sensing
Laser processing, laser microfabrication, and industrial applications
Optical communications and networking
Semiconductor and electro-optic devices
Solid-state laser and other lasers, and laser materials

Joint CLEO Pacific Rim / IQEC topics:

Nanophotonics
Ultrafast laser science
Ultrafast optics and photonics

IQEC topics:

Cold atoms and molecules

Fundamentals of nonlinear optics

Precision measurements and fundamental tests

Quantum information and cryptography

Quantum optics

Quantum science in atoms, molecules and solids

Invited Speakers

Confirmed invited speakers and provisional presentation titles:

CLEO Pacific Rim topics

Applied nonlinear optics

- **Satoshi Ashihara** (Tokyo University of Agriculture and Technology, Japan)
Spectral broadening and phase shaping of mid-IR pulses
- **Aaron C. Bernstein** (University of Texas at Austin, USA)
New opportunities for controlling long distance filaments in air through two beam coupling
- **Thomas Pertsch** (Friedrich-Schiller-University Jena, Germany)
Light bullets

Fiber amplifiers, lasers, sensors and devices

- **Shahraam Afshar** (Institute for Photonics & Advanced Sensing, Australia)
Optical fibre coated with diamond nanocrystal: novel sensing architecture
- **Claude Aguergaray** (Auckland University, New Zealand)
Parabolic and hyper-gaussian similaritons propagating in fiber amplifier and lasers with saturation effect
- **Gilberto Brambilla** (Optoelectronics Research Centre, UK)
Sensors and devices based on optical fibre microwires
- **Ingmar Hartl** (IMRA America Inc, USA)
Advanced ultrashort pulsed fiber lasers
- **Qingwen Liu** (University of Tokyo, Japan)
An ultra-high-resolution large-dynamic-range fiber optic static strain sensor using pound-drever-hall technique
- **Michael Oermann** (Institute for Photonics & Advanced Sensing, Australia)
Tellurite glass for use in 2.3 μ m thulium fibre lasers
- **Kyunghwan (Ken) Oh** (Yonsei University, Korea)
Bessel-beam crossings for 3D optical transport of microscopic particles
- **Nikita Simakov** (Defence Science & Technology Organisation, Australia)
Power scaling of 2 μ m sources for frequency conversion into the mid-infrared
- **Johann Troles** (University of Rennes, France)
New chalcogenide fibers

High power laser technology and high energy density physics

- **Sudeep Banerjee** (University of Nebraska, USA)
Background-free, quasi-monoenergetic electron beams from a self-injected laser wakefield accelerator
- **Almantas Galvanauskas** (University of Michigan, USA)
Lasers for inertial fusion
- **Noriaki Miyanaga** (Osaka University, Japan)
Construction of LFEX PW laser & conceptual design of sub EW laser at Osaka University

Information optics, optical storage and displays

- **Matthew Foreman** (Imperial College London, UK)
Analysis of optical resolution in data storage and beyond
- **Dmitri Psaltis** (Geneve)
Second harmonic nanoparticles in biological imaging
- **Lambertus Hesselink** (Stanford University, USA)
Fundamental principles underlying near field transducers for data storage
- **Takashi Kurokawa** (Tokyo University of Agriculture & Technology, Japan)
Optical short pulse synthesis and its applications

Infrared and THz technology, and astrophotonics

- **Hideaki Ohgaki** (Kyoto University, Japan)
Accelerator based photon beams, generation and applications at Kyoto University
- **Frank Tittel** (Rice University, USA)
Quantum cascade laser based trace gas sensor technologies: recent advances and applications
- **Takeshi Yasui** (University of Tokushima, Japan)
THz color scanner for moving objects

Integrated and guided-wave optics and thin-film optics

- **Alexander Gaeta** (Cornell University, USA)
Novel CMOS-compatible sources based on nonlinear optics
- **Kengo Nozaki** (NTT Basic Research Laboratory, Japan)
Photonic crystal nanocavities toward low-power nanophotonics on chip nanophotonic devices
- **Markus Pollnau** (University of Twente, The Netherlands)
Micromechanically tuned ring resonator in silicon on insulator
- **Andrew Poon** (Hong Kong University of Science & Technology, China)
Silicon microresonators for on-chip optical interconnects and optofluidics

Laser chemistry, biophotonics and applications

- **Mary Ann Go** (Australian National University, Australia)
Three-dimensional multi-site two-photon excitation for probing neuronal signal integration
- **Scott Kable** (The University of Sydney, Australia)
Chemistry at the threshold: unexpected products, unusual mechanisms and generally weird things that happen near the energetic threshold for a reaction
- **Andrei Rode** (Australian National University, Australia)
Influence of polarisation on optical trapping forces in air-transport of spherical particles
- **Nicholas Smith** (Biophotonics Lab, IFREC, Japan)
Optical control of cell functions: using laser light to remote control signalling, contraction and action potentials in living cells
- **Leann Tilley** (The University of Melbourne)
Super-resolution optical imaging of malaria parasites

- **Benjamin J. Vakoc** (Harvard Medical School, USA)
Using optical coherence tomography to image tumor blood vessels

Laser metrology and remote sensing

- **Gesine Grosche** (Physikalisch-Technische Bundesanstalt (PTB), Germany)
High performance frequency comparisons over optical fibre
- **Shiv Sharma** (Hawaii Institute of Geophys & Planetology, USA)
Raman spectroscopy and its applications in earth and planetary science
- **Stanley Whitcomb** (LIGO Laboratory, USA)
Laser interferometer gravitational-wave detectors: advancing toward a global network

Laser processing, laser microfabrication, and industrial applications

- **Roberto Osellame** (Institute for Photonics and Nanotechnologies – CNR, Italy)
Femtosecond laser micromachining as an enabling tool for optofluidics and quantum optics
- **Reinhart Poprawe** (Fraunhofer Institute, Germany)
KW-fs laser technology – enabling a new dimension of materials processing
- **Yasuhiko Shimotsuma** (Kyoto University, Japan)
Manipulation of self-assembled nanostructure in glass
- **Alexander Szameit** (Friedrich-Schiller-University, Germany)
Three-dimensional all-optical routing and switching in laser-written waveguide

Optical communications and networking

- **Vincent Chan** (Massachusetts Institute of Technology, USA)
Optical Flow Switching
- **Masahiko Jinno** (NTT Network Innovation Laboratories, Japan)
Why do we need elastic optical networking in the 1 Tb/s era?
- **Cibby Pulikkaseril** (Finisar, Australia)
Spectral modeling of wavelength selective switches for flexible grid optical networks
- **Rod Tucker** (Institute for a Broadband-Enabled Society (IBES), Australia)
Green optical networking

Semiconductor and electro-optic devices

- **Yasu Arakawa** (University of Tokyo, Japan)
Quantum dot lasers and amplifiers
- **Chennupati Jagadish** (Australian National University, Australia)
III-V compound semiconductor nanowires for optoelectronic devices
- **Robert Rehm** (Fraunhofer IAF, Germany)
Dual-color InAs/GaSb superlattice infrared imagers

Solid-state lasers and other lasers, and laser materials

- **Alexander Hemming** (DSTO, Australia)
A 27 W Mid-IR laser source
- **David Lancaster** (Institute for Photonics & Advanced Sensing, Australia)
A new class of 2 μ m waveguide lasers produced by fs direct-writing of Tm³⁺ and Ho³⁺ doped ZBLAN glass
- **Richard Mildren** (Macquarie University, Australia)
Performance extension of Raman lasers using synthetic diamond
- **Peter Shardlow** (Imperial College London, UK)
Coherent beam combining of self-adaptive lasers
- **Manasadevi Priyamvada Thirugnanasambandam** (Institute for Laser Science, University of Electrocommunications, Japan)
High-order mode selection in Yb:YAG ceramic laser
- **Peter Veitch** (The University of Adelaide, Australia)
High power “single frequency” lasers

Joint IQEC/CLEO Pacific Rim Topics

Nanophotonics

- **Ning Dai** (Shanghai Institute of Technical Physics, China)
Fabrication of solar cells using semiconductor quantum dots and nano-materials
- **Min Gu** (Swinburne University, Australia)
Super-resolution nanolithography in photoreduction polymers
- **Kirsty Hannam** (Australian National University, Australia)
Tuning linear and nonlinear properties of broadside-coupled resonators
- **Martin Hill** (Eindhoven University of Technology, The Netherlands)
Plasmonic and metallic nano-cavity lasers
- **Rajesh Menon** (University of Utah, USA)
Patterning and imaging beyond the far-field diffraction limit
- **Bumki Min** (Korea Advanced Institute of Science and Technology, Korea)
Extremely high refractive index terahertz metamaterials
- **Fang-Fang Ren** (Nanjing University, China)
Photoresponse enhancement in nanoscale Ge photodetector through split bull’s eye shaped plasmonic antenna
- **Aniwat Tandaechanurat** (Institute for Nano Quantum Information Electronics, Japan)
Observation of Purcell effect in a 3D photonic crystal nanocavity with a single quantum dot

Ultrafast laser science

- **Zhengu Chang** (University of Central Florida, USA)
Probing sub-cycle excitation dynamics with isolated attosecond pulses
- **Tony Heinz** (Columbia University, USA)
Probing electronic states and dynamics in graphene by optical spectroscopy
- **Takayoshi Kobayashi** (University of Electro-Communications, Japan)
Generation of CEP-stabilized sub-3-fs pulses

- **R.J. Dwayne Miller** (University of Hamburg, Germany, University of Toronto, Canada)
Making the Molecular Movie: First Frames.....Coming Features

Ultrafast optics and photonics

- **Alexander Fuerbach** (Macquarie University, Australia)
Femtosecond chirped pulse oscillators for high-speed photonic device fabrication
- **Fabian Rotermund** (Ajou University, Korea)
Progress in carbon nanotube mode-locked ultrafast solid-state lasers

IQEC Topics

Cold Atoms and molecules

- **Brian Anderson** (University of Arizona, USA)
Two-dimensional quantum turbulence in Bose-Einstein Condensates
- **Jan Klaers** (University of Bonn, Germany)
Bose-Einstein condensation of paraxial light
- **Andrew Truscott** (Australian National University, Australia)
Higher order correlations in ultracold quantum gases

Fundamentals of nonlinear optics

- **Philip Russell** (Max Planck Institute: Science of Light, Erlangen, Germany)
Gas-based nonlinear optics in hollow core photonic crystal fibre
- **Andrey Sukhorukov** (Australian National University, Australia)
Optical phase transitions and quantum walks in nonlinear waveguide arrays
- **Anatoly Zayats** (King's College London, UK)
Nonlinear nanophotonics
- **Shining Zhu** (Nanjing University, China)
Steering light and photon by engineering domains in ferroelectric crystals

Precision measurements and fundamental tests

- **Pierre Cladé** (LKB – CNRS, France)
New determination of the fine structure constant and test of the quantum electrodynamics
- **Jeffrey Hangst** (Aarhus University, Denmark)
Trapping antihydrogen for tests of CPT invariance
- **Achim Peters** (Humboldt Universitaet Berlin, Germany)
Matter wave interferometry in microgravity and its application for high precision measurements

Quantum information and cryptography

- **Mikio Fujiwara** (National Institute of Information and Communications, Japan)
Field demonstration of quantum key distribution in the Tokyo QKD network

- **Wolfgang Tittel** (University of Calgary, Canada)
Quantum memory for quantum repeaters

Quantum optics

- **Markus Aspelmeyer** (VCQ, University of Vienna, Austria)
Quantum opto-mechanics: quantum optical control of massive mechanical resonators
- **Andrew Doherty** (The University of Sydney, Australia)

Quantum science in atoms, molecules and solids

- **Mikkel F. Andersen** (University of Otago, New Zealand)
Consistent isolation of individual atoms using cold collisions
- **John Teufel** (National Institute of Standards and Technology, Boulder, USA)
Sideband cooling micromechanical motion to the quantum ground state

Green Photonics Symposium

- **Pavlos Lagoudakis** (University of Southampton, UK)
Hybrid optoelectronics for light harvesting and light emission applications

Plenary Speakers

We are pleased to announce the participation of the following Plenary Speakers:



Joss Bland-Hawthorn
University of Sydney, Australia

Joss Bland-Hawthorn is the recipient of a Federation Fellowship at the University of Sydney where he is a Professor in Physics. He is an Associate Director and a founding member of the Institute for Photonics and Optical Science (IPOS). Joss has over 200 research papers, and is world renowned for his breakthroughs in astrophysics and in instrumentation. In 1986, he obtained his PhD in astrophysics from the Royal Greenwich Observatory prior to taking up faculty appointments in Hawaii and Texas. In 1993, he moved to the Anglo-Australian Observatory where he was Head of a highly successful group that pioneered astronomical concepts with names like WFMOS, FMOS, Nod & Shuffle, Dazle, Starbugs, Honeycomb. Joss has carried out pioneering work on tunable filters, gratings and interplanetary laser communications. In 2002, he proposed the new field of astrophotonics that sits at the interface of astronomy and photonics – in Feb 2009, this field was featured in the Focus Issue of Optics Express. Joss is a recipient of the 2008 Muhlmann Award for experimental astronomy, and a recipient of the inaugural 2008 Group Achievement Award from the Royal Astronomical Society. In 2010, he is the Leverhulme Visiting Professor to Oxford and the Merton College Fellow. In 2011, he is the Brittingham Scholar to the University of Wisconsin.



Mark Kasevich
Stanford University, USA

Mark Kasevich is a Professor of Physics and Applied Physics at Stanford University. He received his B.A. degree (1985) in Physics from Dartmouth College, his M.A. (1987) in Physics and Philosophy from Oxford University and his

Ph.D. (1992) in Applied Physics from Stanford University. He joined the Stanford Physics Department faculty in 1992. From 1997-2002 he was a member of the Yale Physics Department faculty. He returned to Stanford in 2002. His current research interests are centered on the development of quantum sensors of rotation and acceleration based on cold atoms (quantum metrology), application of these sensors to tests of General Relativity, investigation of many-body quantum effects in Bose condensed vapors (including quantum simulation), and investigation of ultra-fast laser-induced phenomena. He currently serves as Consulting Chief Scientist at AOSense, Inc. and as a National Security Science and Engineering Faculty Fellow.



Ken-ichi Kitayama

Osaka University, Japan

Ken-ichi Kitayama received the M.E. and Dr.Eng. degrees from Osaka University, Osaka, Japan, in 1976 and 1981, respectively. In 1976, he joined the NTT Laboratory. In 1995, he joined the NICT, Japan. Since 1999, he has been the Professor of Osaka University, Japan. His research interests are in photonic label switchings, optical signal processings, OCDMA, and RoF. He has published over 250 papers in refereed journals and holds more than 30 patents. He currently serves as the Associate Editor of the IEEE/OSA JLT and JOCN. He is the Fellow of the IEEE and the Fellow of the IEICE.



Ferenc Krausz

Max Planck Institute of Quantum Optics, Germany

Ferenc Krausz was born in Hungary in 1962. He studied Electrical Engineering and Physics. In 1991 he obtained his doctorate in Quantum Electronics and Laser Technology and became a professor in 1999 at the Vienna University of Technology. In 2003 Professor Krausz was appointed director at the Max Planck Institute of Quantum Optics in Garching and holds a Chair in Experimental Physics (Laser Physics) at LMU Munich since 2004. He is also director

of the Cluster of Excellence: Munich Centre for Advanced Photonics. Ferenc Krausz has made pioneering contributions to advancing femtosecond and creating attosecond technology.



Ed Moses

National Ignition Facility, Lawrence Livermore National Laboratory, USA

Dr Moses is the Director of the National Ignition Facility, the world's largest and most energetic laser system. He is also the National Director of the National Ignition Campaign to achieve fusion ignition in the laboratory. Dr Moses is internationally recognised in laser and optical sciences and holds several patents and many honors including the Fusion Power Associates 2008 Leadership Award and the Memorial DS Rozhdestvensky Medal for Outstanding Contributions to Lasers and Optical Sciences. Dr Moses is a member of the National Academy of Engineering and a Fellow of SPIE and the American Association for the Advancement of Science.



Oskar Painter

California Institute of Technology, USA

Oskar Painter received his BSEE from the University of British Columbia in 1994, his Master's Degree of Science from the California Institute of Technology in 1995, and his Ph.D. in Electrical Engineering from the California Institute of Technology in 2001. In 2000 he helped found Xponent Photonics, an optical start-up company developing surface-mount photonics for telecom and data networking applications. In 2002 he returned to the California Institute of Technology, where he is currently a Professor of Applied Physics and Executive Officer of the Department of Applied Physics and Materials Science.

Dr Painter's general research interests lie in studying new and interesting ways in which light behaves within micro- and nano-scale dielectric and metallic structures. Specific areas of research include semiconductor cavity QED, integrated microphotonics, surface-plasmon physics and devices, and most recently cavity optomechanics.



Jun Ye
University of Colorado, USA

Jun Ye is a Fellow of JILA and Physics Professor Adjoint at the University of Colorado. He is also a Fellow of NIST, of the American Physical Society, and of the Optical Society of America. His research includes precision measurement and metrology, ultracold matters, ultrafast science and quantum control. He has co-authored over 200 papers and delivered over 250 invited talks. Honors include I. I. Rabi Prize (APS), European Frequency & Time Forum Award, Carl Zeiss Award, W. F. Meggers Award, A. Lomb Medal (OSA), A. S. Flemming Award, Presidential Early Career Award for Scientists and Engineers, Gold Medal (U.S. Commerce Department), F. W. Bessel Award (Humboldt Foundation), S. W. Stratton Award (NIST), and Frew Fellowship (Australian Academy of Science).

Workshops

Expert panels will present the issues for each workshop topic, and much of the session will be devoted to open debate, with vigorous participation of the audience strongly encouraged.

Attendance at workshops is included in the registration fee. However, participant numbers are limited and early registration is encouraged to avoid disappointment. Please indicate your preference to attend when registering.

The following half day workshops will be held on **Sunday 28 August 2011** at the **Sydney Convention and Exhibition Centre**, Level 2:

- Workshop 1: Modulation formats and signal processing techniques to approach the Shannon limit
- Workshop 2: Metamaterials for cloaking: fundamental curiosity or breakthrough technology?
- Workshop 3: Platforms for quantum computing – which way forward?
- Workshop 4: Will guided-wave parametric processing ever move out of the lab?
- Workshop 5: Introduction into fabrication for optics and photonics

Workshop 1: Modulation formats and signal processing techniques to approach the Shannon limit

1030-1330 Sunday 28 August 2011

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

In the last decade, a variety of modulation formats have been explored as means of achieving efficient data encoding in optical communications systems. These include return-zero (RZ), differential phase-shift keying (DPSK), coherent QPSK, and OFDM, amongst others. The need to accommodate the complexity of these encoding systems has been driven by the need for efficient use of the optical spectrum, which has become a critical factor in enabling ever increasing internet traffic. The recent progress in optical coherent detection, aided by rapid advances in electronic digital signal processing (DSP), has brought about many exciting experiments with record-breaking spectral efficiency.

In this workshop, we will first discuss the current status of optical fiber capacity in relation to the theoretical Shannon limit. Second, we will compare the performance of different modulation formats in combating optical noise and fiber nonlinearity – the two fundamental impairments limiting fibre optic communications systems. We will also debate a possible roadmap for pushing the channel bit rate from 100 Gb/s to beyond 400 Gb/s and 1 Tb/s, taking into account signal baud rate and data modulation format requirements, and the expected data traffic growth in future optical networks.

Presenters:

- **Mark Pelusi** (The University of Sydney, Australia)
- **William 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)
 - **Steve Frisken** (Finisar)
 - **Jinno Masahiko** (NTT Network Innovation Laboratories)
 - **Vincent Chan** (Massachusetts Institute of Technology, USA)
-

Workshop 2: Metamaterials for cloaking: fundamental curiosity or breakthrough technology?

1030-1330 Sunday 28 August 2011

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

Making objects invisible has been a dream of humankind for millennia. However, only recently have researchers shown that cloaking is not just a dream: they have found a solution through the development of new artificial metamaterials. A surge of recent activities has led to a number of designs for electromagnetic cloaks, operating at single frequency or hiding objects “under the carpet”. But are such ideas practical for applications, and what are the hidden challenges of realistic cloaking?

In this workshop, we aim to spark discussion on important open questions in the field of optical metamaterials for cloaking applications: is it possible to achieve broadband cloaking of objects? What sort of new technologies do we still need to develop for this? Is covering a system essential for cloaking? Delving into the answers to these questions will reveal knowledge that has not until now been discussed in the popular press. While practical solutions might be difficult to achieve we may uncover other ideas, like disguising the shape of an object rather than cloaking it, or applying cloaking concepts from optics to other fields such as acoustics or plasmonics.

- **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)
-

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

1430-1730 Sunday 28 August 2011

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

The prospect of quantum computing is an exciting development that has spread across many sub-fields of physics. The challenge is to use individual quantum systems for storage and processing of quantum information – one must be able to control and measure a quantum bit (qubit) at the same time that it is sufficiently isolated from its environment to avoid noise that causes decoherence.

Physical implementations of qubits range from microscopic systems, such as trapped atoms (or ions) and electron and nuclear spins, to mesoscopic devices and systems of linear optics. But which is best? Are all qubits created equally?

Isolated trapped atoms, electron and nuclear spins, and especially single photons are naturally protected from decoherence due to weak environmental coupling. Solid state qubits, on the other hand, couple very strongly to external fields, allowing fast manipulation and direct interfacing to electrical circuits. Although rudimentary logic functions have been achieved, fundamental problems associated with decoherence, entanglement and quantum-limited measurements remain to be solved.

In this workshop, a panel of international standing in quantum information science will debate the strengths and weaknesses of the various platforms for representing, storing and processing qubits.

Presenters:

- **Andrew White** (University of Queensland, Australia)
- **Andrew Greentree** (The University of Melbourne, Australia)
- **Andrew Doherty** (University of Sydney, Australia)
- **David Reilly** (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 Kielpinski** (Griffith University, Australia)

Workshop 4: Will guided-wave parametric processing ever move out of the lab?

1430-1730 Sunday 28 August 2011

Organisers: Michel Marhic (Swansea University, UK)

Jochen Schroeder (University of Sydney, Australia)

Chunle Xiong (University of Sydney, Australia)

Parametric optical processes have been studied for decades and have had significant commercial success in bulk-crystal based applications such as optical parametric oscillators (OPOs). In recent years much research has focused on exploiting cubic nonlinearities in optical waveguides and fibres. However, applications based on this work have yet to make a significant commercial impact, and parametric processes have thus far taken a back seat in optical communications systems compared to Raman or rare-earth doped amplification for example. Is parametric amplification and processing in waveguides and fibers the way of the future, or will it be limited to niche applications?

This workshop will review recent research on guided-wave parametric processing such as wavelength conversion, parametric amplification, optical signal processing and quantum applications, and will discuss their potential commercial exploitation.

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

Workshop 5: Introduction to fabrication for optics and photonics

1430-1730 hours Sunday 28 August 2011

Organisers: ANFF

University and industrial research into optics or photonics relies heavily on the ability to fabricate novel materials, structures or devices. The workshop introduces the basic methods for optical materials fabrication and the tool kit provided by the eight Nodes of the Australian National Fabrication Facility. Speakers are world experts in their respective fields, primarily from the “OptoFab” Node which specialises in optics and photonics fabrication.

Topics of the workshop will include:

- Lithography, Deposition and Etching – The basics of micro and nanolithography
- Laser based fabrication – Laser machining and femtosecond laser fabrication
- Optics and Fibres – Glass and polymer optic fibre fabrication
- Case studies – Diamond waveguides and the Bionic Eye project

The aim of the workshop is to assist post-graduate, post-doctoral and early career researchers understand the basic principles of fabrication for optics and photonics, and the range of facilities and expertise they have at their disposal through the Australian National Fabrication Facility (ANFF).

Program

Introduction

What is the Australian National Fabrication Facility – ANFF Ltd

Module 1:

Photolithography – Linda Macks (NSW Node) and Dave O’Connor (OptoFab Node)

Lithography, deposition and etching

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:

Optics and Fibres

Fabrication and development of new optical glasses and fibres - 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)

Case study: Bionic eye – Stephen Praver (Vic Node)

Committees

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Prem Kumar (Northwestern University)

Gerd Leuchs (Max Planck Institute for the Science of Light, Erlangen)

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Martijn de Sterke (University of Sydney, Australia)

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PROGRAMME AT A GLANCE

Sunday 28 August 2011

1030-1330	Morning Workshops
Room 204A	Workshop 1: Modulation Formats and Signal Processing Techniques to Approach the Shannon Limit
Room 204B	Workshop 2: Metamaterials for Cloaking: Fundamental Curiosity or Breakthrough Technology?
1330-1430	Lunch Break
1430-1730	Afternoon Workshops
Room 204A	Workshop 3: Platforms for Quantum Computing – Which Way Forward?
Room 204B	Workshop 4: Will Guided-wave Parametric Processing Ever Move Out of the Lab?
Room 201	Workshop 5: Introduction into Fabrication for Optics and Photonics
1730-1900	Welcome Reception - Parkside Ballroom

Monday 29 August 2011

Room	<i>Bayside Auditorium A</i>						
0900-0915	Opening Ceremony						
0915-1000	Plenary Session 1 - Jun Ye						
1000-1030	Official Opening and OSA Advocate of Optics Award Ceremony - Senator Stephen Conroy						
1030-1100	Morning Tea - Bayside Gallery						
1100-1300	PARALLEL SYMPOSIA - SESSION 1						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 1:	Symposium 2:	Symposium 3:	Symposium 4:	Symposium 5:	Symposium 6:	Symposium 7:
	Nanophotonics 1 (2210)	Semiconductor Lasers (2220)	Mode-locked Fibre Lasers (2230)	Photonic Devices and Modelling (2240)	Biophotonics (2250)	Nonclassical States of Light (2260)	Atom Optics and Interferometry (2270)
1300-1400	Lunch - Bayside Gallery						
1400-1530	PARALLEL SYMPOSIA - SESSION 2						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 4:	Symposium 2:	Symposium 1:	Symposium 3:	Symposium 7:	Symposium 5:	Symposium 6:
	Metamaterials (2440)	Applied Nonlinear Optics 1 (2420)	Gratings and Sensing (2410)	Silicon Photonics (2430)	Ultrafast Laser Modification of Optical Materials (2470)	Imaging and 3D Displays (2450)	Attosecond and Extreme UV Science (2460)
1530-1600	Afternoon Tea - Bayside Gallery						
1600-1730	PARALLEL SYMPOSIA - SESSION 3						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 1:	Symposium 2:	Symposium 3:	Symposium 4:	Symposium 5:	Symposium 6:	Symposium 7:
	Nanoparticles and Applications (2610)	Applied Nonlinear Optics 2 (2620)	High Power Laser Technology (2630)	Optical Signal Processing (2640)	Frequency Dissemination and Frequency Control (2650)	Cavity Quantum Electrodynamics (2660)	Ultrafast Dynamics (2670)
1730-1930	Poster Session 1 (2700) - Bayside Terrace, Level 2						

Tuesday 30 August 2011

Room	<i>Bayside Auditorium A</i>						
0830-1015	Plenary Session 2 - Mark Kasevich						
0915-0930	Award Presentations						
0930-1015	Plenary Session 2 continued - Ken-ichi Kitayama						
1015-1045	Morning Tea - Bayside Gallery						
1045-1245	PARALLEL SYMPOSIA - SESSION 4						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 4:	Symposium 2:	Symposium 1:	Symposium 3:	Symposium 5:	Symposium 6:	Symposium 7:
	Pulsed Fibre Lasers (3240)	Precision Interferometry (3220)	Frequency Conversion of Solid State lasers (3210)	Semiconductor Modulators and Beam Optics (3230)	Nanophotonic Sensing and Imaging (3250)	Plasmonics (3260)	Quantum Information 1 (3270)
1245-1400	Lunch - Bayside Gallery						
1400-1530	PARALLEL SYMPOSIA - SESSION 5						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 1:	Symposium 2:	Symposium 3:	Symposium 4:	Symposium 6:	Symposium 5:	Symposium 7:
	Spectroscopy and Chemical Applications (3410)	Applied Nonlinear Optics 3 (3420)	THz Sources (3430)	Passive Optical Networks (3440)	Femtosecond Laser Microfabrication (3460)	Optical Information Processing and Computing (3450)	Quantum Information 2 (3470)
1530-1600	Afternoon Tea - Bayside Gallery						

1600-1730	PARALLEL SYMPOSIA - SESSION 6 (3600)						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 1:	Symposium 2:	Symposium 3:	Symposium 4:	Symposium 5:	Symposium 6:	Symposium 7:
	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)
1730-1930	Poster Session 2 (3700) - Bayside Terrace, Level 2						

Wednesday 31 August 2011

Room	<i>Bayside Auditorium A</i>						
0830-1030	Plenary Session 3						
0830-0915	Ferenc Krausz						
0915-1000	Ed Moses						
1000-1030	Morning Tea - Bayside Gallery						
1030-1230	PARALLEL SYMPOSIA - SESSION 7						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 1:	Symposium 2:	Symposium 3:	Symposium 4:	Symposium 5:	Symposium 6:	Symposium 7:
	Novel Fibres and Fibre Characterisation (4210)	Solid-State Laser Engineering (4220)	Biomedical Applications (4250)	Novel Photonic Devices (4240)	Nanophotonics 2 (4230)	Phase Stabilization and Pulse Characterisation (4260)	Quantum Science in Atoms, Molecules and Solids 2 (4470)
1230-1400	Lunch - Bayside Gallery						
1400-1530	PARALLEL SYMPOSIA - SESSION 8						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 1:	Symposium 5:	Symposium 3:	Symposium 4:	Symposium 2:	Symposium 6:	Symposium 7:
	Fibre Sensors 1 (4410)	High Power Laser Installation (4450)	Microscopic Imaging and Tomography (4430)	In-Building and Green Networks (4440)	Guiding THz (4420)	Fundamentals of Nonlinear Optics 2 (4460)	Quantum Science in Atoms, Molecules and Solids 1 (4470)
1530-1600	Afternoon Tea - Bayside Gallery						
1600-1730	PARALLEL SYMPOSIA - SESSION 9						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 1:	Symposium 4:	Symposium 2:	Symposium 3:	Symposium 5:	Symposium 6:	Symposium 7:
	Fibre Sensors 2 (4610)	High Power Laser Physics (4640)	High Resolution Spectroscopy (4620)	Sources and Amplifiers (4630)	Optical Storage (4650)	Fundamentals of Nonlinear Optics 3 (4660)	Novel Systems: Photons, Ions, Molecules and Atoms (4670)
1730-1930	Poster Session 3 (4700) - Bayside Terrace, Level 2						
1930	Conference Dinner - Dockside						

Thursday 1 September 2011

Room	<i>Bayside Auditorium A</i>						
0830-0915	Plenary Session 4 - Joss Bland-Hawthorn						
0920-1005	PARALLEL SYMPOSIA - SESSION 10						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 1:	Symposium 3:	Symposium 4:	Symposium 2:	Symposium 5:	Symposium 6:	Symposium 7:
	Broadband Fibre Sources (5210)	Holography (5230)	LEDs (5240)	Optical Nanoscopy (5220)	Short-Pulse Characterisation (5250)	Single Photon Sources and Interference (5260)	Application of Correlated Photons (5270)
1005-1030	Morning Tea - Bayside Gallery						
1030-1230	PARALLEL SYMPOSIA - SESSION 11						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 1:	Symposium 2:	Symposium 3:	Symposium 4:	Symposium 5:	Symposium 6:	Symposium 7:
	IR Astrophotonics (5410)	Waveguide Lasers (5420)	Photonic Crystals and Nano-Crystals (5430)	Nanophotonics 3 (5440)	Optical Trapping and Tweezers (5450)	Dimensionality and Non-Equilibrium Phenomena (5460)	Precision Measurements and Fundamental Tests (5470)
1230-1400	Lunch - Bayside Gallery						
1400-1530	PARALLEL SYMPOSIA - SESSION 12						
Room	<i>Bayside Auditorium A</i>	<i>Bayside 101</i>	<i>Bayside 102</i>	<i>Bayside 103</i>	<i>Bayside 104</i>	<i>Bayside 105</i>	<i>Bayside 106</i>
	Symposium 1:	Symposium 2:	Symposium 3:	Symposium 4:	Symposium 5:	Symposium 6:	Symposium 7:
	Nanophotonic Fabrication (5610)	Frequency and Temporal Control of Solid State Lasers (5620)	Semiconductors /Thin Films (5630)	Symposium on Green Photonics (5640)	Novel Sources (5650)	Ultrafast Optics of the Solid State (5660)	CPT + Equivalence Principle Tests (5670)
1530-1600	Afternoon Tea - Bayside Gallery						
1600-1700	Post Deadline Sessions						
Room	<i>Bayside Auditorium A</i>						
1705-1750	Plenary Session 5 - Oskar Painter						
1750-1800	Conference Closing and Student Prizes Ceremony						



Symposia

1. ***Green Photonics***
2. ***Super Resolution***

CLEO Pacific Rim

1. ***Applied nonlinear optics***
(topics include but are not limited to: quadratic, cubic and higher-order nonlinear processes, stimulated scattering)
2. ***Fiber amplifiers, lasers, sensors and devices***
(topics include, but are not limited to: fiber lasers, CW and pulsed, Raman amplifiers, nonlinear effects in fibers, fiber sensors, fiber design, materials, fabrication, and characterization)
3. ***High Power Laser Technology and High Energy Density Physics***
(topics include but are not limited to: high-power laser design and construction, the physics of matter and radiation under extreme energy density conditions)
4. ***Information Optics, Optical Storage and Displays***
(topics include but are not limited to: optical information processing, optical data storage, optical displays)
5. ***Infrared and THz technology, and Astrophotonics***
(topics include, but are not limited to: sources and systems providing access to the far-infrared region of the spectrum, in the approximate range from 200 GHz to 10 THz, applications in astrophotonics)
6. ***Integrated and Guided-Wave Optics and Thin Film Optics***
(topics include but are not limited to: integrated optics, waveguides, thin films)
7. ***Laser Chemistry, Biophotonics and Applications***
(topics include but are not limited to: biomedical optics, laser medical diagnostics and therapeutics, optofluidics, state selective chemistry, time resolved chemistry, spectroscopy, chemical dynamics)
8. ***Laser Metrology and Remote Sensing***
(topics include, but are not limited to: optical devices, instruments, and technologies for precision measurements, optical standards, remote sensing)
9. ***Laser Processing, Laser Microfabrication, and Industrial Applications***
(topics include but are not limited to: laser machining, laser materials modification, laser deposition)



10. Optical Communications and Networking

(topics include, but are not limited to: long- and short-haul fiber-optic communication systems and networks; fiber nonlinearities and other transmission impairments; advanced optical modulation formats)

11. Semiconductor and Electro-optic Devices

(topics include but are not limited to: semiconductor lasers emitting at any frequency, laser arrays, semiconductor laser modeling, modulators and other EO devices)

12. Solid-State Laser and Other Lasers, and Laser Materials

(topics include, but are not limited to: spectroscopic investigations of laser media, lasers emitting at any wavelengths, modeling of lasers)

Joint CPR / IQEC

1. Nanophotonics

(topics include but are not limited to: plasmonics, near-field optics, metamaterials and nanomechanics)

2. Ultrafast Laser Science

(topics include but are not limited to: attosecond and femtosecond processes, high field physics, high harmonic generation)

3. Ultrafast Optics and Photonics

(topics include but are not limited to: ultrafast lasers, attosecond and femtosecond pulse generation, photonic switching)

IQEC

1. Cold Atoms and Molecules

(topics include but are not limited to: laser cooling and trapping, cold molecule formation, Bose-Einstein condensation, degenerate Fermi gases, atom optics, quantum emulation with cold atoms, ion trapping)

2. Fundamentals of Nonlinear Optics

(topics include but are not limited to: dynamics, instabilities and pattern formation)

3. Precision Measurements and Fundamental Tests

(topics include but are not limited to: ultra-high resolution spectroscopy, atomic clocks, variation of fundamental constants, measurement tests of physical principles)

4. Quantum Information and Cryptography

(topics include but are not limited to: quantum computing in atoms and ions, optical quantum computing, quantum cryptography, quantum control, quantum repeaters)



5. **Quantum Optics** (topics include but are not limited to: optical entanglement, quantum imaging, single photon devices)

6. **Quantum Science in Atoms, Molecules and Solids**
(topics include but are not limited to: information storage, slow light, coherent control of matter)

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 Neshev (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 Kielpinski** (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 performed 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

Nanophotonics 1 (2210)

Symposium 1

Chair: Min Gu, Swinburne University, AUSTRALIA

1100-1130 **2210-IT-1**

INVITED SPEAKER

Aniwat Tандаечанурат¹, Yasutomu 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 101

Semiconductor Lasers (2220)

Symposium 2

Chair: Chennupati Jagadish, Australian National University, AUSTRALIA

1100-1115 **2220-CT-1**

Katsuaki Tanabe¹, Satoshi Iwamoto^{1,2}, Yasuhiko Arakawa^{1,2}

1. Institute for Nano Quantum Information Electronics, University of Tokyo, Japan
2. Institute of Industrial Science, University of Tokyo, Japan

Proposal and Design of III-V/Si Hybrid Lasers with Current Injection across Conductive Wafer-Bonded Heterointerfaces

Room: Bayside 102

Mode-locked Fibre Lasers (2230)

Symposium 3

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

1100-1115 **2230-CT-1**

Norihiko Nishizawa¹, Yuto Nozaki¹, Youichi Sakakibara^{2,3}, Emiko 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

Room: Bayside 103

Photonic Devices and Modelling (2240)

Symposium 4

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

1100-1115 **2240-CT-1**

Nadav Gutman¹, Hugo Dupree¹, Lindsay C. Botten², Andrey 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. 3CUDOS, School of Physics, Australian National University, Australia

Stationary Inflection

Room: Bayside 104

Biophotonics (2250)

Symposium 5

Chair: Jin Dayong, Macquarie University, AUSTRALIA

1100-1130 **2250-IT-1**

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 **2260-CT-1**

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

Room: Bayside 106

Atom Optics and Interferometry (2270)

Symposium 7

Chair: Matthew Davis, University of Queensland, AUSTRALIA

1100-1115 **2270-CT-1**

Karen Kheruntsyan¹, T. Jacqmin², J. Armijo², T. Berrada^{2,3}, I. Bouchole²

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, Atominsttitu, 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 Botten², 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.

ACOFT Presentation

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 Wolf², Nikolai Ledentsov¹, Dieter Bimberg²

1. VI Systems GmbH, Germany
2. Technische University of 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-Wein Lin³, Yinchieh 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 Chia 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 Photonic Engineering, Yuan Ze University, Taiwan

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

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. CINTRA CNRS/NTU/THALES, UMI 3288, Research Techno Plaza, 50 Nanyang Drive, Singapore
3. Institute of Microelectronics, Singapore

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 Soeller**¹

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

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, Yiyan 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

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, DOQS, ANU, Australia

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 Kumar**¹

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

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. Debs¹, 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 Braive**², Isabelle Sagnes², Olivier Arcizet³, Alexios Beveratos², Tobias Kippenberg¹, Isabelle Robert²

1. *Ecole Polytechnique Federale de Lausanne, Switzerland*

Semiconductor Lasers (2220)
continued

1200-1215 **2220-CT-4**
Hooman A. Davani¹, Christian Grasse², Benjamin Kögel³, Christian Gierl¹, Karolina Zogal¹, Tobias Gründl², Petter Westbergh³, Sandro Jatta¹, Gerhard Böhm²

1. *Technical University Darmstadt, Germany*
2. *Walter Schottky Institut, Germany*
3. *Chalmers University of Technology, Sweden*

Widely Electro Thermal Tunable Bulk-Micromachined MEMS-VCSEL Operating Around 850nm

We present a tunable MEMS-VCSEL operating around 850 nm wavelength with the highest reported continuous tuning range of 37 nm achieved with semiconductor DBRs. The electro thermal tuning speed of the device reaches 700 Hz.

1215-1230 **2220-CT-5**
Kenji Kamide¹, Tetsuo Ogawa¹

1. *Department of Physics, Osaka University, Japan*

Many-body Model for Single-mode Laser Operations in Semiconductor Microcavities

Single-mode laser operations are investigated using many-body models of semiconductor microcavities. The input-output characteristics and the linear stability show the strong temperature dependencies due to the sensitivity of the excitonic gain to the temperature.

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, Kyunghwan Oh³, 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 Wang**¹

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**

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

1. *CUDOS & IPOS, 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 Monat^{1,2}, Alex Clark^{1,3}, Christian Grillet¹, Graham Marshall⁴, Michael Steel⁴, Juntao Li³, 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, Qiongy He¹, Shiguo Peng¹, **Margaret Reid**¹

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 **2210-CT-6**

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 **2210-CT-7**

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 **2220-CT-6**

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.

1245-1300 **2220-CT-7**

Jian-Dong Lin¹, **Yong-Zhen Huang**¹, Yue-De Yang¹, Qi-Feng Yao¹, Xiao-Meng Lv¹, Jin-Long Xiao¹, Yun Du¹

1. *State Key Lab on Integrated Optoelectronics, Institute of Semiconductors, CAS China*

Single Mode AlGaInAs/InP Hexagonal Resonator Microlasers

AlGaInAs/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 μm and output waveguide width of 2 μm .

pulse centered at 1035 nm was generated at 1.05 MHz repetition rate.

1200-1230 **2230-IT-5**

INVITED SPEAKER

I. Hartl¹, 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, at 120fs and 150MHz of an Yb-fiber laser and sub-100fs Tm-fiber-systems. Those sources are CEO-phase stabilized for advanced frequency comb applications

1230-1245 **2230-CT-6**

Chang Su Jun¹, Ju Hee Im², Sang Hwa Yoo³, Byoung Yoon Kim¹, Sun Young Choi², 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.

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

Fast Simulation of Slab Photonic Crystal 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 **2240-CT-6**

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 Astrophotonics, Australia*
4. *Australian Astronomical Observatory, Australia*
5. *Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), Australia*

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.

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

1230-1245 **2250-CT-6**

Almar Palonpon^{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 **2250-CT-7**

So V. Pham¹, Meindert Dijkstra¹, Anton J. F. Hollin¹, R. M. de Ridder¹, Henk A. G. M. van Wolferen¹, Gijs J.M. Krijnen¹, **Markus Pollnau**¹ 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

1200-1215 **2260-CT-5**

A McMillan¹, M Delgado-Pinar¹, J Rarity², **W Wadsworth**¹

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 telecoms wavelengths, from a 1064 nm pump through cross-polarised four-wave mixing.

1215-1230 **2260-CT-6**

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

1. *CQIQC, 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. *ACOFT Presentation*

in Ultracold Quantum Gases

Correlations are a fundamental property of matter waves, and the single wavefunction that describes a Bose-Einstein condensate (BEC) is in principle characterised by long range coherence to all orders. Here we measure the higher order correlation properties of ultra-cold matter waves and use them to probe the coherence of the gas.

1230-1245 **2270-CT-6**

Andrei Sidorov¹, Mikhail Egorov¹, Russell Anderson², Valentin Ivannikov¹, Bogdan Opanchuk¹, Peter Drummond¹, Brenton Hall¹

1. *CAOUS, 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 **2270-CT-7**

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

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-CT7**
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 countercirculating mode-locked pulse trains, each with individual fundamental repetition. In the experiment, two countercirculating 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 Gaeta¹

1. Cornell University, USA

Novel CMOS-Compatible Sources Based On Nonlinear Optics

Biophotonics (2250) *continued*

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

Nonclassical States of Light (2260) *continued*

Presentation withdrawn

Atom Optics and Interferometry (2270) *continued*

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

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 Choi¹, Seung Hoon Lee¹, Yushin Kim¹, Seung Beom Kang², Jonghwa Shin³, Min Hwan Kwak², Kwang-Young Kang², Yong-Hee Lee³, Namkyoo Park⁴,

1. Mechanical Engineering, KAIST, Korea
2. ETRI, Korea
3. Physics, KAIST, Korea
4. EECS, Seoul National University, Korea

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.

1430-1445 **2440-CT-2**

Ann Roberts¹, Ling Lin¹

1. The University of Melbourne, Australia

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.

1445-1500 **2440-CT-3**

A.A. Asatryan¹, L.C. Botten¹, M.A. Byrne¹, V.D. Freilikher², S.A. Gredeskul^{3,4}, I.V. Shadrivov⁴, R.C. McPhedran⁵, Yu.A. Kivshar^{4,6}

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}

1. CUDOS, ARC Centre of Excellence, Australia
2. School of Physics, University of Sydney, Australia
3. University of Technology Sydney, Australia
4. Laser Physics Centre, Australian National University, Australia

On-chip cascaded Brillouin stimulated Brillouin scattering

We present the first demonstration of on-chip, cascaded stimulated Brillouin scattering. Multiple Stokes lines were generated in a 50 mm chalcogenide waveguide along with the anti-Stokes lines, generated from four-wave mixing between pump and Stokes

1415-1430 **2420-CT-2**

Hashan Tilanka Munasinghe¹, Shahraam Afshar Vahid¹, David Richardson², Tanya Monro¹

1. Institute for Photonics and Advanced Sensing, University of Adelaide, Australia
2. Optoelectronics Research Centre, University of Southampton, UK

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 **2410-IT-1**

INVITED SPEAKER

Qingwen Liu¹, Zuyuan He¹, Tomochika Togunaga², Kazuo Hotate¹

1. Dept. of Electrical Engineering and Information Systems, The University of Tokyo, Japan
2. Dept. of Environment Systems, The University of Tokyo, Japan

An Ultra-high-resolution Large-dynamic-range Fiber Optic Static Strain Sensor Using Pound-Drever-Hall Technique

In this paper we report the realization of a fiber optic static strain sensor with ultra-high resolution and large dynamic range for the applications of geophysical research. The sensor consists of a pair of fiber Bragg grating based Fabry-Perot interferometers for strain sensing and reference, respectively. Pound-Drever-Hall technique is employed to interrogate the sensor heads, and a cross-correlation algorithm is used to figure out the strain information with high precision. Static strain resolution down to 4.5 nano-strain was demonstrated. The dynamic range can be extended up to hundreds of micro-strain, and the measuring period is a few tens of seconds. ACOFT Presentation

1430-1445 **2410-CT-2**

Robert J. Williams¹, Christian Voigtlander², Graham D. Marshall¹, Andreas Tunnermann², Stefan Nolte², M. J. Steel¹, Michael J. Withford¹

1. CUDOS, MQ Photonics Research Centre, Macquarie University, Australia
2. Institute of Applied Physics, Friedrich-Schiller-University, Germany

1400-1415 **2430-CT-1**

Chad Husko¹, Trung Vo¹, Bill Corcoran¹, Juntao Li², Thomas Krauss², Benjamin Eggleton¹

1. Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), Australia
2. School of Physics and Astronomy, University of St Andrews, UK

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.

1415-1430 **2430-CT-2**

Marcello Ferrera^{1,2}, Yang-Woo Park¹, Luca Razzari^{1,3}, Brent Little⁴, Chu Sai⁴, Roberto Morandotti¹, David Moss⁵, Jose Azana¹

1. INRS - Énergie, Matériaux et Télécommunications, (Québec), Canada
2. University of St Andrews, School of Physics and Astronomy, North Haugh, Scotland
3. IIT, Istituto Italiano di Tecnologia, Via Morego, Italy
4. Infinera Ltd, 169 Java Drive, California, USA
5. CUDOS, School of Physics, University of Sydney, Australia

Monolithic CMOS Compatible 1st and 2nd Order 400GHz All-Optical Integrator

We demonstrate 1st and 2nd order all-optical ultra-high speed temporal integration of complex optical

1400-1430 **2470-IT-1**

INVITED SPEAKER

Roberto Osellame¹

1. Institute for Photonics and Nanotechnologies (IFN) – CNR, Italy

Femtosecond Laser Micromachining As An Enabling Tool For Optofluidics And Quantum Optics

The use of femtosecond lasers as microfabrication tools to produce three-dimensional photonic circuits and optofluidic networks in transparent materials is reported. Applications to on-chip optical sensing in lab-on-a-chip and integrated quantum circuits will be discussed.

1430-1445 **2470-CT-2**

S. Juodkazis¹, D. de Ligny², R. Buividas¹, C. Hnatovsky³, E. G. Gamaly³, A. V. Rode³

1. Centre for Micro-Photonics, Faculty of Engineering and Industrial Sciences, Swinburne University of Technology, Hawthorn, VIC, 3122, Australia
2. Université Lyon 1, Université de Lyon, Laboratoire de Physico-Chimie des Matériaux Luminescents, France
3. Laser Physics Centre, Research School of Physics and Engineering, The Australian National University, Australia

Femtosecond Laser Structuring of Amorphous and Crystalline Materials

Femtosecond laser fabrication via optical breakdown on the surface and inside the volume is demonstrated in crystalline olivine. Structural modifications have been revealed after irradiation by single fs-laser pulses.

ACOFT Presentation

1400-1415 **2450-CT-1**

I-Ching Chen¹, Yi-Wen Chiu¹, Ljiljana Fruk², Yu-Chueh Hung¹

1. Institute of Photonics Technologies, National Tsing Hua University, Taiwan
2. DFG-Centre for Functional Nanostructures, Karlsruhe Institute of Technology, Germany

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.

1415-1430 **2450-CT-2**

Soon-gi Park¹, Jonghyun Kim¹, Youngmin Kim¹, Sung-Wook Min², Byoungso Lee¹

1. School of Electrical Engineering, Seoul National University, Korea
2. Department of Information Display, Kyung Hee University, Korea

5-layered Depth-fused Three-dimensional Display Using 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.

1430-1500 **2450-IT-3**

INVITED SPEAKER

Ye Pu¹, Chia-Lung Hsieh¹, Rachel Grange¹, Xin Yang¹, Ioannis Papadopoulos¹, Demetri

1400-1415 **2460-CT-1**

Dong Hyuk Ko¹, Kyung Taec Kim², Jae-Hwan Lee¹, **Chang Hee Nam**¹

1. Department of Physics and Coherent X-ray Research Center, KAIST, Korea
2. Advanced Photonics Research Institute, GIST, Korea

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.

1415-1430 **2460-CT-2**

Michael Pullen^{1,2}, William Wallace^{1,2}, Dane Laban^{1,2}, Adam Palmer^{1,2}, Friedrich Hanne³, Alexei Grum-Grzhimailo^{4,5}, Brant Abeln⁴, Klaus Bartschat⁴, Dan Wefflen⁴, Igor Ivanov⁶

1. ARC Centre of Excellence for Coherent X-Ray Science, Griffith University, Australia
2. Australian Attosecond Science Facility and Centre for Quantum Dynamics, Australia
3. Atomic and Electronics Physics Group, Westfälische Wilhelms-University, Germany
4. Department of Physics and Astronomy, Drake University, Australia
5. Institute of Nuclear Physics, Moscow State University, Russia
6. Research School of Physical Sciences, The Australian National University, Australia
7. ARC Centre of Excellence for Coherent X-Ray Science, University of Melbourne, Australia

Monday 29 August 2011

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, Raman-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 Universite, 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. Lohe¹, Tanya M. Monro¹, 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 Hinckley¹**

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

A Fibre Bragg Grating Based Reed Switch 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 Bal¹, Will Brown², Wade Scott A², Fotios 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.

1430-1445 **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 PCWs 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. Lancry¹, B. Poumellec¹, K. Cook², **J. Canning²**

1. *LPCES/ICMMO, 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 Formation During Femtosecond Laser Irradiation In Silica

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

ACOFT Presentation

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-Hyeong 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.. Aoyama⁴, K. Yamakawa⁴, T. Sato^{2,5}, A. Iwasaki⁵, S. Owada⁵, K. Yamanouchi⁵, 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. Yabashi², K. Midorikawa¹, T. Ishikawa²

1. *RIKEN Advanced Science Institute, Hirosawa, Japan*
2. *RIKEN, XFEL Project Head Office, Sayo, Hyogo, Japan*
3. *Japan Atomic Energy Agency, Quantum Beam Science Directorate, Japan*
4. *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.

Chunlei Xiong², Ben Eggleton²

1. *(CUDOS), Laser Physics Centre, The Australian National University, Australia*

2. *(CUDOS), (IPOS), 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.

ACOFT 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.

ACOFT 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, Aimé 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 **2450-CT-5**

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 Gaffney^{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.

Room: Bayside Auditorium A**Nanoparticles and Applications (2610)**

Symposium 1

Chair: Aniwat Tандаечанурат, Institute For Nano Quantum Information Electronics, The University of Tokyo, JAPAN

1600-1630 **2610-IT-1****INVITED SPEAKER****Ning Dai¹**

1. *Shanghai Institute of Technical Physics, China*

Fabrication Of Solar Cells Using Semiconductor Quantum Dots And Nano-Materials

We report the fabrication of CdSe, 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.

1630-1645 **2610-CT-2**

Baohua Jia^{1,2}, Dario Buso^{1,2}, Zhengguang He¹, Mengxin Ren³, Joel Van Embden⁴, Paolo Falcaro², Alessandro Antonello⁵, Alessandro Martucci⁵, Min Gu¹

1. *Centre for Micro-Photonics and CUDOS, Swinburne University of Technology, Australia*
2. *CSIRO, Materials Science and Engineering, Australia*
3. *Key Laboratory of Weak Light Nonlinear Photonics, Nankai University, China*
4. *RMIT, Aerospace Mechanical & Manufacturing Engineering, Australia*
5. *Universita' di Padova, Ingegneria Meccanica - settore Materiali, Italy*

Room: Bayside 101**Applied Nonlinear Optics 2 (2620)**

Symposium 2

Chair: Shahraam Afshar, Institute for Photonics & Advanced Sensing, AUSTRALIA

1600-1615 **2620-CT-1**

Darren Hudson¹, Stephen Dekker¹, Eric Magi¹, Alex Judge¹, Stuart Jackson¹, Enbang Li¹, Jas Sanghera², Brandon Shaw², Ishwar Aggarwal², Benjamin Eggleton¹

1. *CUDOS, School of Physics, The University of Sydney, Australia*
2. *Naval Research Laboratory, USA*

Octave Spanning Supercontinuum in an As₂S₃ Taper using Ultra-low Pump Power: Experiment and Theory

An octave spanning spectrum is generated in an As₂S₃ taper via 77 pJ pulses from an ultrafast fiber laser. Chirp compensation allows the octave to be generated directly from the un-amplified laser output.

1615-1630 **2620-CT-2**

Gys Van Der Westhuizen¹, Johan Nilsson¹

1. *Optoelectronics Research Centre (ORC), University of Southampton, UK*

All-fibre OPO system for Visible Wavelengths

An all-fibre PCF-based optical parametric oscillator at 718 nm, spliced to and synchronously pumped by an all-fibre Yb-doped MOPA, reaches an average in-fibre pump-to-anti-Stokes power

Room: Bayside 102**High Power Laser Technology (2630)**

Symposium 3

Chair: Poh Boon Phua, DSO National Labs, SINGAPORE

1600-1615 **2630-CT-1**

Vladimir Pervak^{1,2}, Oleg Pronin³, Olga Razskazovskaya³, Ferenc Krausz^{1,3}

1. *Ludwig-Maximilians-Universitaet Muenchen, Am Coulombwall, Germany*
2. *Ultrafast Innovations GmbH, Am Coulombwall, Germany*
3. *Max Planck Institute of Quantum Optics, Germany*

High Dispersive Mirrors for the High Energy Lasers

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.

1615-1630 **2630-CT-2**

Hong Jin Kong¹, Sangwoo Park¹, Seongwoo Cha¹, Milan Kalal², Ondrej Slezak²

1. *KAIST, Korea*
2. *Czech Technical University, Czech Republic*

4-beam Combination Laser Using Stimulated**Room: Bayside 103****Optical Signal Processing (2640)**

Symposium 4

Chair: Mark Pelusi, CUDOS/IPOS, AUSTRALIA

1600-1630 **2640-IT-1****INVITED SPEAKER**

Cibby Pulikasseril¹, Luke A. Stewart¹, Michael A. F. Roelens¹, Glenn W. Baxter¹, Simon Poole¹, Steve Frisken¹

1. *Finisar Australia, 244 Young st., Waterloo, NSW, Australia*

Spectral Modeling of Wavelength Selective Switches for Flexible Grid Optical Networks

Spectral modeling of wavelength selective switches (WSS) has previously used supergaussian functions to predict the channel bandshape. We show that an error function-based model produces a more accurate representation of WSS channels.

ACOFT Presentation

1630-1645 **2640-CT-2**

Joel Carpenter¹, Timothy D. Wilkinson¹

1. *Electrical Engineering Division, Engineering Department, University of Cambridge, UK*

Adaptive Enhancement of Multimode Fibre Bandwidth by Twin-spot Offset Launch

A binary grating on a Spatial Light Modulator generates twin antiphase spots with adjustable positions across the core of a multimode fibre allowing adaptive excitation of

Room: Bayside 104**Frequency Dissemination and Frequency Control (2650)**

Symposium 5

Chair: Andre Luiten, University of Western Australia, AUSTRALIA

1600-1615 **2650-CT-1**

Yabai He^{1,2}, Magnus Hsu¹, Michael Wouters¹, Malcolm Gray¹, Bruce Warrington¹, Brian Orr², Daniel Shaddock³, Kenneth Baldwin⁴, Guido Aben⁵

1. *National Measurement Institute, Australia*
2. *MQ Photonics Research Centre, Macquarie University, Australia*
3. *Centre for Gravitational Physics, The Australian National University, Australia*
4. *Research School of Physics and Engineering, The Australian National University, Australia*
5. *AARNET, Australia*

An Optical Fiber-based System for High - Stability Distribution of Reference Radio-frequencies

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.

1615-1630 **2650-CT-2**

Jianhua Shang^{1,2}, Shuguang Zhao¹, Yan He², Weibiao Chen²

Room: Bayside 105**Cavity Quantum Electrodynamic (2660)**

Symposium 6:

Chair: Barry Sanders, University of Calgary, CANADA

1600-1615 **2660-CT-1**

James Quach¹, Chun-Hsu Su¹, Andrew Martin², Andrew Greentree², Lloyd Hollenberg¹

1. *Centre for Quantum Computation and Communication Technology, School of Physics, Australia*
2. *School of Physics, The University of Melbourne, Australia*

Engineering Electromagnetic Metamaterials from Coupled Cavity Arrays

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.

1615-1630 **2660-CT-2**

Scott Parkins¹, Howard Carmichael¹, Changsuk Noh¹, Steffen Zeeb¹

1. *Dan Walls Centre for Pure and Applied Optics, University of Auckland, New Zealand*

Superradiant Decay and Dipole-Dipole Interaction of Distant Atoms in a Two-Way Cascaded Cavity QED System**Room: Bayside 106****Ultrafast Dynamics (2670)**

Symposium 7

Chair: Igor Litvinyuk, Griffith University, AUSTRALIA

1600-1630 **2670-IT-1****INVITED SPEAKER**

R. J. Dwayne Miller¹

1. *University of Hamburg, Germany*

Making The Molecular Movie: First Frames..... Coming Features

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.

1630-1645 **2670-CT-2**

Jeffrey Davis¹, Christopher Hall¹, Lap Van Dao¹, Keith Carmichael¹, Changsuk Noh¹, Harry Quiney², H.H. Tan³, C. Jagadish³

1. *Swinburne University of Technology, Australia*
2. *University of Melbourne, Australia*
3. *The Australian National University, Australia*

Three-Dimensional Electronic Spectroscopy of Excitons in

Functional Three-dimensional Nonlinear Nanostructures in a Gold Ion 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 Kamp^{1,2}, 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 Friedenauer¹, Bernhard Ernstberger¹, Vladimir Karpov², Vladimir Protopopov², Wallace Clements², Wolfgang Hackenberg³, Domenico Bonaccini Calia³, Steffan A Lewis³

1. *TOPTICA 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 mJ \pm 0.3 mJ, and the output energy is 169 mJ \pm 6 mJ. The average phase fluctuations between the sub-beams are less than $\pi/26$.

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

M. Murakami¹, H. Nagatomo¹, T. Johzaki¹, K. Shigemori¹, Y. Hironaka¹, T. Watari¹, Y. Arinaga¹, T. Norimatsu¹, H. Shiraga¹, H. Azechi¹, M. Karasik², J. Weaver², Y. Aglitskiy², A. Velikovich², S. Zalesak², J. Bates², A. Schmitt², J. Sethian², S. Obenschain²

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 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.

ACOFT Presentation

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

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

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
ACOFT Presentation

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

Jia Haur Wong¹, Huy Quoc Lam², Kenneth Eng Kian Lee², Vincent Wong², Peng Huei 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. *Physikalisch-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*
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. Yamashita¹, K. Hirochi¹, H. Miyagawa¹, N. Tsurumati¹, S. Koshiba¹, S. Nakanishi¹, H. Itoh¹

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

Nanoparticles and Applications (2610) *continued*

1700-1715 **2610-CT-4**
Betty Kouskousis¹, Xinagping Li¹, Stefania Castelletto¹, Min Gu¹

1. *Centre for Micro-Photonics, Swinburne University of Technology, Australia*

Nanoscale 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. *School of Physics, The University of New South Wales, Australia*
2. *Research School of Physics and Engineering, Australia*

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.

Applied Nonlinear Optics 2 (2620) *continued*

for implementation on the Nasmyth platform inside the rotated telescope structure.

1715-1730 **2620-CT-5**

Stuart Murdoch¹, Jae Jang¹

1. *Physics Dept, University of Auckland, New Zealand*

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.

High Power Laser Technology (2630) *continued*

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. *University Of Michigan, USA*

Lasers For Inertial Fusion

Optical Signal Processing (2640) *continued*

1715-1730 **2640-CT-5**

Cibby Pulikkaseril¹, Jochen Schröder², Michaël A.F. Roelens¹

1. *Finisar Australia, 244 Young st., Waterloo, NSW, Australia*
2. *Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), School of Physics A28 The University of Sydney NSW, Australia*

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.
ACOFT Presentation

Frequency Dissemination and Frequency Control (2650) *continued*

Femtosecond Optical Frequency Comb

A gauge block evaluation system was developed and its uncertainty estimation was performed for distance estimation using the repetition interval of a femtosecond optical frequency comb, the national standard tool for measuring length in Japan.

1715-1730 **2650-CT-5**

David S. Wu¹, Radan Slavik¹, Giuseppe Marra², David J. Richardson¹

1. *Optoelectronics Research Centre, University of Southampton, UK*
2. *National Physical Laboratory, UK*

Robust Optical Injection Locking to a 250 MHz Frequency Comb without 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 1×10^{-17} at 10s averaging.

Cavity Quantum Electrodynamics (2660) *continued*

1700-1730 **2660-IT-5**

INVITED SPEAKER

Andrew Doherty¹

1. *University of Sydney, Australia*

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.

Ultrafast Dynamics (2670) *continued*

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.

ACOFT Presentation

1715-1730 **2670-CT-5**

Eugene G. Gamaly¹, **Andrei V. Rode**¹

1. *Laser Physics Centre, Research School of Physics and Engineering Australian National University, Australia*

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.

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

Stanford University, USA

Sponsored by:



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

Pulsed Fibre Lasers (3240)

Symposium 4

Chair: Ingmar Hartl, IMRA 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 101

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 102

Frequency Conversion of Solid State Lasers (3210)

Symposium 1

Chair: David Coutts, Macquarie University, AUSTRALIA

1045-1115

3210-IT-1

INVITED SPEAKER 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 103

Semiconductor Modulators and Beam Optics (3230)

Symposium 3

Chair: Robert Rehm, Fraunhofer IAF, GERMANY

1045-1100

3230-CT-1

Xiaodong Gu¹, Toshikazu Shimada¹, Fumio Koyama¹

1. *Tokyo Institute of Technology, Japan*

Giant and High-resolution Beam-steering from Slow Light Amplifier with Bragg Reflector Waveguide

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 phasemeter for application in precision length measurements using heterodyne laser interferometry. We achieve a sensitivity of 5 micro-radians/rt(Hz), corresponding to a displacement 0.5 pm/rt(Hz).

1100-1115 **3220-CT-2**
Daniel Shaddock¹, Andrew Sutton¹, Danielle Wuchenich¹, 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 71% 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 Shinkawa¹, Norihiro Ishikura¹, Toshihiro 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, Andrei Zvyagin¹

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 Bohrs 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

4. Centre for Quantum Dynamics, Griffith University, Australia

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

1. *Institute for Laser Science, University of Electro-Communications, Japan*

Q-switched Multicore Photonic Crystal Fiber Laser Phase-locked by End-seal Technique

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.

1130-1145 **3240-CT-5**

Mingzhong Li¹, Feng Jing¹, Honghuan Lin¹, Jianjun Wang¹

1. *Research Center of Laser Fusion, Japan*

High-energy and High-peak-power Nanosecond Pulse Generation Based on an All-fiber MOPA Scheme

A high energy and high peak power nanosecond pulsed source based on all fiber configuration is presented. 7.2mJ/10ns and 3.2Mw/1.16ns output was obtained.

1145-1200 **3240-CT-6**

Ken Kashiwagi¹, Hiroyuki Ishizu¹, Yosuke Mizuno¹, Takashi Kurokawa¹

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

Optical Pulse Compression with Waveform Reshaping Using Pulse Synthesizer and Cascaded Fiber Pair

Pulse compression with waveform reshaping has been demonstrated using a high nonlinear fiber and a

require sensitivities equivalent to displacements of ~10-19 m over multikilometer baselines. I will describe the development of these devices.

1145-1200 **3220-CT-4**

Samuel Choi¹, Kohei Otsuki¹, Osami Sasaki¹, Takamasa Suzuki¹

1. *Dept. of Electrical and Electronic Engineering, Niigata Univ., Japan*

Spectral Interferometer Using Sinusoidal Phase Modulation and Back-propagation Method

In this study, one dimensional profile measurement of glass films using SPM spectral interferometer with MWB method. Displacements of surfaces of the sample vibrating with 9.7 Hz are measured with a repeatability of 4.7 nm.

1200-1215 **3220-CT-5**

Andrew R. Wade¹, Kirk McKenzie², Yanbei Chen³, Daniel A. Shaddock¹, Jong H. Chow¹, David E. McClelland

1. *Australian National University, Australia*
2. *Jet Propulsion Laboratory, USA*
3. *California Institute of Technology, USA*

A Polarisation Folded Speed Meter for Gravitational Wave Detection

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

1145-1200 **3210-CT-4**

Jonas Jakutis Neto^{1,2}, Jipeng Lin¹, Andrew Lee¹, Huajin Zhang³, Jiyang Wang³, Niklaus Ursus Wetter², Helen Pask¹

1. *MQ Photonics Research Centre, Department of Physics, Macquarie University, Sydney, Australia*
2. *Instituto de Pesquisas Energéticas e Nucleares, CNEN/SP, Universidade de São Paulo, Brazil*
3. *State Key Laboratory of Crystal Materials and Institute of Crystal Materials, China*

High Beam Quality cw 1.5 W BaWO4 Raman Laser Using Nd:YLF as Laser Active Medium

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.

1200-1215 **3210-CT-5**

S. T. Lin², W. K. Chang¹, H. H. Chang¹, J. W. Chang¹, Yen-Hung Chen¹, Y. Y. Lin³, Y. C. Huang³

1. *Department of Optics and Photonics, National Central University, Taiwan*
2. *Department of Photonics, FengChia University, Taiwan*
3. *Institute of Photonics Technologies, Department of Electrical Engineering, National Tsinghua University, Taiwan*

2D PPLN for Simultaneous Laser Q-switching and Optical Parametric Oscillation in a Nd:YVO4 Laser

We report a tunable optical parametric oscillator using a 2D

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.

1130 1145 **3230-CT-4**

Han-Sung Chan^{1,2}, Nicholas Forget³, A H Kung^{1,2}

1. *Institute of Atomic and Molecular Sciences, Academia Sinica, Taiwan*
2. *Institute of Photonics Technologies, National Tsing Hua University, Taiwan*
3. *Fastlite, Batiment 403, Ecole Polytechnique, France*

Ultrabroad Band Acousto-optic Programmable Dispersive Filters for Five Discrete Harmonics Spanning the Blue to Mid-infrared Frequencies

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.

1145-1215 **3230-IT-5**

INVITED SPEAKER
Martin Hill¹, Milan Marell¹

1. *Eindhoven University of Technology, The Netherlands*

Plasmonic and Metallic Nano-Cavity Lasers

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.

diamond and demonstration of cellular internalization is presented.

1130-1145 **3250-CT-3**

Masood Naqshbandi^{1,2}, John Canning^{1,2}, Angelica Lau^{1,2}, Maxwell J Crossley¹

1. *School of Chemistry, The University of Sydney, Australia*
2. *Interdisciplinary Photonics Laboratories (iPL), The University of Sydney, Australia*

Controlled Fabrication of Macroscopic Mesostuctured Silica Spheres for Potential Diagnostics and Sensing Applications

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.

1145-1200 **3250-CT-4**

Changxi Yang¹, Ting Liu¹

1. *Dept of Precision Instruments, Tsinghua University, China*

Photochemical Synthesis of Gold and Gold-Silver Nanostructures for Optical Fiber SERS Sensors

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.

Nanophotonics Applications

We develop approximate analytical models that describe transmission characteristics of plasmonic slot waveguides coupled to resonant-cavity structures. These models provide deeper insight and pave the way for rapid design optimization of various integrated nanophotonic devices.

ACOFT Presentation

1130-1145 **3260-CT-4**

Esa Jaatinen¹, Alison Chou², Peter Fredericks²

1. *Physics Discipline, Faculty of Science and Technology, QUT, Australia*
2. *Chemistry Discipline, Faculty of Science and Technology, QUT, Australia*

Are Plasmons Responsible for the Raman Signal Enhancement Observed with Gold Nanoparticle Sensors?

We present results that show no SERS signals are obtained when 25 nm diameter gold NPs layered quartz substrates exposed to 2-aminopyridine are illuminated with plasmon resonant 532 nm radiation.

1145-1200 **3260-CT-5**

Yinlan Ruan¹, Tanya Monro¹

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

Direct Excitation of Surface Plasmon Resonance using Radially Polarized Mode of Silicon Nano Fibers

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.

1115-1130 **3270-CT-3**

Geoff Pryde¹, Sacha Kocsis¹, Tim Ralph², Guoyong Xiang^{1,3}

1. *Griffith University, Australia*
2. *The University of Queensland, Australia*
3. *University of Science and Technology of China, China*

Heralded Noiseless Amplification of Photonic Qubits

We experimentally demonstrate the heralded noiseless amplification of a photon polarization 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.

1130-1145 **3270-CT-4**

Barry Sanders¹, Alexander Hentschel¹

1. *Institute for Quantum Information Science, University of Calgary, Canada*

An Efficient Algorithm for Optimizing Adaptive Quantum Metrology Processes

We introduce an efficient self-learning swarm-intelligence algorithm for devising feedback-based quantum metrological procedures to replace what is otherwise an difficult and

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 Aguergaray¹, 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*

PLN 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 Zhang³

1. *Academy of Opto-Electronics, Chinese Academy of Science, China*
2. *Graduate University of Chinese Academy of Science, China*
3. *Phoebus 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 Okji¹

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, Mitsuru Ishikawa², Vasudevanpillai Bijju²

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 Miroshnichenko¹, 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.

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

1230-1245 **3270-CT-7**
Simon Devitt¹, 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.

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 **3250-CT-7**

Jiangbo Zhao¹, James Piper¹, Judith Dawes¹, Dayong Jin¹, Ewa Goldys¹

1. *Department of Physics and Astronom, 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.

1245-1400 LUNCH - Bayside Gallery

1400-1530 Session 5

Room: Bayside Auditorium A

Spectroscopy and Chemical Applications (3410)

Symposium 1
 Chair: Brian Orr, Macquarie University, AUSTRALIA

Room: Bayside 101

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. Maccarone¹, 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 H/D 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.

ACOFT 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

Passive Optical Networks (3440) continued

1400-1430 **3440-IT-1**

INVITED SPEAKER

Masahiko Jinno¹, Hidehiko Takara¹, Kazushige Yonenaga¹

1. NTT Network Innovation Laboratories, NTT Corporation, Japan

Why Do We Need Elastic Optical Networking, Networking in the 1 Tb/s Era?

We overview the concept and key elements of elastic optical path networking and the benefits in terms of spectral resource savings, disaster survivability, and efficient IP traffic offloading. We also discuss the growing anticipation for advanced optoelectronic devices to support future elastic optical networks.

1430-1445 **3440-CT-2**

Qi Guo^{1,2}, An Tran^{1,2}

1. University of Melbourne, Australia
2. Nation ICT Australia, Australia

Partial-Response Maximum Likelihood Receiver for Long-Reach 10 Gb/s RSOA-based WDM-PON Transmission

We demonstrate 10 Gb/s WDM-PON system using 1.2 GHz RSOA over 150 km distance. The proposed receiver based on partial-response maximum-likelihood equalizer is proven to have superior performance than conventional equalizers in long-reach transmission.

Femtosecond Laser Microfabrication (3460) continued

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

Fei He¹, Ya Cheng¹, Zhizhan Xu¹, Koji Sugioka² 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.

ACOFT 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 Sumriddetchkajorn¹, Chakrit 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, Y. Nambu³, S. Takahashi², A. Tajima², A. Tomita³, T. Hasegawa⁵, Y. Sakai⁵, H. Kobayashi⁵, T. Asai⁵, K. Shimizu⁵, T. Tokura⁵, T. Tsurumaru⁵, T. Honjo⁶, K. Tamaki⁶, H. Takesue⁶, Y. Tokura⁶, J.F. Dynes⁷, A. Dixon⁷, A.W. Sharpe⁷, A.J. Shields⁷, S. Uchikoga⁷, M. Legré⁸, S. Robyr⁸, P. Trinkler⁸, L. Monat⁸, J.-B. Page⁸, T. Yamashita³, T. Domeki⁴, M. Matsui⁵, Z. L. Yuan⁷, G. Ribordy⁹, A. Poppe⁹, A. Allacher¹¹, O. Maurhart⁹, T. Länger⁹, M. Peev⁹, A Zeilinger^{10,11}

1. National Institute of Information and Communication Technology, Japan
2. System Platforms Research Laboratories, NEC Corporation, Japan
3. Green Innovation Research Laboratories, NEC Corporation, Japan
4. Network Platform Business Division, NEC Communication Systems, Japan
5. Information Technology R&D Center, Mitsubishi Electric Corporation, Japan
6. NTT Basic Research Laboratories, NTT Corporation, Japan
7. Toshiba Research Europe Ltd
8. ID Quantique, Switzerland
9. Austrian Institute of Technology, Austria
10. 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**
Mitsuhiro 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. Ganta¹, 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, Lluís 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 (IFDMA) 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-microjoule, 100-femtosecond laser pulse to a narrow line.

1430-1445 **3460-CT-3**

Ricardas Buividas¹, Mindaugas Mikutis^{2,3}, Gintas Slekyš², 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: though-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**

Shiuan 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. *CQC2T, 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-Huei 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.

Femtosecond Laser Microfabrication (3460) continued

order resonance at 800 nm.

1500-1530 **3460-IT-5**

INVITED SPEAKER

Alexander Szameit¹, Robert Keil¹, Felix Dreisow¹, Matthias Heinrich¹, Andreas Tunnermann¹, Stefan Nolte¹

1. *Institute of Applied Physics, Friedrich-Schiller-University, Germany*

Three-Dimensional All-Optical Routing And Switching In Laser-Written Waveguide

We present a comprehensive experimental analysis of the switching and routing behaviour of light in two-dimensional laser-written waveguide arrays. Exploring the unique properties of such systems, we propose different networking schemes for sophisticated logical operations.

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 recoding 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 read-out 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**Long-Wavelength Fibre Lasers (3610)**

Symposium 1

Chair: Ju Han Lee, University of Seoul, KOREA

1600-1630 **3610-IT-1****INVITED SPEAKER****Michael Oermann¹**, Heike Ebendorff-Heidepriem¹, David Ottaway¹, Peter Veitch¹, Tanya Monro¹*1. The University of Adelaide, Australia***Tellurite Glass for use in 2.3µm Thulium Fibre Lasers**

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.

1630-1645 **3610-CT-2****Stephen Dekker¹**, Alexander Judge¹, Ravi Pant¹, Itandehui Gris-Salncnez², Jonathan Knight², C. Martijn de Sterke¹, Benjamin Eggleton¹*1. CUDOS/IPOS, School of Physics, The University of Sydney, Australia*
*2. CPPM, Department of Physics, University of Bath, UK***2.04 µm Light Generation from a Ti:Sapphire Laser Using a Photonic Crystal Fiber with Low OH loss**

We report on the generation of 2.04 µm light from an 801 nm

Room: Bayside 101**Advanced Interferometry and Spectroscopy (3620)**

Symposium 2

Chair: Shiv Sharma, Hawaii Institute of Geophys. & Planetology, USA

1600-1615 **3620-CT-1****Masaya Sakatsume¹**, Tatsutoshi Shioda¹*1. Nagaoka University of Technology, Japan***Spatially Distinguished Spectroscopy and Tomography using Time domain Interferometer**

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.

1615-1630 **3620-CT-2****Yosuke Kasuya¹**, Shuto Kojima¹, Ken Kashiwagi¹, Takashi Kurokawa¹*1. Graduate School of Engineering, Tokyo University of Agriculture and Technology, Japan***High-Resolution Interferometer with Broadband Supercontinuum Light at 1550 nm**

We have constructed a high-resolution interferometer with a broadband supercontinuum light source. The broadband

Room: Bayside 102**Spatial Control of Solid State Lasers (3630)**

Symposium 3

Chair: Judith Dawes, Macquarie University, AUSTRALIA

1600-1630 **3630-IT-1****INVITED SPEAKER****Manasadevi P Thirugnanasambandam¹**, Yuri Senatsky², Ken-ichi Ueda¹*1. Institute for Laser Science, University of Electro-Communications, Japan*
*2. P. N. Lebedev Physical Institute of the Russian Academy of Sciences, Russia***High-Order Mode Selection In Yb:YAG Ceramic Laser**

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.

1630-1645 **3630-CT-2****Ting-Hua Lu¹**, Y. C. Lin²*1. Department of Physics, National Taiwan Normal University, Taiwan*
*2. Department of Electrophysics, National Chiao Tung University, Taiwan***Generation of High-order Coaxial and Multi-axial Laguerre-Gaussian Beams from Degenerate Laser Cavities****Room: Bayside 103****Advanced Networking and Signal Monitoring (3640)**

Symposium 4

Chair: Junichi Hamazaki, National Institute of Information and Communications Technology, JAPAN

1600-1630 **3640-IT-1****INVITED SPEAKER****Vincent Chan¹***1. MIT, USA***Optical Flow Switching**

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.

1630-1645 **3640-CT-2****Sie-Wook Jeon¹, Ki-Hee Song¹**, Youngbok Kim¹, Yong-Kyu Choi¹, Chang-Soo Park¹*1. School of Information and Communications, GIST, Korea***A Wideband OSNR 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.

Room: Bayside 104**Laser Surface Nanostructuring (3650)**

Symposium 5

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

1600-1615 **3650-CT-1****Kazuki Kubo¹**, Kota Okazaki¹, Tetsuya Shimogaki¹, Koji Tsuta¹, Daisuke Nakamura¹, Mitsuhiro Higashihata¹, Tatsuo Okada¹*1. Kyushu University, Japan***LLaser Irradiation Effect of ZnO Nanowires and GaN Thin Film for Fabrication of Hetero p-n Junction**

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.

1615-1630 **3650-CT-2****Koji Tsuta¹**, Tetsuya Shimogaki¹, Kazuki Kubo¹, Yuki Ishida¹, Tatsuro Sugie¹, Kota Okazaki¹, Mitsuhiro Higashihata¹, Daisuke Nakamura¹, M.S.Ramachandra Rao², Tatsuo Okada¹*1. Kyushu University, Japan*
*2. Indian Institute of Technology, Madras, India***Combination of ZnO nanowire UV-LED and ZnO-SiO₂ phosphor for fabrication of ZnO-based white LED****Room: Bayside 105****Fundamentals of Nonlinear Optics 1 (3660)**

Symposium 6

Chair: Anatoly Zayats, King's College London, UK

1600-1615 **3660-CT-1****Y Sheng¹**, T. Lukasiewicz², M. Swirkowicz², W. Krolkowski¹, A. Arie³, K. Koynov⁴*1. Laser Physics Center, Australian National University, Australia*
2. Institute of Electronic Materials Technology, Poland
3. Department of Physical Electronics, Fleischman Faculty of Engineering, Israel
*4. Max-Planck Institute for Polymer Research, Germany***Cerenkov Second Harmonic Microscopy for Three-Dimensional Ferroelectric Domain Visualization**

We show when a laser is focused on a boundary between anti-parallel ferroelectric domains, an enhancement of the Cerenkov second-harmonic emission occurs. Then we develop a Cerenkov second-harmonic microscopy for three-dimensional ferroelectric domain visualization.

1615-1630 **3660-CT-2****Frank Setzpfandt¹**, Andrey A. Sukhorukov², **Dragomir N. Neshev²**, Roland Schiek³, Alexander S. Solntsev², Raimund Ricken⁴, YooHong Min⁴, Wolfgang Sohler⁴, Yuri S. Kivshar², Thomas Pertsch¹**Room: Bayside 106****Mesoscopic Quantum Optics (3670)**

Symposium 7

Chair: Warwick Bowen, The University of Queensland, AUSTRALIA

1600-1630 **3670-IT-1****INVITED SPEAKER****Markus Aspelmeyer¹***1. VCQ, University of Vienna, Austria***Quantum Opto-Mechanics: Quantum Optical Control Of Massive Mechanical Resonators**

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.

Long-Wavelength Fibre Lasers (3610) continued

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.

1645-1700 **3610-CT-3**

Stuart Jackson¹, Darren Hudson¹, Luke Anderson¹, Eric Magi¹, Ben Eggleton¹, Laercio Gomes²

1. CUDOS and Institute of Photonics and Optical Science, School of Physics, Australia
2. Center For Lasers and Applications, Paulo, SP, Brazil

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.

1700-1730 **3610-IT-4**

INVITED SPEAKER

Nikita Simakov¹, Alex Hemming¹, Shayne Bennetts¹, John Haub¹

1. EWRD, Defence Science and Technology Organisation, Australia

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.

Advanced Interferometry and Spectroscopy (3620) continued

characteristic of the interferometer achieved axial resolution of 2.16 micro meter at a center wavelength of 1550 nm.

1630-1645 **3620-CT-3**

Kohei Suzuki¹, Tatsutoshi Shioda¹

1. Nagaoka University of Technology, Japan

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.

1645-1700 **3620-CT-4**

Gediminas Gervinskas¹, Daniel Day¹, **Saulius Juodkazis¹**

1. Centre for Micro-Photonics, Faculty of Engineering and Industrial Sciences, Swinburne University of Technology, Australia

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-

Spatial Control of Solid State Lasers (3630) continued

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.

1645-1700 **3630-CT-3**

Takashige Omatsu^{1,2}, Masahito Okida¹, Koki Iwamatsu¹, Ara Minassian³, Michael J Damzen³

1. Department of Information and Image Sciences, Chiba University, Japan
2. CREST Japan Science and Technology Agency, Japan
3. Photonics, The Blackett Laboratory, Imperial College London, UK

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.

1700-1715 **3630-CT-4**

Katsuhiko Miyamoto¹, Sachio Miyagi¹, Masaki Yamada¹, Masahito Okida¹, Nobuyuki Aoki¹, Takashige Omatsu^{1,2}

Advanced Networking and Signal Monitoring (3640) continued

1645-1700 **3640-CT-3**

Junsen Lai¹, **Aiyang Yang¹**, Yunan Sun¹

1. School of Optoelectronic, Beijing Institute of Technology, China

Multiple-Impairment Monitoring For 40-Gbps RZ-OOK Using Artificial Neural Networks Trained With Reconstructed Eye Diagram Parameters

A technique using artificial neural networks trained with parameters derived from reconstructed eye diagrams for multi-impairment monitoring for 40-Gbps RZ-OOK is demonstrated. The proposed monitoring scheme can identify simultaneous impairments without requiring data clock recovery. ACOFT Presentation

1700-1715 **3640-CT-4**

Guo-Wei Lu¹, Takahide Sakamoto¹, Tetsuya Kawanishi¹

1. National Institute of Information and Communications Technology (NICT), Japan

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 45o phase-shifter and QPSK modulator; ii) cascading rectangular- and square- QPSK modulators.

Laser Surface Nanostructuring (3650) continued

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.

1630-1700 **3650-IT-3**

INVITED SPEAKER

Reinhart Poprawe^{1,2}, Arnold Gillner¹, Hans-Dieter Hoffmann¹, Peter Russbuedt¹, Jens Gottmann²

1. Fraunhofer Institute for Laser Technology, Aachen, Germany
2. Chair for Lasertechnology RWTH Aachen University, Aachen, Germany

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.

1700-1715 **3650-CT-4**

Yaoyu Cao¹, Zongsong Gan¹, Baohua Jia¹, Richard A. Evans², Min Gu¹

1. Centre for Micro-Photonics & CUDOS, Swinburne University of Technology, Australia
2. CSIRO Materials Science and Engineering, Australia

Fundamentals of Nonlinear Optics 1 (3660) continued

1. Friedrich Schiller University Jena, Germany
2. Nonlinear Physics Centre, RSPE, Australian National University, Australia
3. University of Applied Sciences Regensburg, Germany
4. Applied Physics, University Paderborn, Germany

Spatio-temporal Dynamics of Laser Pulses in Lithium Niobate Waveguide Arrays

We study experimentally and numerically the spatiotemporal evolution of short pulses in quadratic nonlinear waveguide arrays with coupled second-harmonic modes, revealing complex spectral transformations involving generation of new frequency components at the Brillouin zone edge.

1630-1645 **3660-CT-3**

Neil Broderick¹, Max Lohe², Timothy Lee³, Shahraam Afshar V.²

1. Department of Physics, University of Auckland, New Zealand
2. Institute for Photonics and Advanced Sensing, University of Adelaide, Australia
3. Optoelectronics Research Centre, University of Southampton, UK

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

Mesoscopic Quantum Optics (3670) continued

1630-1645 **3670-CT-2**

C Holmes¹, **C Meaney¹**, G Milburn¹

1. School of Mathematical and Physical Sciences, The University of Queensland, Australia

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.

1645-1700 **3670-CT-3**

Alex Szorkovszky¹, Andrew Doherty², Barbara Fairchild³, Glen Harris¹, Joachim Knittel¹, Andrew Greentree³, Warwick Bowen¹

1. Centre for Engineered Quantum Systems, University of Queensland, Australia
2. School of Physics, University of Sydney, Australia
3. School of Physics, University of Melbourne, Australia

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 optoelectromechanical system with the nonlinear driving and

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. CREST Japan Science and Technology Agency, Japan

2 μ m Optical Vortex Output from a Degenerated Optical Parametric Oscillator

The first demonstration of a 2- μ m optical vortex output from a 1- μ m optical vortex pumped degenerated optical parametric oscillator is presented. A 0.24-mJ, 2- μ m 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 Park**¹

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. ACOFT 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. Miroshnichenko¹

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

Shining 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 Scholten^{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 Broome³, **Alessandro Fedrizzi**³, 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

Novel Fibres and Fibre Characterisation (4210)

Symposium 1

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

Room: Bayside 101

Solid-State Laser Engineering (4220)

Symposium 2

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

1030-1100 **4220-IT-1**

INVITED SPEAKER

Alexander Hemming¹, Jim Richards², Alan Davidson¹, Neil Carmody¹, 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 CUDOS@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. Ebendorff-Heidepriem², K. Kuan², S. Afshar V.², J. Orwa¹, S. Tomljenovic-Hanic¹, S. Prawer¹, T. Monro², A. Greentree¹

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

Novel Fibres and Fibre Characterisation (4210)
continued

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.

1100-1115 **4210-CT-2**

Frederica Poli¹, Enrico Coscelli¹, Sidsel Petersen^{2,3}, Thomas Alkeskjold², Annamaria Cucinotta¹, Lasse Leick², Jes Broeng²

1. Information Engineering Department, University of Parma, Italy
2. NKT Photonics A/S, Denmark
3. Department of Photonics Engineering, Technical University of Denmark, Denmark

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.

1115-1130 **4210-CT-3**

Chad Carlson¹, Benjamin Ward¹, Justin Spring¹

1. United States Air Force Academy, USA

Large Mode Area Random Acoustically Microstructured Photonic Crystal Fibers For SBS Suppression

Solid-State Laser Engineering (4220)
continued

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.

1100-1115 **4220-CT-2**

Miftar Ganija¹, David Ottaway¹, Peter Veitch¹, Jesper Munch¹

1. School of Chemistry and Physics, The University of Adelaide, Australia

A Cryogenic, End Pumped, Zigzag Slab Laser Suitable For Power Scaling

We exploit improvements in the thermo-mechanical and thermo-optical properties of YAG at low temperatures in a new cryogenic, conduction cooled, robust, end-pumped, zigzag, power-scalable Yb:YAG slab laser design and report on the lasing properties achieved

1115-1130 **4220-CT-3**

Junji Kawanaka¹, Hiroaki Furuse², Daniel Albach^{1,3}, Yasuki Takeuchi^{1,4}, Akira Yoshida¹, Toshiyuki Kawashima⁴, Hirofumi Kan⁴

1. Institute of Laser Engineering, Osaka University, Japan
2. Institute for Laser Technology, Japan
3. LULI, Ecole Polytechnique, France
4. Hamamatsu Photonics K. Co., Japan

Biomedical Applications (4250)
continued

coherence tomography based vascular imaging and present its use in broad-ranging cancer studies.

1100-1115 **4250-CT-2**

Barry Vuong¹, Beau Standish¹, Carry Sun¹, Gary Tearney², Rasmus Kieh³, Theodor van der Kwast³, Jarley Koo⁴, Josaphat de Moraes⁵, Leo de Costa⁶, **Victor Yang¹**

1. Ryerson University, Canada
2. Harvard University, USA
3. University Health Network, Canada
4. St. Michael's Hospital, Canada
5. Hospital de Baleia, Brazil
6. Sunnybrook Health Sciences Centre, Canada

3D Optical Coherence Tomography and Digital Pathology

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.

1115-1130 **4250-CT-3**

Yuri Kim¹, Joo Beom Eom^{2,3}, Sang Jin Lee², Eun Jung Min², Byeong Ha Lee^{1,2}

1. Graduate program of Medical System Engineering, GIST, Korea
2. School of Information and Communications, GIST, Korea
3. Korea Photonics Technology Institute, Korea

Novel Photonic Devices (4240)
continued

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.

1045-1100 **4240-CT-2**

Ji Ruiqiang¹, Tian Yonghui¹, Yang Lin¹, Zhang Lei¹, Ding Jianfeng¹, Chen Hongtao¹, Lu Yangyang¹, Zhou Ping¹

1. Optoelectronic System Laboratory, Institute of Semiconductors, CAS, China

On-Chip Optical Router for Optical Networks-on-Chip

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.

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}

1. School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore
2. CINTRA CNRS/NTU/THALES, Singapore

Nanophotonics 2 (4230)
continued

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.

1045-1100 **4230-CT-2**

Ivan Maksymov¹, Artur Davoyan¹, Yuri Kivshar¹

1. The Australian National University, Nonlinear Physics Center and CUDOS@ANU, Australia

Tapered Plasmonic Yagi-Uda Nanoantennas for Emission Enhancement and Broadband Communication

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.

1100-1115 **4230-CT-3**

Dmitri Gramotnev^{1,2}, Anders Pors¹, Sergey Bozhevolnyi¹

1. University of Southern Denmark, Niels Bohrs Alle 1, Denmark
2. Nanophotonics Pty Ltd, Australia

Gap Plasmon Nanoantennas and Nanolenses

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.

Phase Stabilization and Pulse Characterisation (4260)
continued

Laser by the Direct Locking Method

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.

1045-1100 **4260-CT-2**

Dane Laban^{1,2}, William Wallace^{1,2}, Thijs Clevis^{1,2}, Naylyn Gaffney^{1,2}, Michael Pullen^{1,2}, Adam Palmer^{1,2}, Dansha Jiang³, Harry Quiney³, Igor Litvinyuk^{1,2}, Dave Kielpinski^{1,2}

1. ARC Center of Excellence in Coherent X-Ray Science, Griffith University, Australia
2. Australian Attosecond Science Facility, Griffith University, Australia
3. ARC Center of Excellence in Coherent X-Ray Science, University of Melbourne, Australia

Zeptosecond Timing Resolution from a High-harmonic Gouy Phase Interferometer

We present an interferometer that utilises 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.

1100-1130 **4260-IT-3**

INVITED SPEAKER

Takayoshi Kobayashi^{1,2,3,4}, Kotaro Okamura^{1,2}

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

Single Photon Emission from Nanodiamond in Tellurite Glass

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.

1045-1100 **4270-CT-2**

Carlo Bradac^{1,2,3}, Gaebel Torsten^{1,2,3}, Andrey Zvyagin^{1,2,3}, James Rabeau^{1,2,3}

1. ARC Centre of Excellence for Engineered Quantum Systems, Australia
2. Centre for Quantum Science and Technology, Australia
3. MQ Photonics Research Centre Department of Physics and Astronomy, Australia

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.

1100-1115 **4270-CT-3**

Faraz Inam^{1,2}, Torsten Gaebel^{1,2}, Carlo Bradac^{1,2}, Luke Stewart², Micheal Withford^{1,2},

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-Hz.

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

Alex Butler¹, David Spence¹, David Coutts¹

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 Kaminskii³

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

2. *University of Electro-Communications, Japan*
2. *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. *ACOFT 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 5 μm 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. *ACOFT 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*

Photoresponse 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. *ACOFT Presentation*

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

Lorenzo Rosa¹, Kai Sun², Ewa Kowalska³, Saulius Juodkazis¹

1. *Swinburne University of Technology, Australia*

1. *Advanced Ultrafast 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 Dawes², 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. Szigeti^{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.

Novel Fibres and Fibre Characterisation (4210)
continued

Sr. G Lona^{3,2}, H. E. Hernandez-Figueroa^{3,2}, H.L. Fragnito⁵

1. *Faculdade de Tecnologia (FT), UNICAM, 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*

Polarization Analysis Across Different Photonic Bandgaps of Hybrid Photonic Crystal Fibers

We present an experimental polarization analysis across different photonic bandgaps of three Hybrid Photonic Crystal Fibers. Polarization dependent loss of at least 17.5 dB has been observed in the first three bandgaps around 1500 nm.
ACOFT Presentation

1215-1230 **4210-CT-7**

Heike Ebendorff-Heidepriem¹, David Lancaster¹, Kevin Kuan¹, Roger Moore¹, Samiul Sarker¹, Tanya Monro¹

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

Extruded Fluoride Fiber for 2.3µm Laser Application

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.

Solid-State Laser Engineering (4220)
continued

Q-switched Yb:LuAG/Cr4+:YAG microchip lasers were demonstrated with slope efficiencies of 40% .

1200-1215 **4220-CT-6**

Jun Dong¹, Ying Cheng¹, Jian Ma¹, Ken-ichi Ueda², Alexander Kaminskii³

1. *Department of Electronic Engineering, Xiamen University, China*
2. *University of Electro-Communications, Japan*
2. *Russian Academy of Sciences, Russia*

Enhancement of Cr, Yb:YAG self-Q-switched Lasers by Bonding Yb:YAG Crystal

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.

1215-1230 **4220-CT-7**

Masaki Tsunekane¹, Takunori Taira¹

1. *Institute for Molecular Science, Japan*

Laser Performance of Composite Nd:YAG/Cr:YAG Ceramics for Laser Ignition

Monolithic lasers of composite Nd:YAG/Cr:YAG ceramics with different Nd concentrations and cavity lengths were tested. A passively Q-switched pulse energy

Biomedical Applications (4250)
continued

Sepsis Analysis for POCT applications

In the last years, there has been a strong request of the physicians for point-of-care testing (POCT) instrumentation. The present paper deals with the characterisation of a POCT optical instrument, the channel array interrogation (CAI) 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.

1200-1215 **4250-CT-6**

Shuhei Shibasaki¹, Daisuke Nakamura¹, Tatsuo Okada¹, Yukiyasu Yoshinaga², Tokio Ueno³, Masahiko Kobayashi³, Hiroshi Enaida⁴, Tasturou Ishibashi⁴

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*

High Resolution Imaging for Measurement of Oxygen Saturation in Human Retinal Vessels

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.

Novel Photonic Devices (4240)
continued

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.
ACOFT Presentation

1145-1200 **4240-CT-6**

Markus Pollnau¹, Edward H Bernhardt¹, Henk A G M van Wolferen¹, Kerstin Warhoff¹, Renae M de Ridder¹

1. *University of Twente, The Netherlands*

Monolithic Distributed Bragg Reflector Cavities in Al2O3 with Quality Factors Exceeding One Million

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.

1200-1230 **4240-IT-7**

INVITED SPEAKER

Markus Pollnau¹, Lasse J Kauppinen¹, Shahina M.C. Abdulla¹, Meindert Dijkstra¹, Renae M de Ridder¹, Meint J de Boer¹, Erwin Berenschot¹, Gijs J M Krijnen¹

1. *University of Twente, The Netherlands*

Micromechanically Tuned Ring Resonator in Silicon on Insulator

Nanophotonics 2 (4230)
continued

2. *Harbin Institute of Technology, China*
3. *Friedrich-Alexander University of Erlangen-Nuremberg, Germany*

Novel Plasmonic Applications in Physics and Chemistry

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-titanium substrates for photocatalysis, are demonstrated.

1215-1230 **4230-CT-7**

Dayan Handapangoda¹, Malin Premaratne¹, Ivan Rukhlenko¹

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

Optimum Design of Single-Core Nanowaveguide for Surface Plasmon Polaritons

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.
ACOFT Presentation

1. *University of Twente, The Netherlands*

Phase Stabilization and Pulse Characterisation (4260)
continued

6. *EE Department and Graduate Institute of Photonics and Optoelectronics, National Taiwan University, Taipei, Taiwan*

Synthesis and Measurement of Ultrafast Optical Waveforms

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.

1145-1200 **4260-CT-5**

Chur Kim¹, Kwangyun Jung¹, Hyoji Kim¹, Youjjan Song¹, Jungwon Kim¹

1. *KAIST, South Korea*

Ultra-low Timing and Intensity Noise from Mode-locked Yb-fiber Lasers at Close-to-Zero Intra-cavity Dispersion

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.

1200-1215 **4260-CT-6**

Han-Sung Chan^{1,2}, **Zhi-Ming Hsieh¹**, A.H. Kung^{1,2}

1. *Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan*
2. *Institute of Photonics Technologies, National Tsing Hua University, Hsinchu, Taiwan*

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

1130-1200 **4270-IT-5**

INVITED SPEAKER

Mikkel F. Andersen¹, Tzahi Grunzweig¹, Andrew Hilliard¹, Matthew McGovern¹, Yin H. Fung¹

1. *Jack Dodd Centre, Department of Physics, University of Otago, New Zealand*

Consistent Isolation Of Individual Atoms Using Cold Collisions

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

1200-1215 **4270-CT-6**

Laura McKemmish¹, David Kedziora², Graham White², Noel Hush³, Jeffrey Reimers¹

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*

Molecular Design Principles for Linearly Scalable, Frequency-Based, Universal Quantum Computers

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.

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*

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.

ACOFT Presentation

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

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

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.

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*

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.

1230-1400

LUNCH - Bayside Gallery

1400-1530

Session 8

Room: Bayside Auditorium A

Fibre Sensors 1 (4410)

Symposium 1

Chair: Shu Namiki, AIST, JAPAN

1400-1430 **4410-IT-1**

INVITED SPEAKER

Gilberto Brambilla¹

1. Optoelectronics Research Centre, UK

Sensors and Devices Based On Optical Fibre Microwires

This paper reviews some passive components manufactured from optical fiber microwires.

1430-1445 **4410-CT-2**

Zi-Yu Weng¹, Cheng-Ling Lee¹

1. Department of Electro-Optical Engineering, National United University, Taiwan

Self-Interference of Fiber Lloyd's Interferometer

We have proposed an ultracompact reflective self-interference of fiber Lloyd's interferometer (SIFL) based on an ultrathin Au film embedded in a diffused-core fiber endface.

Interference fringes are observed experimentally and investigated for the first time.

1445-1500 **4410-CT-3**

Stefan Forstner^{1,2}, Stefan Prams¹, Erik D van Ooijen¹, Jonathan D Swaim¹, Joachim Knittel¹, Glen I Harris¹, Alexander Szorkovszky¹, Halina Rubinszstein-Dunlop¹, Warwick P Bowen¹

Room: Bayside 101

High Power Laser Installation (4450)

Symposium 5

Chair: Heinrich Hora University of New South Wales, AUSTRALIA

1400-1415 **4450-CT-1**

Hiroshi Azechi¹, **Masakatsu Murakami¹**, FIREX Project Team¹

1. Institute of Laser Engineering, Osaka University, Japan

Present Status of Fast Ignition Realization EXperiment (FIREX) and Inertial Fusion Energy Development

Japanese fast ignition experiment is reported, where the coupling efficiency is estimated to be 15%, giving a prediction that the fuel will be heated up to ~ 5 keV at PW-beam energies ~ 10 kJ

1415-1430 **4450-CT-2**

Briggs Atherton¹, Jens Schwarz¹, Patrick Rambo¹, Mark Kimmel¹, Matthias Geissel¹, Marius Schollmeier¹, Ian Smith¹, John Bellum², John Porter¹

*1. Sandia National Laboratories, USA
2. Sandia Staffing Alliance, USA*

Z-Backlighter Facility Upgrades: A Path to Short/Long Pulse, Multi-frame, Multi-color X-Ray Backlighting at the Z-Accelerator

Room: Bayside 102

Microscopic Imaging and Tomography (4430)

Symposium 3

Chair: Ben Vakoc, Harvard Medical School, USA

1400-1430 **4430-IT-1**

INVITED SPEAKER

Mary Ann Go¹, Christian Stricker¹, Steve Redman¹, Hans-A Bachor², Vincent Ricardo Daria²

*1. John Curtin School of Medical Research, Australian National University, Australia
2. Research School of Physics and Engineering, Australian National University, Australia*

Three-dimensional Multi-site Two-photon Excitation for Probing Neuronal Signal Integration

We show three-dimensional multi-site two-photon excitation using phase-only holographic projection as applied to the photolysis of caged neurotransmitters and look at its use in studying how a neuron integrates multiple synaptic inputs.

1430-1445 **4430-CT-2**

Liisa Hirvonen¹, Trevor Smith¹

1. School of Chemistry, University of Melbourne, Australia

Structured Illumination Microscopy of Living Yeast Cells

Structured Illumination Microscopy can improve the resolution of a light

Room: Bayside 103

In-Building and Green Networks (4440)

Symposium 4

Chair: Ampavalanapillai Nirmalathas, The University of Melbourne, AUSTRALIA

1400-1430 **4440-IT-1**

INVITED SPEAKER

Rod Tucker¹

1. University of Melbourne, Australia

Green Optical Networking

In this paper, we review the fundamental limitations on energy consumption in optical communication systems and networks. We provide a framework for understanding how this energy consumption might be managed in a future information economy.

1430-1445 **4440-CT-2**

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, Australia*

Ultra-Broadband Indoor Full-Duplex WDM Optical Wireless Communication with Multi-Mode Fiber

In this paper we experimentally demonstrate an ultra-broadband full-duplex indoor optical wireless communication system with multi-mode fiber incorporating WDM

Room: Bayside 104

Guiding THz (4420)

Symposium 2

Chair: Takeshi Yasui, University of Tokushima, JAPAN

1400-1415 **4420-CT-1**

Jessienta Anthony¹, Rainer Leonhardt¹, Alexander Argyros², Sergio Leon-Saval²

*1. Department of Physics, The University of Auckland, New Zealand
2. Institute of Photonics and Optical Science, The University of Sydney, Australia*

Wideband, Low Loss Terahertz Propagation Through Kagome Air-core Microstructured Fibers

We demonstrate single mode guidance in THz kagome microstructured fibers over a wide transmission band, with propagation losses more than 20 times less than the material losses.

1415-1430 **4420-CT-2**

Alessandro Tuniz¹, Richard Lwin¹, Alexander Argyros¹, Simon Fleming¹, Elise Pogson², Evan Constable², Roger Lewis², Boris Kuhlmeiy¹

*1. Institute of Photonics and Optical Science (IPOS), Australia
2. Institute for Superconducting and Electronic Materials, Australia*

Direct-Drawn Metamaterial Fibers with Magnetic Response in the 100GHz Range

We present a method for producing metamaterial fibers containing slotted metallic cylinder resonators,

Room: Bayside 105

Fundamentals of Nonlinear Optics 2 (4460)

Symposium 6

Chair: Shining Zhu, Nanjing University, CHINA

1400-1415 **4460-CT-1**

Claudiu Cirloganu^{1,2}, Dmitry Fishman¹, Scott Webster¹, Lazaro Padilha^{1,3}, Morgan Monroe¹, David Hagan^{1,4}, **Eric Van Stryland^{1,4}**

*1. CREOL, The College of Optics & Photonics, University of Central Florida, USA
2. Center for Organic Photonics and Electronics, Georgia Institute of Technology, USA
3. Los Alamos National Laboratory, USA
4. Department of Physics, University of Central Florida, USA*

Extremely Nondegenerate Two-Photon Detection of Sub-Bandgap Pulses

Our observation of two-to-three orders of magnitude enhancement of nondegenerate two-photon absorption in direct-gap semiconductors has led to gated detection of subgap femtosecond pulses, e.g. measurement of 200fs 5.6µm pulses in a GaN photodiode.

1415-1430 **4460-CT-2**

Stephane Coen¹, **Yiqing (Ray) Xu¹**

1. Physics Department, The University of Auckland, New Zealand

Room: Bayside 106

Quantum Science in Atoms, Molecules and Solids 2 (4470)

Symposium 7

Chair: Warwick Bowen, The University of Queensland, AUSTRALIA

1400-1430 **4470-IT-1**

INVITED SPEAKER

J.D. Teufel¹, T. Donner², D. Li¹, K.W. Lehnert², R.W. Simmonds¹

*1. NIST, USA
2. JILA, University of Colorado and NIST, USA*

Sideband Cooling Micromechanical Motion To The Quantum Ground State

We create a microwave cavity optomechanical system by coupling the motion of a membrane to a superconducting resonant circuit. We present the first experimental demonstration of sideband cooling micromechanical motion to the quantum ground state.

1430-1445 **4470-CT-2**

Glen Harris¹, Ulrik Andersen², Joachim Knittel¹, Warwick Bowen¹

*1. Centre for Engineered Quantum Systems, University of Queensland, Australia
2. Department of Physics, Technical University of Denmark, Denmark*

Feedback Enhanced Sensitivity in Optomechanics: Surpassing the

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 Universit, Taiwan*

2. *Department of Electrical Engineering of Feng Chia University, Taiwan*

3. *Department of Avionics Engineering, Air Force Academy, Taiwan*

Volatile-Organic Gas Fiber Sensor Based on Air-Gap Long Period Fiber Grating

A novel optical-fiber sensor based on air-gap long-period fiber grating with a coated zinc-oxide thin-film is proposed for detecting the diallyl disulfide and thiol, which are the main volatile organic compounds ingredients of the pepper.

We discuss upgrades currently underway at Sandia National Labs Z-Backlighter 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, LFEF Team¹, GEKKO EXA Design Team¹

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

Construction of LFEF 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 (HSHP-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 Vanholsbeek¹**, 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-Sava²

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.

ACOFT 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 Ohgaki¹

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 Kadoya^{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. Skryabin⁴, **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 Sellars¹

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. Pollnau**¹

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. Sfeir³, 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, Norihiko 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 **4610-IT-1**

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 **4640-IT-1**

INVITED SPEAKER

Sudeep Banerjee¹, Serguei Kalmykov¹, Nathan Powers¹, Vidya 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 **4620-CT-1**

Jiqiao Liu¹, Xiaopeng Zhu¹, Jun Zhou¹, Huaguo 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 Sumriddetchkajorn 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, Wegelerstr, 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 (dE/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 Shiina¹, Kazuo Noguchi², Tetsuo Fukuchi³, Hideki Ninomiya⁴, Ippei Asahi⁴, Sachiyo 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, >40nm gain bandwidth, and a record gain of 2.8dB/cm with 1480nm pumping and potential 5.4dB/cm for 980nm pumping. *ACOFT Presentation*

1630-1645 **4630-CT-3**

Tomohiro Amemiya¹, Takahiko Shindo², Daisuke Takahashi², Seiji Myoga², Nobuhiko Nishiyama², Shigehisa 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. *ACOFT 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. Petrasianus¹, 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 Petrasianus¹, 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.

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1700-1715 **4610-CT-4**

Kyung Su Kim¹, Yosuke Mizuno¹, Masayuki Nakano², Seiichi 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**

Brent Le Cornu¹, Reynaldo Castillo¹, Timothy Stait-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 Lalousis³, Kirk Flippo⁴, Sandrine A. Gailard⁴, Dustin Offermann⁴, Juan Fernandez⁴, Xiaoling Yang², Masakatsu Murakami⁵, Reynaldo Castillo⁶, Timothy Stait-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. *BMSci. 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 & Planetology, 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 m.

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}, Ruifeng Kan³, Wenqing Liu³

1. *MQ Photonics Research Centre, Macquarie University, Australia*
2. *National Measurement Institute, Australia*

Semiconductor DFB Laser with Plasmonic Metal Layers for Subwavelength Confinement of Light

An InP-based 1.55- μm wavelength DFB laser that uses surface plasmon polaritons for light confinement is proposed. A threshold current of 650 μA can be expected with the waveguide width of 200 nm and the cavity length of 76.5- μm . The device is monolithically integratable with waveguide-based optical devices.

ACOFT Presentation

1645 - 1700 **4630-CT-4**

M. Pollnau¹, D. Geskus¹, S. Aravazhi¹, S.M. Garcia-Blanco¹

1. *Integrated Optical MicroSystems Group, MESA+ Institute for Nanotechnology, University of Twente, The Netherlands*

Giant Optical Gain in Rare-earth-ion-doped Thin Films and Waveguides

In a rare-earth-ion-doped double tungstate channel waveguide amplifier, we demonstrate an ultra-high modal gain of 950 dB/cm, two orders of magnitude higher than in other rare-earth-ion-doped materials and comparable to modal gain in semiconductors.

1700-1730 **4630-IT-5**

INVITED SPEAKER

Kengo Nozaki¹, Takasumi Tanabe¹, Akihiko Shinya¹, Shinji Matsuo¹, Tomonari Sato², Yoshihiro Kawaguchi², Hideaki Taniyama¹, Masaya Notomi¹

1. *NTT Basic Research Laboratories, Japan*
2. *NTT Photonics Laboratories, Japan*

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.

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 $\times 10^7$ 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.

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 responsive material and a fiber Bragg grating has been proposed. Here we suppress the thermal effect and analyze wavelength-dependent UV sensitivity of the sensor.

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.

ACOFT Presentation

1715-1730 **4640-CT-5**

Yun Liu¹, Chunng 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.

ACOFT Presentation

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.

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.

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 (0.15-15 μ m) window that is increasingly becoming more accessible to photonic technologies.

ACOFT Presentation

0920-1005

Session 10

Room: Bayside Auditorium A

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- μ m diameter) As₂Se₃ optical fibre. With 2.5- μ m pump pulses, four cascaded Raman Stokes peaks are observed.

Room: Bayside 101

Holography (5230)

Symposium 3

Chair: Nam Kim, Chungbuk National University, KOREA

0920-0935 **5230-CT-1**

Takayuki Higuchi¹, Pham Duc Quang¹, Satoshi Hasegawa¹, **Yoshio Hayasaki¹**

1. Center for Optical Research and Education (CORE), Utsunomiya University, Japan

In-line Digital Holography of Nanoparticles in Optical Tweezers

An optical tweezers controls a position of nanoparticles in a liquid. A digital holographic microscope with an in-line arrangement measures the three-dimensional position of the nanoparticles under light potential.

0935-0950 **5230-CT-2**

Satoshi Hasegawa¹, Yoshio Hayasaki¹

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 Chia 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, **Jianning 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, sech²-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 Elman^{1,2}, Alessandro 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*

A Single Ion Headlight

We report on progress towards achieving a full 4pi solid angle

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 Poullos¹, 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*

Photonic Components for Quantum Information Science

New photonic components are required to exploit the integrated architecture for Quantum Information science. We

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, Hyunsung 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, KRIS, Daejeon, Korea*
4. *Department of Physics, Chungnam National University, 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 Wavefront
Control**

Adaptive wavefront 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 wavefront aberration.

0950-1005 **5230-CT-3**

Zulfiqar 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 Photonic & 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 (ERA) 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 Lee**¹

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 Sointsev¹, 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-Brouri¹, 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.

ACOFT Presentation

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.

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: Joss Bland-Hawthorn, University of Sydney, AUSTRALIA

Waveguide Lasers (5420)

Symposium 2

Chair: Michael Withford, Macquarie University, AUSTRALIA

Photonic Crystals and Nano-Crystals (5430)

Symposium 3

Chair: Laurie Faraone, University of Western Australia, AUSTRALIA

Nanophotonics 3 (5440)

Symposium 4

Chair: Warwick Bowen, The University of Queensland, AUSTRALIA

Optical Trapping and Tweezers (5450)

Symposium 5

Chair: Nicholas Smith, Biophotonics Lab, JAPAN

Dimensionality and Non-Equilibrium Phenomena (5460)

Symposium 6

Chair: Andrew Truscott, Australian National University, AUSTRALIA

Precision Measurements and Fundamental Tests (5470)

Symposium 7

Chair: Andre Luiten, University of Western Australia, AUSTRALIA

1030-1100 **5410-IT-1**

INVITED SPEAKER

Frank Tittel¹, Lei Dong¹, Longwen Gong², Robin Griffin², Rafal 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.

ACOFT Presentation

1030-1100 **5420-IT-1**

INVITED SPEAKER

David Lancaster¹, Simon Gross², Sebastian Ng¹, Heike Ebendorff-Heidepriem¹, Tanya 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 48mW with a 50% slope efficiency, and we report the first lasing of a Ho³⁺ waveguide laser in any form.

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

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.

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*

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. Kuhnle¹, 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*

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.

IR Astrophotonics (5410)
continued

1100-1115 **5410-CT-2**
Fangxin Li¹, Stuart Jackson¹, Eric Magi¹, Christian Grillet¹, Steve Madden³, Yash Moghe², Peter Antanackovic², Steven Duvall², Ben Eggleton¹, David Moss¹

1. CUDOS, School of Physics, University of Sydney, Australia
2. Sillana PtyLtd, Australia
3. CUDOS, Australian National University, Australia

Low Propagation Loss Silicon-on-sapphire Nanowires for the mid-IR

We report low loss silicon-on-sapphire nanowires for applications to mid infrared optics. We achieve propagation losses of < 1 dB/cm at $\lambda=1550\text{nm}$ and < 2 dB/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.

ACOPT Presentation

1115-1130 **5410-CT-3**
Shou-Tai Lin¹, Yen-Yin Lin¹, Yen-Chieh Huang¹

1. Institute of Photonics Technologies, Department of Electrical Engineering, National Tsing Hua University, Taiwan

Thermally Guided Mid-IR Optical Parametric Oscillator

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.

Waveguide Lasers (5420)
continued

1100-1115 **5420-CT-2**
Ka S. Wu¹, Jesper Munch¹, Peter J. Veitch¹, David J. Ottaway¹
1. Institute for Photonics & Advanced Sensing (IPAS), The University of Adelaide, Australia

Suppression of Self-pulsing Behaviour in Tm:YAlO₃ Lasers via Pump Diode-current Feedback

Current method of suppressing self-pulsing in Tm:YAlO₃ using AOMs is not viable for high power. We demonstrate the first reported pulse suppression in Tm:YAlO₃ using a feedback loop with current directly injected into the diode.

1115-1130 **5420-CT-3**
E. Jaatinen¹, P. Dekker², M. Ams², G. Marshall², M. Withford²

1. Applied Optics and Nanotechnology, Discipline of Physics, QUT, Australia
2. MQ Photonics Research Centre, CUDOS, Dept. of Physics and Astronomy, Macquarie University, Australia

Intensity Pulsations in Distributed Feedback Yb:Phosphate Waveguide Lasers

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.

Photonic Crystals and Nano-Crystals (5430) continued

1045-1100 **5430-CT-2**
Kota Okazaki¹, Daisuke Nakamura¹, Mitsuhiro Higashihata¹, Tatsuo Okada¹
1. Graduate School of Information Science and Electrical Engineering, Japan

Lasing Characteristics from Optically-pumped ZnO Nanocrystals for Ultraviolet Laser Diode

Lasing characteristics from a single ZnO nanocrystal were investigated by photoluminescence measurement for ultraviolet laser diode application. ZnO nanosheets would be superior laser medium to nanowire due to lower threshold for lasing.

1100-1115 **5430-CT-3**
Sara Ek¹, Per Lunnemann¹, Elizaveta S. Semenova¹, Kresten Yvind¹, Jesper Mørk¹

1. DTU Fotonik-Department of Photonics Engineering, Denmark

Enhanced Gain in Slow-Light Photonic Crystal Waveguides with Embedded Quantum Dots

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.

1115-1130 **5430-CT-4**
Duncan MacFarlane¹, Marc Christensen², Amr El Nagdi¹, Gary Evans², Louis Hunt¹,

Nanophotonics 3 (5440) continued

1045-1100 **5440-CT-2**
Neil G. R. Broderick², Timothy Lee¹, Gilberto Brambilla¹
1. Optoelectronics Research Centre, University of Southampton, UK
2. Department of Physics, University of Auckland, New Zealand

Polarisation Effects in Optical Microcoil Resonators

We examine polarisation effects in optical microcoil resonators in both the linear and nonlinear regimes. In the linear regime twisting of the fibre breaks the symmetry of the modes leading to a large degree of polarisation mode extinction. While in the nonlinear regime twisted microcoil resonators can be used for Boolean logic operations. Finally we show that in suitable microcoil resonators the Berry phase can be enhanced by almost a million-fold leading to large polarisation rotation even in the presence of significant losses.

1100-1115 **5440-CT-3**
Jon Swaim¹, Joachim Knittel¹, Warwick Bowen^{1,2}
1. Department of Physics, University of Queensland, Australia
2. Centre for Engineered Quantum Systems, University of Queensland, Australia

Plasmonic Enhancement of Whispering Gallery Mode Biosensors

We show that the optical mode volume of a whispering gallery resonator can be reduced by a factor of 30000 using a surface-bound plasmonic nanoparticle,

Optical Trapping and Tweezers (5450) continued

Stability, Scaling and Temperature in Double-well Optical Tweezers

Optical tweezers are exciting tools to probe the local environment of fluids with microscopic particles. Here we present a dual-beam strategy for investigating fluidic environments and the properties of optical traps through Brownian motion.

1115-1130 **5450-CT-3**
W. Krolikowski¹, V.G. Shvedov¹, C. Hnatovsky¹, A.V. Rode¹

1. Laser Physics Centre and Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University, Australia

Robust Trapping and Manipulation of Airborne Particles with a Bottle Beam

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.

1130-1145 **5450-CT-4**
Daryl Preece¹, Timo A. Nieminen¹, Halina Rubinsztein-Dunlop¹

1. The University of Queensland, St Lucia, Queensland, Australia

Shack-Hartmann Measurement of OAM in Highly Focused Light Beams

Dimensionality and Non-Equilibrium Phenomena (5460) continued

Universal Properties of a Strongly Interacting Fermi Gas

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.

1100-1130 **5460-IT-3**
INVITED SPEAKER

Brian P. Anderson¹, Tyler W. Neely^{1,2}, Ashton S. Bradley³, E. Carlo Samson¹, Sam J. Rooney³, Ewan M. Wright¹, Kody J.H. Law⁴, Ricardo Carretero-Gonzalez⁵, Panayotis G. Kevrekidis⁶, Matthew J. Davis⁷

1. College of Optical Sciences, University of Arizona, USA
2. National Institute of Standards and Technology (NIST), USA
3. Department of Physics, University of Otago, New Zealand
4. Mathematics Institute, University of Warwick, UK
5. Dept. of Mathematics and Statistics, San Diego State University, USA
6. Department of Mathematics and Statistics, University of Massachusetts, USA
7. School of Mathematics and Physics, University of Queensland, Australia

Two-Dimensional Quantum Turbulence in Bose-Einstein Condensates

Using dilute-gas Bose-Einstein condensates, we experimentally generate two-dimensional quantum turbulence. Quantum

Precision Measurements and Fundamental Tests (5470) continued

1045-1100 **5470-CT-2**
Julian Berengut¹, Victor Flambaum¹

1. School of Physics, University of New South Wales, Australia

Enhanced Laboratory Searches for Variation of Fundamental Constants

We report on recent progress in finding new reference transitions for atomic clocks that exhibit strongly enhanced sensitivity to potential variation of fundamental constants.

1100-1115 **5470-CT-3**
Victor Flambaum¹

1. School of Physics, University of New South Wales, Australia

Astrophysical Evidences for the Variation of Fundamental Constants and Proposals of Laboratory Tests

New astrophysical results indicate variation of the fine structure constant in space. There is an agreement between the results obtained using different telescopes. These results may be used to predict the variation effects for atomic, nuclear and molecular clocks.

1115-1130 **5470-CT-4**
Gar-Wing Truong¹, James Anstie¹, Thomas Stace², Eric May³, Andre Luiten¹

1. Frequency Standards and Metrology Research Group, School of Physics, UWA, Australia
2. School of Mathematics and Physics, University of Queensland, Australia

1130-1145 **5410-CT-4**

B Norris¹, N. Jovanovic^{2,3,4}, P. Tuthill¹, S. Lacour⁵, S. Gross^{2,6}, 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 Dalfsen¹, D. 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

Jiyoung Kim⁴, T.W. Kim⁴, Jay Kirk², Tim LaFave¹, Viswanath Ramakrishna³

1. Department of Electrical Engineering, University of Texas at Dallas, USA
2. Department of Electrical Engineering, Southern Methodist University, USA
3. Department of Mathematical Sciences, University of Texas at Dallas, USA
4. Department of Materials Science and Engineering, University of Texas, Dallas, USA

Two Dimensional Optical Lattice Filters with Gain: Fabrication and Experimental Results

A scalable adjustable photonic integrated circuit is developed. A key enabling component is a nanophotonic coupler requiring very high aspect ratio InP etching. The measured filter response of the device agrees well with theory.

1130-1200 **5430-IT-5**

INVITED SPEAKER Chennupati Jagadish¹

1. The Australian National University, Australia

III-V Compound Semiconductor Nanowires for Optoelectronic Devices

We review various III-V compound semiconductor nanowires grown by metalorganic chemical vapor deposition. Transmission and scanning electron microscopy, micro-photoluminescence and micro-Raman spectroscopy have been used to understand the crystal structure, light emission and band structure.

significantly improving the detection sensitivity as a biological sensor.

1115-1130 **5440-CT-4**

Qijie Wang¹, Changling Yan², Nanfang Yu³, Christian Pflügl³, Laurent Diehl³, Federico Capasso⁵, Julia Unterhinninghofen⁴, Jan Wiersig⁴, Tadataka Edamura⁵, Masamichi Yamanishi⁵

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. Eah**¹, S.M. Koo², N.K. Park², P. Nordlander³, C. Lienau⁴, H. Kim⁵, N.J. Halas⁵

1. Center for Subwavelength Optics, Department of Physics and Astronomy, Seoul National University, Korea
2. Photonic Systems Laboratory, School of EECS, 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 as 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 Bouchendir¹, 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: $\alpha^{-1} = 137.035999037(91)$. 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,

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. Loehmannsroeber⁴

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. *innoFSPEC - 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.

Nanotechnology, University of Twente, The Netherlands
2. *Transducers Science and Technology Group, MESA+ Institute for Nanotechnology, University of Twente, The Netherlands*

Ultra-narrow-linewidth Distributed Feedback Lasers in Al₂O₃:Er³⁺ and Al₂O₃:Yb³⁺

The fabrication and characterization of rare-earth-ion-doped monolithic distributed feedback channel waveguide lasers in aluminum oxide are presented. Erbium-doped lasers with linewidths of 1.7 kHz and ytterbium-doped lasers with slope efficiencies of 67% are demonstrated.

1215-1230 **5420-CT-7**

Hirota So¹, Hirofumi Watanabe¹, Masayuki Yahiro², Yu Yang¹, Yuji Oki¹, Chihaya Adachi³

1. *Graduate School of ISEE, Kyushu University, Japan*
2. *Institute of Systems, Information Technologies and Nanotechnologies, Japan*
3. *Center of Future Chemistry, Kyushu University, Japan*

Highly Efficient Distributed-feedback Waveguide Blue Laser Using Spirobifluorene Derivative

We have demonstrated the highly efficient distributed-feedback waveguide blue laser using spirobifluorene derivative; hexylbiphenyl-spirobifluorene (HBP-spiro). The maximum slope efficiency of 13.5% was measured with single longitudinal spectrum.

1200-1215 **5430-CT-6**

Chih-Kuo Tseng¹, Jiun Ru Huang¹, Hau-Wei Hung¹, Yao-Tsu Yang¹, Kun-Yu Lee¹, Ting-Hsiao Wu¹, Gong-Ru.Lin², Jia-MinShieh³, 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

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 Rybin¹,²

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.

distributed inside the devices.
ACOFT 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,

1200-1215 **5460-CT-6**

Peter Drummond¹, Shi-Guo Peng¹, Hui Hu¹, 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.

with a precision twenty times greater than has previously been attained. Dispersion and birefringence measurements of the spider silks are also realised.
ACOFT Presentation

1215-1230 **5470-CT-7**

Adil A. Gangat¹, 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.

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 **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.

potentially capable of measuring multiple particles at MHz frame rates.

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, Xiangping 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 Walther¹, Frank Rutz¹, Johannes Schmitz¹, Wolfgang Luppold¹, Matthias Wauro¹, Jasmin Niemasz¹, Andreas Worl¹, 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**

Ajay Pandey¹, Muhsen Aljada¹, Marappan Velusamy¹, Paul Burn¹, 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**

In Hyung Baek¹, Sun Young Choi¹, Hwang Woon Lee¹, Valentin Petrov², Antonio Agnesi³, Valdas Pasiskevicius⁴, Dong-II 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

Nanophotonic Fabrication (5610) continued

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

1430-1500 **5610-IT-2**

INVITED SPEAKER

Dragov Neshev

Light Control in Plasmonic Structures and Metamaterials

1500-1515 **5610-CT-3**

Igor Aharonovich¹, Jonathan Lee¹, Andrew Magyar¹, Evelyn Hu¹

1. *School of Engineering and Applied Sciences, Harvard University, USA*

Fabrication of Diamond Microcavities for Quantum Information Processing

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.

Frequency and Temporal Control of Solid State Lasers (5620) continued

predefined resonator modes allows power scaling beyond the usual limits of self-organised coherent combination.

1430-1445 **5620-CT-2**

Joshua Toomey¹, Chetan Nickkawde¹, Deborah Kane¹

1. *Macquarie University, Australia*

Uncertainty in Interpulse Time Interval Evaluated as a New Measure of Nonlinear Laser Dynamics

Maps of the variation in interpulse duration of an optically injected solid state laser with varying injection power and frequency detuning is a useful tool for identification of different dynamical regions within the parameter space.

1445-1500 **5620-CT-3**

Chandrajit Basu^{1,2}, Oliver Puncken¹, Lutz Winkelmann¹, Maik Frede³, Bastian Schulz³, Peter Weßels^{1,2}, Jörg Neumann^{1,2}, Dietmar Kracht^{1,2}

1. *Laser Zentrum Hannover, Germany*
2. *QUEST - Centre for Quantum Engineering and Space-Time Research, Germany*
3. *neoLASE GmbH, Germany*

Single Frequency Solid State Laser Amplifier System: Towards 3rd Generation of Gravitational Wave Detectors

We demonstrate a robust, single frequency, solid state laser amplifier system with 177 W linearly

Semiconductors /Thin Films (5630) continued

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.

1430-1445 **5630-CT-2**

Tatsuya Ishimaru¹, Mirai Ieda¹, Hiroshi Kamisaka¹, Zamri Yusop¹, Masaki Tanemura¹, **Shingo Ono**¹, Tomohito Nagami², Noriaki Kawaguchi², Sumito Ishizu², Kentaro Fukuda², Toshihisa Suyama², Yuui Yokota³, Takayuki Yanagida³, Akira Yoshikawa³

1. *Nagoya Institute of Technology, Japan*
2. *Tokuyama Corporation, Japan*
3. *Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Japan*

Vacuum Ultraviolet Field Emission Lamp based on a KMgF3 Thin Film Phosphor

A vacuum-ultraviolet light emitting device was demonstrated by employing KMgF3 thin film as phosphor and carbon nanofibers field electron emitter. The device shows the spectra from 140 to 200 nm in wavelength.

Symposium on Green Photonics (5640) continued

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% .

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. *Centre for Organic Photonics and Electronics, University of Queensland, Australia*
2. *Bragg Institute, Australian Nuclear Science and Technology Organisation, Australia*
3. *School of Chemistry, University of New South Wales, Australia*
4. *School of Chemistry and Molecular Biosciences, University of Queensland, Australia*

Vertical Morphology in Solution-processed Organic Solar Cells

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 ("bilayer"TM) organic solar cell.

1430-1445 **5640-CT-3**

H.C. Chen¹, C.C. Lin³, H.W. Wang², M.A. Tsai², Peichen Yu¹, and H.C. Kuo¹

1. *Department of Photonic & Institute of Electro-Optical*

Novel Sources (5650) continued

fiber. Three probes of this kind were aligned in a micro-fluidic chamber in order to form Bessel-beam crossings that can endow a new degree of freedom to trap and transport microscopic particles. Theoretical aspects of beam formation and experimental results of particle transports are reviewed.

1430-1445 **5650-CT-2**

Meng Jiang¹, Bo Lin¹, Ping Shum¹, Swee Chuan Tjin¹, Xinyong Dong²

1. *School of Electrical and Electronics Engineering, Nanyang Technological University, Singapore*
2. *Institute of Optoelectronic Technology, China Jiliang University, China*

Frequency Tunable Microwave Generation Based on a Dual-Wavelength Single-Longitudinal-Mode Fiber Laser Incorporating a Phase-Shifted Grating

Frequency tunable microwave signal generation, based on a dual-wavelength single-longitudinal-mode (SLM) erbium-doped fiber (EDF) laser, incorporating a phase-shifted fiber Bragg grating (PS-FBG) with two π -phase shifts, is achieved.

1445-1500 **5650-CT-3**

Zohreh Lali-Dastjerdi¹, Toke Lund-Hansen¹, Karsten Rottwitt¹, Micheal Gallii¹, Christophe Peucheret¹

1. *Fotonik, Department of Photonics Engineering, Technical University of Denmark*

Ultrafast Optics of the Solid State (5660) continued

3. *Dipartimento di Elettronica dell'Università di Pavia, Italy*
4. *Department of Applied Physics, Royal Institute of Technology, Sweden*
5. *SKKU Advanced Institute of Nanotechnology, Korea*

Passive mode-locking of a Ti:sapphire laser using low-dimensional carbon nanostructures

We report on passive mode-locking of a Ti:sapphire laser employing novel saturable absorbers based on low-dimensional carbon nanostructures such as single-walled carbon nanotubes and monolayer graphene. The mode-locked operation with both saturable absorbers were characterized and compared to pure Kerr-lens mode-locking.

1415-1430 **5660-CT-2**

Toshiaki Yamazaki¹, Hiroshi Ono¹, Tatsutoshi Shioda¹

1. *Nagaoka University of Technology, Japan*

2Tb/s Digital Holographic Optical Frequency Comb Synthesizer / Analyzer

Optical complex electric field spectra of a 400 GHz optical frequency comb were controlled by a colorless optical synthesizer. The synthesized 2 Tb/s signals were measured by a proposed digital holographic optical frequency comb analyzer.

1430-1500 **5660-IT-3**

INVITED SPEAKER

Fabian Rotermond¹

1. *Ajou University, Korea*

CPT + Equivalence Principle Tests (5670) continued

1430-1500 **5670-IT-2**

INVITED SPEAKER

Achim Peters for the QUANTUS Team¹

1. *Humboldt-Universität zu Berlin, Institut für Physik, Germany*

Matter Wave Interferometry in Microgravity and its Application for High Precision Measurements

We present the latest results of the QUANTUS project in generating atomic quantum gases in microgravity and employing them for precision measurements. Important technological developments and perspectives for future space missions will be discussed.

1500-1515 **5670-CT-3**

Fred Baynes¹, Michael Tobar¹, **Andre Luiten**¹

1. *University of Western Australia, Australia*

Odd-Parity Tests of Electrodynamics

We present results from the first test of Lorentz invariance (LI) using an odd-parity optical resonator. This type of resonator offers enhanced sensitivity to odd-parity and isotropic violations of LI and high immunity to environmental fluctuations.

1515-1530 **5670-CT-4**

Stephen Parker¹, Paul Stanwix¹, **Michael Tobar**¹, Moritz Nagel², John Hartnett¹, Eugene Ivanov¹, Achim Peters²

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 $\approx \lambda/12$ 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 Hermannstädter¹, 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, Ryouichi 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%
ACOFT 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.
ACOFT Presentation

1500-1515 **5650-CT-4**

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 Ultrafast Solid-State Lasers

Carbon nanotubes were successfully applied for mode-locking ultrafast 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.

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, 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.

**Semiconductors /Thin Films
(5630) continued**

coherent wavelength converters were obtained theoretically and experimentally.

1515-1530 **5630-CT-5**

Naokatsu Yamamoto¹,
Kouichi Akahane¹, 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 MOPA 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.

ACOFT 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

POSTER SESSIONS

Sponsored by:



Monday 29 August 2011

1730-1930 POSTER SESSION 1 (2700)

Room: Bayside Terrace, Level 2

CLEO Pacific Rim

Semiconductor and Electro-Optic Devices

2700-PO-1

Takehiro Fukushima¹, Koichiro Sakaguchi¹, Yasunori Tokuda¹

1. *Okayama Prefectural University, Japan*

Quality Factor of Laser Diode Beam Tailored by Lloyd's Mirror Interference

The quality factor of a laser diode beam tailored by Lloyd's mirror interference is numerically evaluated. A quality factor as low as 1.08 was obtained for the tailored beam, which was nearly circular in shape.

2700-PO-2

Warren McKenzie¹

1. *Australian National Fabrication Facility, Australia*

The Challenges Facing Open Access Nanofabrication Facilities

This paper explores the challenges faced when creating and operating genuinely open-access facilities, provides an introduction to the ANFF facilities and access mechanisms and describes how these facilities can benefit researchers requiring fabrication of semiconductor and electro-optic devices.

2700-PO-3

Yong Gon Seo^{1,2}, Kwang Hyeon Baik¹, Hoo-Young Song¹, Ji-Su Son Jihoon Kim¹, Kyunghwan Oh², Sung-Min Hwang¹

1. *Korea Electronics Technology Institute, Korea*
2. *Yonsei University, Korea*

Optical Properties of Green Light-Emitting Diodes Grown on r-Plane Sapphire Substrates

We have reported on demonstration of green LEDs on a-plane GaN templates which were grown on r-plane sapphire substrates and characterized the optical output power and the emission spectra.

2700-PO-4

T.E. Tzeng¹, K.Y. Chuang¹, K.D. Tzeng¹, C.H. Chang¹, **Tsong-Sheng Lay¹**

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

Broadband InGaAs Quantum Dots-in-a-Well Solar Cells

BBBbroadband quantum dots solar cells with In_{0.1}Ga_{0.9}As quantum wells underneath the QDs are inserted to successfully reduce the strain effect on VOC, and p-type doping in the wells shows the enhancement in JSC.

2700-PO-5

Wanhua Zheng^{1,2}, Wenjun Zhou¹, Wei Chen¹, Anjin Liu¹, Hailing Wang¹, Aiyi Qi¹, Feiya Fu¹, Yufei Wang¹

1. *Nano-optoelectronics Lab, Institute of Semiconductors, CAS, China*
2. *State Key Laboratory on Integrated Optoelectronics, ISCAS, China*

Novel Lateral Cavity Surface Emitting Laser on Commercial Epitaxial Waveguide Wafer without DBR Layers

Novel lateral cavity surface emitting laser was realized on the commercial epitaxial wafer based on the photonic crystal band edge mode lateral resonance. Electrically driven single mode lasing action was obtained at room temperature

2700-PO-6

Yu-Shou Wang¹, Nai-Chuan Chen², Jenn-Fang Chen¹

1. *National Chiao Tung University, Taiwan*
2. *Chang Gung University, Taiwan*

Diffusion-controlled Effects of Luminescent Efficiency in InGaN GaN Light-Emitting Diodes

Temperature dependence of photoluminescence (PL) and time-resolved photoluminescence (TRPL) were used to investigate the recombination process in InGaN/GaN light-emitting diodes (LEDs). The results exhibited that the nonradiative recombination process can be explained by diffusion-controlled kinetic.

2700-PO-7

Shingo Ono¹, Mirai Ieda¹, Tatsuya Ishimaru¹, Noriaki Kawaguchi², Kentaro Fukuda², Toshihisa Suyama², Yuui Yokota³, Takayuki Yanagida³, Akira Yoshikawa³

1 *Nagoya Institute of Technology, Gokiso, Japan*
2 *Tokuyama Corporation, Japan*
3 *Institute of Multidisciplinary Research for Advanced Materials, Tohoku University, Japan*

Evaluation of NdF₃ Thin Films as a Vacuum Ultraviolet Photoconductive detector

We report on photoconductive detector based on NdF₃ thin films grown by PLD. NdF₃ thin film grown at 670 K exhibited the maximum photocurrent and the response below 180 nm in sensitivity spectrum.

High Power Laser Technology and High Energy Density Physics

2700-PO-8

Sungman Lee¹, **Hyunki Cha¹**

Korea Atomic Energy Research Institute, Korea

Laser Induced Fast Neutrons for Possible Activation Analysis of Explosive Materials

A laser-induced fast neutron generation system was developed and operated repetitively for the potential applications in activation analysis. The neutron yield was measured by using a fast-gating scintillation detector, a CR-39 detector, and a neutron activation of gold. A PGNA system was designed and tested for the laser-induced neutrons.

2700-PO-9

Zining Yang¹, Hongyan Wang¹, Qisheng Lu¹, **Weihong Hua¹**, Xiaojun Xu¹

1. *National University of Defense Technology, China*

Model of Diode Double-side Pumped Alkali Vapor Lasers

Based on published model for DPALs in single-side pumped configuration, we made some modifications to model the double-side pumped alkali lasers. By this model, a conceptual design for a 100kW Rb laser is made.

2700-PO-10

Go Imada^{1,2}, Hiroyuki Saitou³, Masataro Suzuki³, Wataru Masuda³

1. *Dept. Info. & Electron. Eng., Niigata Inst. Technol, Japan*
2. *Extreme Energy-Density Res. Inst., Nagaoka Univ. Technol, Japan*
3. *Dept. Mech. Eng., Nagaoka Univ. Technol, Japan*

Increase in Gain on TEA-CO₂ Laser Device with Supersonic Flow

The gain of a TEA-CO₂ laser with supersonic flow M = 2 is measured at 2.2 % /cm, which is 1.3 times as high as that obtained for the still laser gas at the room temperature.

Solid-State Laser and Other Lasers, and Laser Materials

2700-PO-11

Reza Salimi¹, Hassan Sameie¹, **Ali. A Sabbagh Alvani²**, Ali. A Sarabi¹, Manouchehr Khorasani², Mohammad A. Mokhtari¹, Farsi Yalda Ebrahimi¹, Mohammadreza Tahri³

1. Faculty of Polymer Engineering & Color Tech., Amirkabir University of Technology, Iran
2. Color and Polymer Research Center (CPRC), Amirkabir University of Technology, Iran
3. Biomaterials Group, Faculty of Biomedical Engineering, Amirkabir University of Technology, Iran

Optical Characterization of the Novel Nanostructure Eu-doped Phosphor for Potential Application in LEDs

After excitation of the phosphors which is efficiently matched to LED applications, blue light emits due to $4f65d1(2D)^14f7(8S7/2)$ transition of Eu^{2+} . The effect of structural parameters on the optical properties was evaluated by luminescence spectroscopy.

2700-PO-12

Jianlei Wang¹, Xiaojin Cheng¹, Zhenhua Zhang¹, Lei Li¹, Xiangchun Shi¹, **Xiaolei Zhu¹**, Weibiao Chen¹

1. Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China

Temperature-Dependent Performances of Diode-Pumped Yb:YAG Disk Lasers

The temperature-dependent performances of LD pumped Yb:YAG laser is investigated. The maximum output energy of 1.46J is obtained in experiment with the corresponding optical-optical efficiency of 48.7% when the pump energy is 3J.

2700-PO-13

Takeshi Hirai¹ Satoshi Hashimoto², Nobuhito Ohno³, Michio Matsumura⁴

1. College of Science and Engineering, Ritsumeikan University, Japan
2. Graduate School of Science, Osaka Prefecture University, Japan
3. Graduate School of Engineering, Osaka Electro-Communication University, Japan
4. Research Center for Solar Energy Chemistry, Osaka University, Japan

Amplified Spontaneous Emission from Organic Thin Film Crystals Grown from the Melts

Photoluminescence spectra of organic semiconducting thin film crystals [2-(4-tert-butylphenyl)-5-(4-biphenyl)-1, 3, 4-oxadiazole, etc.] grown from the melts have been investigated under high-density photo-excitation, suggesting the occurrence of amplified spontaneous emission from the organic thin film crystals.

2700-PO-14

Hsiao-Hua Wu¹, Jr-Yuan Juang¹, Wan-I Liu¹

1. Department of Physics, Tunghai University, Taiwan

Stable QML of SAM Based Picosecond Nd:GdVO₄ Lasers by Gain Modulation

Gain modulation was applied to semiconductor saturable absorber mirror based picosecond Nd:GdVO₄ lasers for achieving stable Q-switched mode locking and enhancing its peak power to 8 times higher than that operated at continuous-wave mode locking.

2700-PO-15

Alena Zavadilova¹, Vaclav Kubecek¹, Jean-Claude Diels², Jan Sulc¹

1. Czech Technical University in Prague – FNSPE, Prague
2. University of New Mexico, USA

Synchronously Intracavity Pumped Dual Pulse Optical Parametric Oscillator

We improved experimental setup of intracavity synchronously pumped optical parametrical oscillator, generating two independent trains of picosecond pulses at wavelength 1540 nm. The influence of external conditions on dual pulse generation was studied.

2700-PO-16

Andrew Lee¹, Jonas Jakutis-Neto^{1,2}, Helen Pask¹

1. MQ Photonics Research Centre, Department of Physics, Macquarie University, Australia
2. Instituto de Pesquisas Energeticas e Nucleares, Universidade de Sao Paulo, Brazil

Generation of Combs of Wavelengths in the Infrared and Visible using Cascaded Stimulated Raman Scattering in Potassium Titanyl Phosphate

We generate a comb of emission wavelengths in the near-infrared, and wavelength-tunable emission at up to five discrete wavelengths in the visible by applying cascaded stimulated Raman scattering in potassium titanyl phosphate.

2700-PO-17

Xiaoli Li^{1,2}, Andrew Lee¹, Helen Pask¹, James Piper¹, Yujing Huo²

1. MQ Photonics, Department of Physics and Astronomy, Macquarie University, Australia
2. Department of Electronic Engineering, Tsinghua University, China

330 mW CW Yellow Emission from Miniature Self-Raman Laser based on Direct HR-Coated Nd:YVO₄ Crystal

We report continuous-wave yellow emission from a miniature self-Raman laser using direct HR-coated Nd:YVO₄ crystal pumped by 3.8 W diode laser. Up to 330 mW output at 587.8 nm was obtained from an 18 mm long resonator.

2700-PO-18

Yu Lu¹, Zuochun Shen¹, Jianye Lu¹

1. National Key Laboratory of Tunable Laser Technology, Harbin Institute of Technology, Harbin 150001, China

Fresnel Lens Design to pump Cr/Nd:YAG Ceramic and Spectral Distribution at the Focal Plane

Based on the absorption spectrum of Cr/Nd:YAG ceramic, this paper addresses itself to the study of convex Fresnel lens focus solar light and choose spectrum. The design of Fresnel lens can be changed to obtain the desirable spectral distribution on focal plane. By way of simulation, the maximum absorb power density in six optimum design is 288.5W/cm², which is 3.2% -18.5% higher than absorb power density in six initial design based on purpose of obtaining the maximum power density.
ACOPT Presentation

2700-PO-19

Young-Ho Park¹, Myoung-Kyu Oh¹, Hoonsoo Kang¹

1. APRI, Gwangju Institute of Science and Technology, Korea

Characterization of a Homemade External-Cavity Diode Laser Employing Tapered Amplifier

An external-cavity diode laser employing tapered amplifier was built exploiting the high output power of tapered amplifier and the narrow spectral linewidth of external cavity configuration. An output power of 500 mW with the current of 2.5 A at the wavelength of 794 nm was achieved.

Applied Nonlinear Optics

2700-PO-20

Sheng-Min Wang¹, Siao-Shan Jyu¹, Wei-Wei Hsiang², Yinchieh Lai¹

1. Institute of Electro-Optical Engineering, National Chiao Tung University, Taiwan
2. Department of Physics, Fu Jen Catholic University, Taiwan

Demonstration Of 10ghz Asynchronous Mode-Locking In A Ytterbium-Doped Fiber Laser With Normal Dispersion

The asynchronous harmonic mode-locking technique is experimentally demonstrated on a Yb-doped fiber laser with normal cavity dispersion. Stable 10 GHz pulse trains with SMSR of 53 dB and 3 dB bandwidth of 1.15 nm have been achieved.

2700-PO-21

Daisuke Gunji¹, Masashi Hakamata¹, Ichiro Shoji¹, Tatsuo Fukui², Yasunori Furukawa²

1. Chuo University, Japan
2. OXIDE Corporation, Japan

Accurate measurements of the refractive indices of Mg-doped and undoped stoichiometric LiNbO₃ and LiTaO₃ by use of the minimum deviation method

We have measured the refractive indices of Mg-doped and undoped stoichiometric LiNbO₃ and LiTaO₃ at the wavelengths from 398 to 1064 nm with an accuracy of better than 1×10^{-4} by use of the minimum deviation method.

2700-PO-22

Zhi-Ming Hsieh¹, Shou-Tai Lin³, A. H. Kung^{1,2}

1. Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei, Taiwan
2. Institute of Photonics Technologies, National Tsing Hua University, Taiwan
3. Department of Photonics, Feng Chia University, Taichung, Taiwan

KHz multi-octave-spanning harmonics generated by quasi-phase matching

We report the generation of a kHz, five harmonic frequency comb by cascaded quasi-phase matched frequency mixing processes. This configuration permits the synthesis of a train of periodic sub-cycle subfemtosecond pulses in a compact setting.

2270-PO-23

W. Krolikowski¹, V. Roppo², Q. Kong³, Y. Sheng¹, **K. Kalinowski¹**

1. *Laser Physics Centre and Nonlinear Physics Centre, Australian National University, Australia*

2. *Department de Física i Enginyeria Nuclear, Universitat Politècnica de Catalunya, Spain*

3. *Department of Physics, Shanghai University, China*

Cerenkov Second Harmonic Generation in Nonlinear Crystals

We investigate the role of the fundamental beam width on Cerenko second harmonic generation in periodically poled crystal. We show that broader beam yields stronger signal and enhanced wavelength sensitivity of the emission process.

2700-PO-24

Hwan Hong Lim¹, Toshio Katagai², Takahiro Shimizu², Sunao Kurimura¹, Noriaki Ohmae³, Norikatsu Mio³, Ichiro Shoji²

1. *National Institute for Material Science (NIMS), Japan*

2. *Chuo University, Japan*

3. *University of Tokyo, Japan*

Optimal Pump Linewidth for Conversion Efficiency in cw Single-pass QPM SHG

We investigated normalized conversion efficiency depending on pump linewidth in cw single-pass QPM SHG. A maximum normalized SHG conversion efficiency is observed around a pump linewidth of 0.03 nm by additional SFG between longitudinal modes.

Infrared and THz Technology, and Astrophotonics

2700-PO-25

Hideto Shirai¹, Keiji Uzumi¹, Katsuya Fujita¹, Shyun Koshiba¹, Shunsuke Nakanishi¹, Hiroshi Itoh¹, Noriaki Tsurumachi¹

1. *Faculty of Engineering, Kagawa University, Japan*

THz radiation from Fabry-perot microcavity with GaP crystal in strong excitation condition

We investigated the characteristic of THz emission from microcavity structure with GaP crystal in the THz region under strong excitation and the two photon absorption properties in GaP crystal using optical pump terahertz probe spectroscopy.

2700-PO-26

Hidekazu Nakajima¹, Christopher T. Que¹, Elmer Estacio¹, Kohji Yamamoto¹, **Masahiko Tani¹**

1. *Research Center for Development of Far-Infrared Region, University of Fukui, Japan*

Enhancement of Terahertz Emission from InSb Using a Lens Coupler and Magnetic Field

THz emission enhancement from InSb pumped with 1.55- μ m femtosecond laser by simultaneous use of a lens-coupler and a magnetic field is investigated. A maximum amplitude enhancement of 74 times from a bare InSb is observed.

2700-PO-27

Kenji Wada¹, Shumpei Takeshita¹, Yuki Hono¹, Tetsuya Matsuyama¹, Hiromichi Horinaka¹

1. *Department of Physics & Electronics, Graduate School of Engineering, Osaka Prefecture University, Japan*

Stable Two-Wavelength Oscillation from External-Cavity Laser Diode Incorporating Cover Glass Etalons and Its Application to THz-Wave Generation

Stable two-wavelength oscillations from an external-cavity laser diode were achieved by incorporating cover glass etalons in the external-cavity. By focusing the two-wavelength outputs on a spiral photoconductive antenna, THz-waves were generated from the compact system.

2700-PO-28

Tomoharu Inoue¹, Kouichi Tsushima¹, Takashi Kataoka¹, **Kenichi Kasahara¹**, Naota Akikusa², Kazuue Fujita², Tadataka Edamura²

1. *Ritsumeikan University, Japan*

2. *Hamamatsu Photonics KK, Japan*

Small Optical Feedback-Induced Noise of 6.1- μ m Quantum Cascade Lasers

Relative intensity noise of a quantum cascade laser under optical feedback was first evaluated. Noise smaller than that of a conventional laser diode was due to a small line enhancement factor and long cavity length.

Integrated and Guided-Wave Optics and Thin Film Optics

2700-PO-29

Zilun Chen¹, Jing Hou¹, Shengping Chen¹, Zefeng Wang¹

1. *College of Optoelectronic Science and Engineering, National University of Defense Technology, China*

Low loss fusion splicing photonic crystal fibers and double cladding fibers

We demonstrate a novel method for low-loss splicing photonic crystal fibers (PCFs) and double cladding fibers (DCFs) by controlled hole collapse and tapering using a conventional fusion splicer.

2700-PO-30

Jinbiao Xiao¹, Saisai Xia¹, Wenliang Li¹, Xiaohan Sun¹

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

Characterization of Multiple-Slotted Silicon Wires with Angled Sidewalls Using Finite Element Method

The multiple-slotted silicon wires with angled sidewalls are analyzed by using a finite element method based on E-fields. The modal characteristics in quasi-TE and quasi-TM modes as function of the structural parameters are presented.

2700-PO-31

Liyang Liu¹, Yingfeng Li¹, Shaojun Wang¹, Lei Xu¹

1. *Key Lab for Micro and Nanophotonic Structures (Ministry of Education) Department of Optical Science and Engineering, School of Information Science and Engineering, Fudan University, China*

Low propagation loss binary ZrO₂-SiO₂ optical waveguides

ZrO₂-SiO₂ optical waveguides with low loss and large refractive index adjusting range were prepared by sol-gel process/dip-coating rapid thermal annealing treatment. Propagation loss is below 0.5 dB/cm even ZrO₂ concentration is over 40%.

2700-PO-32

A.T. Rosenberger¹, E.B. Dale¹, D. Ganta¹

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

Cross-Polarization Mode Coupling in Whispering-Gallery Microresonators

When whispering-gallery modes of one polarization are driven, modes of the other polarization can also be excited. Our results suggest that scattering into a co-resonant mode of the orthogonal polarization is responsible.

2700-PO-33

Cheng-Chung Jaing¹, Ming-Chung Liu², Ping-Chi Feng¹, Chien-Jen Tang¹, Yeuh-Yeong Liou³, Bo-Huei Liao², Cheng-Chung Lee²

1. *Minghsin University of Science and Technology, Taiwan*

2. *National Central University, Taiwan*

3. *Chienkuo Technology University, Taiwan*

Thermal Expansion Coefficients of Obliquely Deposited LaF₃ Thin Films

Effects of columnar angles on the thermal expansion coefficients of LaF₃ films were investigated. The LaF₃ films with columnar microstructures were obliquely deposited on two types of glass substrates by means of resistive heating evaporation.

2700-PO-34

Duk-Yong Choi¹, Steve Madden¹, Rongping Wang¹, Barry Luther-Davies¹

1. *Laser Physics Centre, Australian National University, Australia*

The Impact of Thermal- and Photo-annealing of Chalcogenide Films for Optical Waveguides

Monday 29 August 2011 - Poster Session 1 continued

We present the application of photo-induced structural change and thermal annealing in chalcogenide films and its impact on waveguide performance. Light annealing is an efficient way for making the film homogeneous, hence for low-loss guides.

2700-PO-35

Vaclav Prajzler¹, Eduard Strilek¹, Oleksiy Lyutakov², Ivan Huttel², Jarmila Spirkova², Vlastimil Jurka³

1. Department of Microelectronics, Czech Technical University in Prague, Czech Republic
2. Institute of Chemical Technology, Czech Republic
3. Institute of Physics of the Academy of Sciences, Czech Republic

Polymer Optical Microring Filter for Passive Optical Network Applications

We report about of the Epoxy Novolak Resin polymer optical microring resonator (MR) filter operating at 1490 nm. The design was done by using FullWAVE software and MR was fabricated by using electron beam lithography.

ACOFI Presentation

2700-PO-36

Sakoolkan Boonruang¹, Waleed S. Mohammed²

1. National Elect & Computer Tech Ctr, National Science and Tech Development Agency, Thailand
2. School of Engineering, Bangkok University, Thailand

Integrated On-Axis Light Coupler for Surface Plasmon Resonance Using a Concentric Chirp Grating

A novel on-axis one-element polarization independent light in/out-coupling mechanism in a surface plasmon resonance (SPR) is proposed. The system with broad dynamic range ($\Delta n > 0.35$) utilizes an integrated high numerical aperture - concentric chirp grating.

Information Optics, Optical Storage and Displays

2700-PO-37

Jiarong Ji¹, Yansheng Song¹, Xianghua Feng¹, Wenhua Dou²

1. College of Opto-Electronic Science and Engineering, National University of Defense Technology, China
2. College of Computer National University of Defense Technology, China

Dependence of the Lifetime of Thermal Fixed Hologram on Grating Spacing in Photorefractive Crystals

We deduced the analytic expression of the lifetime of thermal fixed ionic holograms in photorefractive crystal. The result revealed that larger grating spacing was advantage for increasing the lifetime but had less influence on it.

2700-PO-39

Chikara Egami¹, Takuya Okawa¹, Kazuhiro Kuwahara¹

1. Shizuoka University, Japan

Jitter-Free Nanoparticles Optical Disk Storage

An optical storage disk composed of nanoparticles with buffer rings is proposed for high density recording without jitter. Nanoparticles doped with nonlinear organic dyes were used as recordable pits.

2700-CT-40

Ki-Mun Pak¹, Hyun-Hwan Choi¹, Yong-Hyub Won¹

1. Department of Electrical Engineering, Korea Advanced Institute of Science and Technology, Korea

Demonstration of Color Encrypted Computer-generated Hologram for an Error-free Optical ID Tag System

A color encryption method for APM-CGH for use in an error-free optical ID system is proposed. In a comparison with the conventional kinoform-CGH, it shows dramatically faster pattern generation times and more robust reconstruction capabilities.

ACOFI Presentation

2700-PO-41

Kosom Chaitavon¹, Sarun Sumriddetchajorn², and Jiti Nukeaw³

1. Photonics Technology Laboratory, National Electronics and Computer Technology Center, Thailand

2. Intelligent Devices and Systems Research Unit, National Electronics and Computer Technology Center, Thailand

3. College of Nanotechnology, King Mongkut's Institute of Technology, Thailand

Highly-Sensitive Optofluidics-based Single-Flow-Channel Refractometer Structure

This paper shows how only a single-channel microfluidic chip when deployed in our interferometric optofluidics-based refractometer can offer a very high sensitivity of 6.16×10^{-6} RIU/pixel suitable for sensitive bio and chemical sensing applications.

2700-PO-42

F.J. Wen¹, P. S. Chung¹, Y. Chen¹, Y.T. Chow¹

1. City University of Hong Kong, China
2. Shanghai Institute of Optics and Fine Mechanics, China

Novel Measurement Techniques using Mixed Circular and Cylindrical Phase Gratings

We propose an optical diffractive element which is composed of circular and cylindrical phase gratings, producing a mixed spectrum in a fractional Fourier transform system. It can be used in measuring distance, area and angle.

Optical Communications and Networking

2700-PO-43

Po-Hung Hsieh¹, **Wen-Shing Tsai¹**, Chun-Chia Weng¹, Hai-Han Lu²

1. Ming Chi University of Technology, Taiwan
2. National Taipei University of Technology, Taiwan

Optical Single-Sideband Modulation Based on FWM of SOA Using Electro-Absorption Laser

OSSB modulation scheme using FWM effects of SOA to achieve wavelength conversion. By properly adjust the phase shifter for phase difference between the two paths of electrical signal and transmit for a 25 km SMF.

2700-PO-44

T.P. Villena A.^{1,2}, **Arismar Cerqueira S. Jr.^{3,2}**, Marcelo L.F. Abbade⁴, H.E. Hernandez-Figueroa^{1,2}, H.L. Fragnito^{5,2}

1. Faculdade de Engenharia Elétrica e de Computação, UNICAMP, Brazil
2. Optics and Photonics Research Center, UNICAMP, Brazil
3. Faculdade de Tecnologia (FT), UNICAMP, Limeira-SP, Brazil
4. Faculdade de Engenharia Elétrica, PUC-Campinas, Brazil
5. Instituto de Física Gleb Wataghin, UNICAMP, Brazil

A New Optical Heterodyne Technique for Generating Multi-amplitude Microwave Signals

We propose a new technique that uses photodiode nonlinear response to convert two modulated optical signals into a single multi-amplitude microwave signal. Experimental tests successfully show the generation of 20 GHz quaternary amplitude-shift keying signals.

ACOFI Presentation

2700-PO-45

Jongdeog Kim^{1,2}, Munseob Lee¹, Sang-Heung Lee¹, **Seiyoung Lee¹**, Hakjeon Bang², Chang-Soo Park²

1. Electronics and Telecommunications Research Institute (ETRI), Korea
2. Gwangju Institute of Science and Technology (GIST), Korea

XG-PON1 OLT Transceiver With A Single-chip Burst-mode Receiver

We present the design and evaluation of a 10-gigabit small form factor pluggable transceiver with a prototype single-chip burst-mode receiver, a signal detection circuit, and a clock-data-recovery device for 2.5 Gbit/s upstream in the ITU-T G.987.2 recommendation.

2700-PO-46

P. C. Peng¹, H. H. Lu¹, C. H. Chang², W. L. Chuang¹

1. National Taipei University of Technology, Taiwan
2. National Chiayi University, Taiwan

40 GHz Tunable Microwave Photonic Filter based on Vertical-Cavity Surface-Emitting Laser

This study demonstrates a 40 GHz microwave photonic filter using a vertical-cavity surface-emitting laser. Experimental results indicate that the filter has a tuning range of over 31 GHz and a notch rejection of over 30 dB.

Laser Metrology and Remote Sensing

2700-PO-47

Qi Wang¹

1. Department of Physics, Huazhong University of Science & Technology, China

Roughness Measurement of Optical Quality Surface from a Single Image

I propose a method to estimate the roughness of an optical quality surface with Gaussian height distribution using a single image. The concept of the profile array of the image is defined, which contains information about the roughness of the surface. The standard deviation of the profile array can be calculated from the standard deviation of the central positions of a bright fringe in the image. Measurements on simulated images have been performed and the results are displayed and discussed. The method needs only one image and therefore it is immune to vibration. The method also has the same lateral resolution as multiple image methods.

2700-PO-48

Dukhyeon Kim¹, Sunho Park¹, Hai-Du Cheong¹, Wonseok Choi¹, Yong-Gi Kim², Moonsang Yun², Imkang Song²

1. Hanbat National University, Korea

2. Kongju National University, Korea

Can We Measure the Aerosol and Cloud Liquid Characteristics by Using Mie and Liquid-water Raman Lidar?

Liquid water Raman signal was measured and normalized by Mie and water vapor Raman signals. Here we have discussed the possibility of characterizing the aerosol and liquid cloud by using normalized liquid water lidar.

2700-PO-49

Gerry Bagtasa^{1,2}, Nobuo Takeuchi³, Hiroaki Kuze³

1. Institute of Environmental Science & Meteorology, University of the Philippines, Philippines

2. Natural Sciences Research Institute, University of the Philippines, Philippines

3. Center for Environmental Remote Sensing, Chiba University, Japan

Wavelet Denoising Applied to Cloud Base Height Determination from Portable Automated Lidar Data

The Portable Automated Lidar is capable of continuous monitoring of the atmosphere. Wavelet-based denoising is done to increase its observable range and a new cloud retrieval method is developed from the analysis of wavelet transform.

2700-PO-50

Shigeki Nishida¹, Yoshihiro Oshida¹

1. Nara National College of Technology, Japan

Development of an Optical Ruler for Range Finding Using a Binary Fresnel Hologram

We propose an optical ruler for range finding using a Fresnel hologram. It was fabricated using electron beam lithography. The fabricated hologram acted on a ruler for range finding with distance resolution of 20 millimeters.

ACOFT Presentation

2700-PO-51

Biju Cletus¹, William Olds¹, Emad L Izake¹, Peter M Fredericks¹, Esa Jaatinen²

1. Chemistry Discipline, Faculty of Science and Technology, Queensland University of Technology, Australia

2. Physics Discipline, Faculty of Science and Technology, Queensland University of Technology, Australia

Concealed Substance Identification using a Defocused Inverse Spatially Offset Raman Spectrometer

In this work we demonstrate a defocused inverse Spatially Offset Raman Spectrometer geometry with a modified data analysis method capable of making inverse SORS measurements from a distance greater than the focal distance of the collection lenses. With the defocused geometry we were able to detect acetaminophen, concealed inside a 2 mm thick plastic bottle, at a non-contact distance of 30 cm.

ACOFT Presentation

2700-PO-52

Youngkyu Park¹, Jun Gyu Park¹, and Kyuman Cho^{1,2}

1. Department of Physics, Sogang University, Korea

Constant-Phase Scanning Heterodyne Interferometer

A constant-phase scanning heterodyne interferometer scheme is introduced. The phase difference between the probe beam and reference beam is locked at the constant value by using a feedback control loop, by which nonlinearity and 1/ε-ambiguity of the phase measurements are minimized.

Laser Processing, Laser Microfabrication, and Industrial Applications

2700-PO-53

Yuan-Chin Lee^{1,2}, Shih-Chao¹, Chun-Chieh Huang², Chin-Tien Yang²

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

2. Industrial Technology Research Institute, Taiwan

Fabrication of a Dual-wavelength Optical Pickup Head for Laser Direct Writing

A dual-wavelength optical pickup head design for laser direct writing is designed, fabricated, and used for exposing some in-organic photo resist. A spot with 500nm in diameter and 120nm in depth is achieved for GeTeSnOx

ACOFT Presentation

2700-PO-54

I.A. Palani¹, K. Okazaki¹, D. Nakamura¹, M. Higashihata¹, T. Okada¹

1. Laser Laboratory, Graduate School of Information science and Electrical Engineering, Kyushu University, Japan

Characterization of Sb-Al Co-doped ZnO Nanowires Synthesized Using Nanoparticle-Assisted Pulsed-Laser Deposition

Sb-Al co-doped ZnO nanowires have been successfully synthesized using nanoparticles-assisted pulsed-laser deposition. These nanowires possess wurzite crystal structures with a sharp UV emission, highly suitable for optoelectronics applications.

2700-PO-55

Yuwen Duan¹, Martin Ams¹, Graham D. Marshall¹, Peter Dekker¹, M.J. Steel¹, Michael J. Withford¹

1. Centre for Ultrahigh bandwidth Devices for Optical, Macquarie University, Australia

Recent developments in dual-wavelength DFB waveguide lasers fabricated by femtosecond laser pulses

We report a dual-wavelength (DW) distributed feedback (DFB) waveguide laser based on a symmetric periodically sampled grating fabricated in Yb-doped phosphate glass, using the femtosecond laser direct-write technique.

2700-PO-56

Fei Jiang^{1,2}, Adrain Keating², Mariusz Martyniuk¹, Lorenzo Faraone¹, John Dell¹

1. EECE, The University of Western Australia, Australia

2. Mechanical and Chemical Engineering, The University of Western Australia, Australia

Fabrication Process for Optically Low Loss Si Cantilever Waveguide

Finite difference time domain was used to model through a waveguide consisting of a deflecting cantilever butt-coupling into a fixed waveguide. Effects towards fabrication of modulated structure revealed stress gradients in top Si layer.

Laser Chemistry, Biophotonics and Applications

2700-PO-57

Nam Hyun Cho¹, Unsang Jung¹, Suhwan Kim¹, Jeehyun Kim¹

1. Kyungpook National University, Korea

Next-generation Otitis Media Diagnosis Method by Otolaryngology type Optical Coherence Tomography (OCT)

OCT (Optical Coherence Tomography) is an optical imaging method that can real-time and non-invasively acquire detailed images of in vivo tissues using optical interference phenomenon. But traditional OCT system has been developed for observing relatively big objects. We developed an otolaryngology type OCT as a next-generation middle ear diagnosis method for early diagnosis.

2700-PO-58

Song-Hee Han¹, Man Minh Tan², Yonghoon Lee²

1. Division of Liberal Arts and Science, Mokpo National Maritime University, Japan

2. Department of Chemistry, Mokpo National University, Japan

Monday 29 August 2011 - Poster Session 1 continued

3. Department of Chemistry, Mokpo National University, Japan

Feasibility Study for Classification of Sun-Dried Sea Salts by Laser-Induced Breakdown Spectroscopy

We have investigated the feasibility of laser-induced breakdown spectroscopy (LIBS) for classification of sun-dried sea salts. The LIBS spectra of various sun-dried sea salts from 11 provenances were recorded in the wavelength region between 760 nm and 800 nm.

2700-PO-59

Ryosuke Tanaka¹, Takeshi Yasui^{1,2}, Shu-ichiro Fukushima¹, Tsutomu Araki¹

1. Graduate School of Engineering Science, Osaka University, Japan
2. Institute of Technology and Science, The University of Tokushima, Japan

In Vivo Observation of Skin Burn Using Collagen-Sensitive Second-Harmonic-Generation Microscopy

We applied collagen-sensitive second-harmonic-generation (SHG) microscopy for in vivo assessment of skin burn in animal model. Characteristic structural change of collagen fiber was clearly visualized in SHG image depending on a degree of burn.

2700-PO-60

Leo Matsuoka¹, Masashi Hashimoto¹, Keiichi Yokoyama¹

1. Japan Atomic Energy Agency, Japan

Narrow-Band Regenerative Amplifier for Momentum Imaging Spectroscopy of Molecules

We developed a Ti:Sapphire narrow-band regenerative amplifier for molecular spectroscopy. The gain bandwidth was narrowed to ~ 0.7 cm⁻¹ in the cavity. With 1.1-mJ pumping, mode-locked seed pulses were amplified to ~ 25 μ J at 1-kHz repetition.

2700-PO-61

Masato Ohmi¹, Motomu Tanigawa¹, Yuki Wada¹, Masamitsu Haruna¹

1. Yamada-Oka, Suita, Japan

Dynamic Analysis for Internal Mental Sweating of a Group of Eccrine Sweat Glands by Optical Coherence Tomography

We demonstrate dynamic OCT analysis of mental sweating of a group of eccrine sweat glands. The sweating dynamics is tracked simultaneously for nineteen sweat glands by time-sequential piled-up en-face OCT images with the frame spacing of 3.3 sec. Strong non-uniformity is observed in mental sweating where the amount of excess sweat is different for each sweat gland although the sweat glands are adjacent to each other. The non-uniformity should be necessary to adjust as precisely the total amount of excess sweat as possible through the sympathetic nerve in response to strength of the stress.

2700-PO-63

Yi-Chun Chen¹, Huei-Jyuan Pan¹, Li-Wei Chu², Chung-Shi Yang², **Chau-Hwang Lee**^{1,3}

1. Research Center for Applied Sciences, Academia Sinica, Taiwan
2. Center for Nanomedicine Research, National Health Research Institutes, Taiwan
3. Institute of Biophotonics, National Yang-Ming University, Taiwan

An Image Processing Algorithm to Tackle Noisy Point Spread Functions in 3D Intracellular Particle Tracking

We developed an algorithm that combines wavelet denoising and azimuthally averaging of point spread functions (PSFs) to achieve 3D particle tracking with noisy background. This algorithm provides positions of single quantum dots in living cells.

2700-PO-64

M. Pollnau¹, N. Ismail¹, K. Wörhoff¹, L.-P. Choo-Smith², A. C. Baclig³, P. J. Caspers³, G. J. Puppels³, A. Driessen¹, R.M. de Ridder¹

1. Integrated Optical MicroSystems Group, MESA+ Institute for Nanotechnology, University of Twente, The Netherlands
2. Institute for Biodiagnostics, National Research Council Canada, Canada
3. Center for Optical Diagnostics and Therapy, Department of Dermatology, Erasmus Medical Center, The Netherlands

On-chip Raman Spectrometer for the Detection of Dental Caries

We measure Raman spectra of teeth using an integrated arrayed-waveguide-grating spectrometer fabricated in silicon-oxynitride technology. The results represent a step towards the realization of compact, hand-held, integrated spectrometers for the detection of early dental caries.

2700-PO-65

Jang Hyuk Lee¹, Dae Sik Choi¹, Dong Hoon Song¹, Eun Hee Cho², Sang-Mo Shin², Myoung-Kyu Oh³, **Do-Kyeong Ko**^{1,3}

1. Graduate Program of Photonics and Applied Physics, Gwangju Institute of Science and Technology, Korea
2. Graduate program of Medical System Engineering, Gwangju Institute of Science and Technology, Korea
3. Advanced Photonics Research Institute, Gwangju Institute of Science and Technology, Korea

Dual-color Nonlinear Optical Microscope Imaging and its Applications

A photonic crystal fiber(PCF) based dual-color nonlinear microscope that combines coherent anti-Stokes Raman scattering(CARS) microscopy and two-photon excitation fluorescence(TPEF) microscopy was developed and applied to imaging of various samples using a femtosecond laser.

2700-PO-66

In-Sik Kim¹, Sung In Hwang¹, Donghoon Song¹, **Do-Kyeong Ko**^{1,2}

1. School of Photon Science and Technology, Gwangju Institute of Science and Technology, Korea
2. Advanced Photonics Research Institute, Gwangju Institute of Science and Technology, Korea

On-axis Spiral Phase Contrast Microscopy with Femtosecond Light Source

We demonstrate that enhancement of optical image can be achieved with the femtosecond field by redirecting a DC part of the object image with a spiral phase plate.

2700-PO-67

Sang-Won Lee¹, Hyun-Woo Song¹, Jae Du Cho², Chang-Seok Kim Bong-Kyu Kim¹, Moon-Yuon Jung¹, Seung-Hwan Kim¹

1. Electronics and Telecommunications Research Institute, Japan
2. Pusan National University, Japan

Fourier Domain Optical Coherence Tomography for Ophthalmology using 800-nm Wavelength-Swept Laser: Preliminary Study

In this preliminary study, we constructed an 800-nm Fourier-domain/swept-source optical coherence tomography (FD/SS-OCT) for ophthalmology and obtained in vivo retinal OCT image of a healthy volunteer with an acquisition speed of 2.0 fps (1,000 A-lines/frame).

Fiber Amplifiers, Lasers, Sensors and Devices

2700-PO-68

Tian Jiang¹, Xiang-Ai Cheng¹

1. College of Photoelectric Science and Engineering, National University of Defense, Japan

Study of Ring Damage Phenomenon of CCD Irradiated by Ultrashort Pulse

To study the mechanism of ring damage phenomenon of array CCD irradiated by ultrashort pulsed Laser, it is found that the camera operated in the defocussing state is the main reason of ring damage phenomenon.

ACOFT Presentation

2700-PO-69

Bing He^{1,2}, Jun Zhou^{1,2}, Zhen Li^{1,2}, Yuhao Xue^{1,2}, Jingxing Dong^{1,2}, Yunrong Wei^{1,2}, Qihong Lou^{1,2}

1. Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China
2. Shanghai Key Laboratory of All solid-state Laser and Applied Techniques, China

Impact of Phase Perturbation on Passive Phase Locking of Fiber Laser Array

The phase perturbation of passive phase locking of fiber laser array is studied. Stable interference fringes with high contrast ratio can be still obtained even at modulation frequency of about 50 kHz

ACOFT Presentation

2700-PO-70

Young Ho Kim¹, Seong Jun Park¹, Kwan Seob Park¹, Sie-Wook Jeon¹, Chang-Soo Park¹, Byeong Ha Lee¹

1. School of Information and Communications, Korea

Simultaneous Measurements of Temperature and Refractive Index by Using Two-mode Fiber Interferometry

Fiber-optic interferometer probe based on two-mode fiber (TMF) is proposed and fabricated for simultaneous measurements of surrounding temperature and refractive index of liquid. The phase change of the reflection spectrum of the proposed probe is related only to the temperature variation, while the intensity change depends only on the refractive index variation.

2700-PO-71

Hyunmin Park¹, Kwang-Hoon Ko¹, Yong-Ho Cha¹, Jaemin Han¹, Gwon Lim¹, Taek-Soo Kim¹, Do-Young Jeong¹, Yong Gi Kim²

1. Quantum Optics Division, Korea Atomic Energy Research Institute, Korea
2. Department of Physics, Kongju National University, Korea

A Pulsed Diode-Oscillator Fiber-Amplifier with Wavelength Tunable Fourier-transform Limited Linewidth

We developed a single-frequency wavelength-tunable pulsed laser with Fourier-transform limited linewidth using the diode-oscillator fiber-amplification. The output power and spectral bandwidth after the final amplification using 40- μm core Yb-PCF fiber were measured and analysed.

2700-PO-72

Albert Canagasabay^{1,2}, Andrew Michie^{1,2}, **John Canning¹**, John Holdsworth³, Simon Fleming², Hsiao-Chuan Wang^{1,2}, Mattias L. Åslund¹

1. Interdisciplinary Photonics Laboratories (iPL), School of Chemistry, University, Australia
2. Institute of Photonics and Optical Science (IPOS), School of Physics University, Australia
3. SMAPS, University of Newcastle, Australia

A Comparison of Michelson and Mach-Zehnder Interferometers for Laser Linewidth Measurements

The performances of the Michelson (MI) and Mach-Zehnder interferometers (MZI) are compared for laser linewidth measurement with the delayed self-heterodyne technique. Voigt fitting is used to extract the Lorentzian and Gaussian components for the MZI and MI with Faraday mirrors and also standard gold mirrors. The MI with Faraday mirrors provides a measurement with significantly lower error, owing to the elimination of noise associated with random polarisation drifts.

2700-PO-73

Yu-Hsin Hsieh¹, Nan-Kuang Chen²

1. Department of Electro-Optical Engineering, National United University, Taiwan
2. Optoelectronics Research Center, National United University, Taiwan

Micro Sagnac loop interferometer based on a sphere-end hollow-core optical fiber

We demonstrate an ultracompact and robust micro Sagnac loop interferometer by splicing the end-sphered hollow-core fiber against single mode fiber. The device length is less than 450 μm and the extinction ratio can be above 29dB.

2700-PO-74

Lili Gui¹, Xiaosheng Xiao¹, **Changxi Yang¹**, Xin Yang², Jinsong Zhu², Xiao Li³, Hongwei Zhu³

1. State Key Laboratory of Precision Measurement Technology and Instruments, Department of Precision Instruments, Tsinghua University, China
2. National Center for Nanoscience and Technology, China
3. Key Laboratory for Advanced Manufacturing by Materials Processing Technology, Department of Mechanical Engineering, Tsinghua University, China

Observation of Various Bound Solitons of a Fiber Laser with Carbon Nanotubes and Graphene as Saturable Absorbers

Both in-phase and anti-phase two-soliton bound states were observed in a carbon-nanotube based mode-locked fiber laser. This paper also reports preliminary results of bound states with graphene as the saturable absorber for the first time.

2700-PO-75

Paul Jansz¹, Graham Wild¹, Steven Richardson¹, **Steven Hinckley¹**

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

Simulation of Optical Delay Lines for Optical Coherence Tomography

We present an analytical model used to simulate different optical delays in time domain optical coherence tomography. Its primary purpose is to compare conventional moving

optical delay lines to quasi-stationary and stationary optical delay lines.
ACOFT Presentation

2700-PO-76

Paulo Antunes^{1,2}, Rui Travanca³, Humberto Varum³, **Paulo André^{1,2}**

1. Instituto de Telecomunicações, Campus de Santiago, Portugal
2. Departamento de Física, Campus de Santiago, Portugal
3. Departamento de Engenharia Civil, Campus de Santiago, Portugal

Dynamic Characterization of a Radio Communication Tower with a FBG Based Accelerometer

The dynamic monitoring of a tower for mobile communications with 50 meters high using a bi-axial optical accelerometer is reported. The resonant frequencies for the first modes were obtained, being consistent with the expected values.

2700-PO-77

Shailendra K. Varshney¹, **Bhagyalaxmi Behera¹**, Annesha Maity¹, Raja Datta¹

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

Designing Bend-limited Large Mode Area Multi-Core Optical Fibers

We present design principles and constraints on bend-limited large-mode-area multi-core optical fibers. By introducing an extra air-hole ring in the cladding or trench, the bend losses can be reduced despite maintaining single-mode operation and large-mode-area.
ACOFT Presentation

2700-PO-78

Jiafang Bei¹, Heike Ebendorff-Heidepriem¹, Roger Moore¹, Tanya Monro¹

1. Institute for Photonics & Advanced Sensing and School of Chemistry & Physics, Australia

Fluoroindate Fibres With Reduced Loss in the Mid Infrared Spectral Region: A Study of the Glass Melting and Fibre Preparation Conditions

The optimization of a fluoroindate glass preparation and preform fabrication has been investigated, which led to the reduction of the water content and fibre loss. The improvement of fluoroindate glass system enables longer wavelength and high power delivery laser devices fabrication.
ACOFT Presentation

2700-PO-79

Hou-Ren Chen¹, Chih-Hsuan Wu¹, Kuei-Huei Lin², **Jo-Yi Cheng²**, Hsiao-Hua Wu³, Wen-Feng Hsieh¹

1. Department of Photonics, National Chiao Tung University, Taiwan
2. Department of Science, Taipei Municipal University of Education, Taiwan
3. Department of Physics, Tunghai University, Taiwan

High-Repetition-Rate Passive Harmonic Mode-Locking in an SOA-Based Fiber Laser with Normal Dispersion

Harmonic mode-locking is operated in an 18-m figure-8 laser cavity having SOA gain medium at 1060 nm under normal dispersion. We can tune the repetition rate from 0.336 to 1.75 GHz by adjusting intracavity polarization at 100 mA pump.

2700-PO-79B

Hae Won Jung¹, Seoung Hun Lee¹, Kyong Hon Kim¹, Byeong Joo Lee², Goo Hwan Jeong², Han Young Yu³

1. Department of Physics, Inha University, Korea
2. Dept. of Advanced Materials Science & Engineering, Kangwon National University, Korea
3. ETRI, 161 Gajeong-dong Yuseong-gu, Korea

Graphene Thickness-Dependent Q-Switched Fiber Lasers

Graphenes of a couple of different thicknesses, both in a range of 10~20 layers, were tested as saturable absorbers for passively Q-switched erbium-doped fiber lasers. It was observed that the thin graphene provided a Q-switched pulse output of higher peak power, shorter pulse width, and higher repetition rate than the thick graphene.
ACOFT Presentation

IQEC

Quantum Optics

2700-PO-80

Byoung Ham¹

1. Inha University, Korea

Matched Pulse in Solid by Nondegenerate Four-Wave Mixing in an Ultralow Light Regime

Delayed nondegenerate four-wave mixing signals in a ultraslow light regime of rare-earth doped crystal has been observed, where the nondegenerated four-wave mixing signal copropagates along with the ultraslow probe pulse forming matched ultraslow light.

2700-PO-81

Yong-Chun Liu¹, Qihuang Gong¹, Bei-Bei Li¹, Xue-Feng Jiang¹, Yan Li¹, Yun-Feng Xiao¹

1. State Key Lab for Mesoscopic Physics, Department of Physics, Peking University, China

Position-Insensitive Photon Turnstiles in a Diamond Nanocrystal - Microcavity System

We find that Rayleigh Scattering plays a significant role in the photon transportation in a CEQD system where a single nitrogen-vacancy center is coupled to a whispering-gallery microcavity. The system can function as high-efficiency and position-insensitive photon turnstiles.

2700-PO-82

Akihiro Yamaguchi^{1,2}, Holger F. Hofmann^{1,2}

1. Hiroshima University, Japan
2. JST, CREST, Japan

Analysis of Quantum Correlations in the Light-Atom Interaction using a Time Domain Model of Light Field Propagation

We analyze the interaction of arbitrary quantum states of light with a single atom in free space using a local interaction with a single mode and a discrete model of light field propagation.

2700-PO-83

Alexei Filinkov², **Ian G. Fuss**¹

1. School of Electrical and Electronic Engineering, University of Adelaide, Australia
2. School of Mathematical Sciences, University of Adelaide, Australia

A Rigorous Description of Optical Phase

We represent the phase of an optical field by an operator valued distribution thus enabling a rigorous analysis of its statistics and new approaches to its approximation and measurement.

ACOFI Presentation

2700-PO-84

Masataka Iinuma¹, Yutaro Suzuki¹, Gen Taguchi¹, Yutaka Kadoya¹, Holger F. Hofmann¹

1. ADSM Hiroshima University, Japan

A Method for Weak Measurement of Photon Polarization Robust Against Experimental Imperfections

We realized a simple optical weak measurement of diagonal (PM) polarization of photons by interference between the horizontal and vertical polarization components. This measurement can achieve small back-action even at low visibilities of the interference.

2700-PO-85

Yutaro Suzuki¹, Masataka Iinuma¹, Tomonori Okazaki¹, Gen Taguchi¹, Yutaka Kadoya¹, Holger Hofmann^{1,2}

1. Graduate school of Advanced Sciences of Matter, Hiroshima University, Japan
2. JST, CREST, Japan

Experimental Investigation of the Role of Measurement Uncertainties in the Violation of Leggett-Garg Inequalities

We show that the violation of Leggett-Garg inequalities can be confirmed by intermediate measurements of arbitrary strength if both measurement resolution and back-action uncertainties are taken into account.

Quantum Science in Atoms, Molecules and Solids

2700-PO-86

Daniel L. Creedon¹, Yarema Reshitnyk², Jean-Michel le Floch¹, Warrick Farr¹, John M. Martinis³, Tim L. Duty^{2,4}, **Michael E. Tobar**¹

1. ARC Centre of Excellence for Engineered Quantum Systems, School of Physics, University of Western Australia, Australia
2. ARC Centre of Excellence for Engineered Quantum Systems, School of Mathematics & Physics, University of Queensland, Australia
3. Department of Physics, University of California, USA
4. School of Physics, The University of New South Wales, Australia

Sapphire Whispering Gallery Mode Resonators at Milli-Kelvin Temperature

We report the cool down of a single crystal sapphire whispering gallery mode resonator to as low as 25 mK, and to low excitation strengths at microwave frequencies to that of a single photon. High Q-factors are obtained of order one billion.

Cold Atoms and Molecules

2700-PO-87

S Jose^{1,2}, **Prince Surendran**^{1,2}, L Krzemien^{1,2}, S Whitlock^{1,2}, M Singh^{1,2}, P Hannaford^{1,2}, A Sidorov^{1,2}, R Mclean^{1,2}

1. ARC Centre of Excellence for Quantum-Atom Optics, Australia
2. Centre for Atom Optics and Ultrafast Spectroscopy, Swinburne University of Technology, Australia

Trapping of Ultracold Atoms in a 10- μ m-Period Permanent Magnetic Lattice

We report the realization of trapping of 87Rb $|F=1, m_F=-1\rangle$ atoms at temperature of 1-2- μ K in a 10- μ m-period 1D magnetic lattice constructed from a TbGdFeCo magnetic microstructure on an atom chip.

2700-PO-89

Arif Ullah¹, Maarten Hoogerland¹

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

Investigation of fractional resonant effects in an atom optics delta-kicked rotor

We are presenting a series of experiments describing the fractional resonant effects, and the dependence of energy of quantum resonances on the pulse period, when the atoms are exposed to short pulses of light.

2700-PO-90

Ju-Kuei (Ru-Gway) Wu¹, Sean Hodgman¹, Andrew Manning¹, Mattias Johnsson¹, Robert Dall¹, Andrew Truscott¹

1. Research School of Physics and Engineering, The Australian National University, Australia

Using Correlation Measurements to Probe Amplified Matter Waves and Bose-Einstein Condensate Formation

We performed correlation measurements using single atom detection offered by metastable helium. With this we have demonstrated second-order coherence of amplified matter waves, and investigated the onset of coherence during the formation of Bose-Einstein condensates.

2700-PO-91

A.J. McCulloch¹, D.V. Sheludko¹, R. E. Scholten¹

1. ARC Centre of Excellence for Coherent X-ray Science, School of Physics, the University of Melbourne, Australia

Emitance measurements of shaped electron bunches from cold atoms

Cold electrons extracted from laser cooled atoms have both the spatial coherence and high current required for picosecond molecular scale imaging. Similarly, sources of cold ions provide the opportunity of ion beam milling with unprecedented resolution. Here we use arbitrary and real-time control of the electron bunch shape to measure the low emitance of electrons from a cold atom source, thus demonstrating the unique combination of bunch shaping and high transverse coherence of these novel sources.

2700-PO-92

V. Ahufinger^{1,2}, Yu. Loiko^{1,3}, R. Corbalán¹, G. Birkel⁴, J. Mompart¹

1. Departament de Física, Universitat Autònoma de Barcelona, Spain
2. Institució Catalana de Recerca i Estudis Avançats, Lluís Companys 23, Spain
3. Institute of Physics, National Academy of Sciences of Belarus, Belarus
4. Institut für Angewandte Physik, Technische Universität Darmstadt, Germany

Filtering of Matter-wave Vibrational States via Spatial Adiabatic Passage

We discuss filtering of vibrational states via spatial adiabatic passage and its applications for quantum tomography and engineering of atomic Fock states that, eventually, could be used for tunneling-assisted evaporative cooling.

Quantum Information and Cryptography

2700-PO-93

Hoonsoo Kang¹, Bongjune Kim^{1,2}, Young Ho Park¹, Cha Hwan Oh², Inwon Lee¹

1. Quantum optics Laboratory, Advanced Photonics Research Institute, GIST, Korea
2. Department of Physics, Hanyang University, Korea

Phase-Controlled Switching By Interference Between Incoherent Fields In A Double- λ System

We showed experimentally interference could be occurred between incoherent lights in a double $-\lambda$ transition implemented with rubidium atomic vapor. We suggested optically cryptic information could be delivered by the phase-controlled switching with incoherent fields in a double $-\lambda$ system.

2700-PO-94

Austin Lund¹

1. Centre for Quantum Dynamics, Griffith University, Australia

Efficient Quantum Computing With Weak Measurements

We show that constraining a quantum computing architecture to low strength measurement does not introduce an inefficient overhead provided non-local measurements are allowed. With only local measurements an inefficient overhead must be introduced.

2700-PO-95

Holger F. Hofmann^{1,2}

1. Hiroshima University, Japan
2. JST, CREST, Japan

Characterization of Decoherence in a Quantum Channel using Weak Measurements

It is shown that weak measurements can determine the total amount of incoherent noise in quantum state transmissions through a quantum channel. Decoherence effects can then be identified efficiently without complete process tomography.

Precision Measurements and Fundamental Tests

2700-PO-96

Andrew Ong¹, Julian Berengut¹, Vladimir Dzuba¹, Victor Flambaum¹

1. School of Physics, University of New South Wales, Australia

Optical Clocks Using Highly Charged Ions to Probe Variation of the Fine-Structure Constant

Optical transitions in highly-charged ions may provide the reference for atomic clocks with sensitivity to variation of the fine-structure constant enhanced by up to two orders of magnitude.

2700-PO-96B

Kan Wu¹, **Chunmei Ouyang**¹, Perry Ping Shum¹, Jia Haur Wong¹

1. Electrical & Electronic Engineering, Nanyang Technological University, Singapore

Characterization of the RIN-to-Phase-Noise Conversion Induced by Photodetectors in the Microwave Synthesis from Mode-locked Lasers

The relative-intensity-noise-to-phase-noise conversion induced by the photodetectors in the microwave synthesis from mode-locked lasers is investigated. A new and simple method is proposed to evaluate the noise conversion avoiding measuring the exact noise spectra.

ACOFT Presentation

Fundamentals of Nonlinear Optics

2700-PO-97

Andrew Golubkov¹, Vladimir Makarov¹

1. M.V. Lomonosov Moscow State University, Advanced Education and Science Center, Russia

Nonlinear Spectroscopy of One-Dimensionally Inhomogeneous Medium with Cubic Nonlinearity

The possibility of unique reconstruction of the spatial profile of the cubic nonlinear susceptibility tensor component of a one-dimensionally inhomogeneous plate whose medium has a symmetry plane perpendicular to its surface is proved and reconstruction algorithm is proposed.

2700-PO-98

YeongKwon Cho¹, Kihong Kim¹

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

The Spectral Analysis of Breathing and Chaotic Solitons in the Dissipative Nonlinear systems

By the cubic-quintic complex Ginzburg-Landau equation, the existence of breathing and chaotic solitons and their spectral properties are revealed in detail. The spectral analysis helps the understanding of different behaviors of solitons.

ACOFT Presentation

2700-PO-99

Elena Turitsyna¹, Gregory Falkovich², Atalla El-Taher¹, Paul Harper¹, Xuewen Shu¹, Sergei Turitsyn¹

1. Photonics Research Group, Aston University, UK
2. Physics of Complex System, Weizmann Institute of Science, Israel

Optical Turbulence and Spectral Condensate in Fibre Lasers

We study optical wave turbulence in Raman fibre lasers with cavities larger than 10-km scale. We demonstrate that the sign of the cavity dispersion has critical impact on properties of the generated radiation.

Joint IQEC/GLEO Pacific Rim

Nanophotonics

2700-PO-100

Indika B. Udagedara¹, Ivan D. Rukhlenko¹, Malin Premaratne¹

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

Propagation of surface plasmon-polaritons in linear chains of metallic nanoparticles embedded in a gain medium

The two different types of complex solutions to the dispersion equation of surface plasmon-polaritons residing in a linear chain of metallic nanoparticles are analyzed in the presence of gain in the host medium.

2700-PO-101

Michael Lorke¹, Torben Nielsen¹, Jesper Mørk¹

1. DTU Fotonik, Department of Photonics Engineering, Denmark

Dynamical Properties of QD-based Nanolaser Devices

We investigate the switch-on behavior of QD-based nanolasers devices. Even though carrier capture needs to take place before emission can occur, we observe a fast switch-on that is driven by an ultra-fast carrier dynamics.

2700-PO-102

Madara Marasinghe¹, Malin Premaratne¹, David Paganin²

1. Faculty of Engineering, Monash University, Australia
2. School of Physics, Faculty of Science, Monash University, Australia

Degree of Polarization of Mie Scattered Stationary Partially Coherent Electromagnetic Fields

The polarization of non-paraxial partially coherent light scattered from nanospheres cannot be described easily. We utilize the degree of polarization to quantify Mie scattered partially coherent light and demonstrate that this form regular polarization lattices.

2700-PO-103

Khaled Kirah¹

1. Faculty of Engineering, The French University in Egypt (UFE), Egypt

The Study of a New Spatial Arrangement for Carbon Nanotube Photovoltaic Array

An array spatial arrangement of carbon nanotube based diodes is formed as a square mesh fractal topology in order to concentrate the incident power in hot spots. A simulator based on the self-consistent solution of Poisson and the drift-diffusion equations is used to calculate the I-V characteristics of the device and hence its efficiency.

2700-PO-104

Jae Yong Lee¹, Eun Seong Lee¹

1. Korea Research Institute of Standards and Science, Korea

Simple Analytic Modeling of Photoresist Development Profiles in Evanescent-field Optical Lithography

We present a simple analytic model to predict photoresist profiles with a localized exposure decaying exponentially in a photoresist of finite contrast. Impacts of lithographic parameters such as exposure dose and developing time are explored.

2700-PO-105

S. Hidaka¹, H. Hattori¹, Y. Yamamoto^{2,3}, S. Tokonami¹, H. Yamauchi⁴, S. Ito^{4,5}, T. Iida^{1,5}

1. Nanoscience and Nanotechnology Research Center, Japan

2. GreenChem In, Japan

3. Department of Applied Chemistry, Japan

4. Graduate School of Engineering Science, Osaka University, Japan

5. PRESTO, Japan Science and Technology Agency, Japan

Theoretical Study of Light-induced Force on Spherical Shell-type Metallic Nanocomposites

A high power picosecond laser was demonstrated in an all fiber MOPA configuration. The maximum power was 12W and the UV output at 355nm was 2.9W with 44MHz repetition rate and 5.6ps duration. We theoretically study the optical response and light induced force (LIF) on metallic nanoparticles arranged on the surface of microsphere. Results show that significantly broad optical spectra and sufficiently strong LIF can be obtained.

2700-PO-106

Qiming Zhang¹, Xiangping Li¹, Min Gu¹

1. Centre for Micro-Photonics, Faculty of Engineering and Industrial Sciences, Australia

Characterisation and Optimisation of Photonic Crystal Superlens for Super-resolution Nanoscopy

The spectral responses of a superlens with triangular-lattice and square-lattice photonic crystal structures were studied by simulation using the finite element method. The simulation predicts the smallest focusing spot size of $\lambda/3.9$ in the near field of the square-lattice photonic crystal superlens. The application of such a superlens in super-resolution imaging will be demonstrated by a near-field scanning microscope.

2700-PO-107

Wei Liu¹, Dragomir N. Neshev¹, Ilya V. Shadrivov¹, Andrey E. Miroshnichenko¹, Yuri S. Kivshar¹

1. Nonlinear Physics Centre, Centre for Ultra-high bandwidth Devices for Optical Systems (CUDOS), Australia

Manipulation of Airy plasmon beams by linear optical potentials

We demonstrate that in linear optical potentials obtained in wedged metal-dielectric-metal structures, the deflection of plasmonic Airy beams could be accelerated, compensated or reversed, thus creating new opportunities for on-chip signal processings and nanoparticle clearances.

2700-PO-108

Fumiaki Tajima¹, Yoshio Nishiyama¹

1. Yokohama National University, Japan

Measurement and Analysis of Scattering of an Evanescent Wave by a Thin Fiber on or Near a Prism

Measured optical scattering patterns of an evanescent wave by a nano-fiber on or near a prism are well fitted by a model taking into account near-field effects and multiple reflections.

2700-PO-109

Ivan Fernandez-Corbaton¹, Nora Tischler², Gabriel Molina-Terriza¹

1. QISS, Department of Physics and Astronomy, Macquarie University, Australia

2. Applied Optics and Nanotechnology Group, Queensland University of Technology, Australia

Radiation Diagrams from a Nanohole in the Momentum Basis

We present the complete radiation diagram of the field scattered by a nanohole in a metallic film under Gaussian illumination. The expansion coefficients for both propagating and evanescent planewave components are obtained in a semi-analytical fashion.

2700-PO-110

K. Alan Shore¹

1. Bangor University, School of Electronic Engineering, UK

Electrically-Injected Nano-Spin VCSELs: Design and Applications

Procedures for optimized design of the dynamical and wave-guiding properties of electrically-injected metal-clad nano-spin VCSELs are presented. Such procedures enable laser bandwidth maximization and threshold current minimization. Options for utilizing optimized devices are indicated.

2700-PO-111

Nora Tischler¹, Kristy Vernon¹

1. Applied Optics Group, Discipline of Physics, Queensland University of Technology, Australia

Coupling of Quantum Dots to Plasmonic V Groove Waveguides

We study the coupling of emitters such as quantum dots to plasmonic waveguides consisting of a triangular groove in metal. The decay rate of the emitter into the plasmonic mode and coupling efficiency are determined.

2700-PO-112

John Canning^{1,2}, Angelica Lau^{1,2}, Masood Naqshbandi^{1,2}, Ingemar Petermann^{1,2}, Maxwell J. Crossley^{1,2}

1. Interdisciplinary Photonic Laboratories (iPL), School of Chemistry, The University of Sydney, Australia

2. School of Chemistry, The University of Sydney, Australia

Giant Self-Assembled Mesostructured Silica Sphere Characterised using a Doped Fluorophore and an AMOLED Mobile Screen as the Excitation Source.

Using the emission for the blue OLED component of a HTC Android Phone, a Rhodamine 123 doped silica mesostructured shell, fabricated by evaporative self-assembly on a super hydrophobic surface, is excited with blue light and the fluorescence image taken. The results demonstrate the potential of smart mobile platforms as optical hardware for portable and intelligent diagnostics as well as illustrating the fabrication of large mesostructured spheres.

Ultrafast Optics and Photonics

2700-PO-113

Yu Oishi¹, Masudul Kabir¹, Daiki Ito¹, Fumihiko Kannari¹

1. Department of Electronics and Electrical Engineering, Keio University, Japan

Two-wave mixing amplification of femtosecond pulses in a Rh:BaTiO₃ crystal

We report the photorefractive two-wave mixing amplification of broadband femtosecond pulses in a Rh:BaTiO₃ crystal. The maximum gain coefficient of the two-wave mixing amplification was $\sim 11/\text{cm}$ using 30 fs pulses at 800 nm wavelength regime.

2700-PO-114

Hoe-Seok Jeong¹, Chan-Young Kim¹, Woojin Shin², **Tae-Jung Ahn¹**

1. Dept. Photonic Engineering, Chosun University, Republic of Korea

2. Photonics Research Institute (APRI), Republic of Korea

First-order optical differentiator based on fused fiber coupler

We have proposed a novel first-order optical differentiator based on a conventional fused-fiber coupler. The optical differentiator can be fabricated using simple processes and provides ultrafast signal processing.

Ultrafast Laser Science

2700-PO-115

Yasuo Nabekawa¹, Yusuke Furukawa¹, A. Amani Eilanlou^{1,2}, Kennichi. L. Ishikawa², Eiji. J. Takahashi¹, Katsumi Midorikawa¹

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

Development of an Intense High-order Harmonic Beam Line using a Sub-15fs Multi-terawatt Leaser System at 100-Hz Repetition Rate

We report on the development of a multi-TW laser system with a pulse duration of 12 fs and an a repetition rate of 100 Hz. This laser system is applied to generate intense high-order harmonic fields with loosely focused geometry.

2700-PO-116

Yosuke Kojima^{1,2}, Yusuke Furukawa¹, Yasuo Nabekawa¹, Eiji Takahashi¹, Fumihiko Kannari², Katsumi Midorikawa¹

1. *RIKEN, Japan*
2. *Keio University, Japan*

Beam Splitter Materials for XUV High-order Harmonic Fields without Absorbing Visible Light

We have investigated the reflectance of several substrate materials against the XUV high-order harmonics of a Ti:sapphire laser. We expect these substrates to be suitable for high-average-power application due to the transparency for visible light.

2700-PO-117

Hongjun Liu¹, Shiguo Liang¹, Nan Huang¹, Qibing Sun¹, Wei Zhao¹

1. *Xian Institute of Optics and Precision Mechanics, Chinese Academy of Science, China*

Temporal Contrast Enhancement of Ultra-short Pulses by the Phase-conjugate Wave in a Kerr Medium

A novel method to improve the temporal contrast ratio of ultra-short pulses based on phase-conjugate wave generation is presented, which is promising as powerful technique to eliminate the background of ultra-short and ultra-intense laser pulses.

Tuesday 30 August 2011

1730-1930

POSTER SESSION 2 (3700)

Room: Bayside Terrace Level 2

CLEO Pacific Rim

Semiconductor and Electro-Optic Devices

3700-PO-1

Jin-Tae Kim¹, Suk-Hee Lee¹, Du-Ho Jo¹, IL-Won Kim², Hee-Dae Kim², Hyun-Ee Shin², In-Kag Hwang¹

1. *Department of Physics, Chonnam National University, Korea*
2. *Opticis Co., Korea*

Simulation and Implementation of 780 nm Single-mode Micro-structured VCSEL

We report full-3D FDTD simulation and experimental implementation of 780 nm micro-structured VCSELs, and show strong correlation between the simulation and experimental data. Output power of 1.7 mW with SMSR of 24 dB was achieved.

3700-PO-2

Ying-Chien Chu¹, Yan-Kuin Su¹, Chia-Hsin Chao², Wen-Yung Yeh²

1. *National Cheng Kung University, Taiwan*
2. *Industrial Technology Research Institute, Taiwan*

Studies on the Color Converting Efficiency of Organic Polymer Integrated onto InGaN Light-emitting Diodes

PMMA prevents organic light-emitting polymer chain from conjugating while deposited onto blue LED. Encapsulating LED by epoxy enhances the maximum conversion efficiency and red-shift of wavelength would be eased since modification of heat and moisture.

3700-PO-3

Seungtaek Kim¹, Hyoyoeng Park¹, Kyeongyong Ch¹, Jongseok Kim¹, Kyeongkyun Lee¹, Hyngtae Kim¹

1. *Korea Institute of Industrial Technology, Korea*

Illuminance and color coordinate variation in CIE chromaticity due to the signal modulation for LED lighting

The effects of the illumination and the color coordinates was experimentally monitored using the fabricated LED lightings with about 7 W at two different heights. It was observed that the trace of the illuminance is similar to the line shape but the trajectory of the color coordinates was different for each condition.

3700-PO-4

Bradley A. Clare¹, Kerry A. Mudge¹, Kenneth J. Grant¹

1. *Defence Science and Technology Organisation, Australia*

Design of a Coupled Quantum Well Modulator with Enhanced Modulation Efficiency

A coupled quantum well modulator design is presented which offers a 30% improvement in modulation efficiency at 1500nm, compared to current state-of-the-art.

3700-PO-5

Po-Tsun Liu¹, Chur-Shyang Fuh¹, Yi-Teh Chou¹, Li-Feng Teng¹, Fu-Hai Li¹, Han-Ping Shieh¹

1. *National Chiao Tung University, Taiwan*

High performance amorphous IGZO TFT with in-situ IGZON back channel passivation

A thin film transistor (TFT) with bi-layer stack structure of amorphous nitrogenated InGaZnO (a-IGZO:N) on an InGaZnO (IGZO) channel is proposed to enhance device stability
ACOFT Presentation

3700-PO-6

Ming-Hsuan Kao¹, Ting-Gang Chen², Min-An Tsai³, Hsin-Chu Chen², Fang-I Lai¹, Hao-Chung Kuo², Shou-Yi Kuo⁴, Pei-Chen Yu²

1. *Yuan Ze University, Taiwan*
2. *National Chiao Tung University, Taiwan*

3. National Chiao Tung University, Taiwan

4. Chang Gung University, Taiwan

Fabrication and Simulation of Antireflective Nanostructures on c-Si Solar Cells

The enhanced photoelectric conversion is demonstrated in nanostructured photovoltaics using RIE techniques. The trapezoid-cone arrays Si with SiNx passivation layer suppress the reflection in the wavelength 400-1000 nm. An RCWA simulation describes the optimized nanostructure to further reduce reflectance.

ACOPT Presentation

3700-PO-7

Ming-Yang Hsieh¹, Shou-Yi Kuo^{1,2}, Fang-I Lai³, Ming-Hsuan Kao³, Pei-Hsuan Huang³, Hao-Chung Kuo⁴, Hsun Wen Wang⁴, Min-An Tsai⁴

1. Chang Gung University, Taiwan

2. Chang Gung University, Taiwan

3. Engineering, Yuan-Ze University, Taiwan

4. National Chiao Tung University, Taiwan

Optimization of CdS Buffer Layer on the Performance of Copper Indium Gallium Selenide Solar Cells

In this study, we report on the performances of Cu(In,Ga)Se₂ solar cells device simulation of the carrier concentration and thickness of CdS buffer layer, to find out an optimum CIGS solar cell.

3700-PO-8

M. Xin^{1,2}, C.E. Png², S.T. Lim², V. Dixit², A.J. Danner^{1,2}

1. National University of Singapore, Singapore

2. Institute of High Performance Computing, Agency for Science, Technology and Research, Singapore

A High Speed Electro-optic Phase Shifter Based on a Polymer-infiltrated P-S-N Diode Capacitor

A polymer-infiltrated P-S-N diode capacitor is studied for phase shifters that incorporate both Pockels nonlinearity and carrier depletion. At least 269 GHz 3-dB bandwidth with high efficiency of 5.5 V/cm and 5.83 pJ/bit is achievable.

ACOPT Presentation

3700-PO-9

H.H. Tsai¹, H.C. Chen¹, C.H. Wang¹, K.J. Chen¹, C.W. Hung¹, C.C. Yeh¹, C.C. Lin², H.C. Kuo¹, T.C. Lu^{1,2}

1. Department of Photonic & Institute of Electro-Optical Engineering, National Chiao Tung University, Taiwan

2. Institute of Photonic System, National Chiao Tung University, Taiwan

Improving the Lumen Efficiency by Air-gap Embedded Package in White Light-emitting Diodes

White light-emitting diodes with air-gap embedded package were proposed and fabricated through a simple method including pulsed spray coating. The lumen efficiency of air-gap embedded LED was enhanced by 8.8% compared to reference remote-phosphor LED.

ACOPT Presentation

High Power Laser Technology and High Energy Density Physics

3700-PO-10

Changhwan Lim¹, Sung-Ki Hong¹, Hee Jin Kim¹, In Ho Yun¹, Taek-Jin Yang², Hidetsugu Yoshida³, O-Hwan Kwon², Masahiro Fujita³, Masahiro Nakatsuka³

1. Korea Atomic Energy Research Institute, Korea

2. P-Cube Inc., Korea

3. Institute of Laser Engineering, Japan

Development of a Split-Disk Nd: Ceramic Amplifier for Materials Processing

Small signal gain of a split disk Nd: Ceramic amplifier was measured more than 3 at the center of gain medium. Output energy of the amplifier in five-pass geometry was 6.5 J at 10 nsec.

3700-PO-11

Yan Shao¹, Jin Zhou¹, Lin Lai¹

1. College of Aerospace and Material Engineering, NUDT, China

Numerical Simulation of a CW Supersonic DF-CO₂ Transfer Chemical Laser Based on HYLTE Nozzle

Aiming at the application of continuous wave supersonic DF-CO₂ transfer chemical laser based on HYLTE nozzle, chemical kinetic model and inlet parameter optimization are performed by three-dimensional nozzle-cavity flowfield simulation. This modeling procedure could be used as a method to guide experiments to improve DF-CO₂ TCL performance.

3700-PO-12

Paulo S. André¹, Fátima Domingues¹, Margarida Facão¹, Ana M. Rocha¹

1. Instituto de Telecomunicações and Physics Department, Aveiro University, Campus Santiago, Portugal

Optical Fuse Discharge Temperature Determination Employing the CIE Color Coordinates

We measured the fuse effect optical discharge temperature using CIE color coordinates. The achieved values for 2 and 3 W optical signal were 5196 K and 5348 K, respectively.

Solid-State Laser and Other Lasers, and Laser Materials

3700-PO-13

Masanori Kaku¹, Masahito Katto¹, Shoichi Kubodera¹

1. University of Miyazaki, Japan

Vacuum ultraviolet Ar₂⁺ laser at 126 nm pumped by an infrared high-intensity laser

We have observed similar small signal gain coefficients of 0.84 and 0.86 cm⁻¹ in two different experiments, where Ar₂⁺ was produced in free space filled with Ar and inside an Ar-filled hollow fiber, respectively.

3700-PO-14

Jacek Kwiatkowski¹, Jan Jabczynski¹, Waldemar Zendzian¹, Jacek Swiderski¹, Lukasz Gorajek¹, Mateusz Kaskow¹

1. Military University of Technology, Poland

Resonantly Pumped Q-switched Ho:YAG Laser

The Q-switched Ho:YAG hybrid laser resonantly pumped at the wavelength of 1908 nm was developed. For the best case of Q-switching regime the pulses of 127 kW peak power (2.8 mJ, 22 ns) were achieved at the repetition rate of 20 Hz.

3700-PO-15

Takuya Inoue¹, Masataka Hshimoto¹, Junichi Matuura¹, Atsushi Taketomi¹, Yuki Wada¹, Shigeru Yamaguchi¹, Yasuhiro Kamba¹, Jun Enokidani², Kazuyoku Tei¹, Shin Sumida²

1. Tokai University, Japan

2. Seikoh Giken Co. Ltd., Japan

High power hybrid pico-second laser

A high power picosecond laser was demonstrated in a hybrid MOPA configuration operating at 1064nm. The maximum power was 10W and the green output was 3W with 100MHz repetition rate and 30ps duration.

3700-PO-16

Che-Hsuan Su¹, Yu-Chueh Hung¹

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

Amplified Spontaneous Emission from Photopumped Films of Dye-doped DNA Biopolymers

We report photoluminescence, amplified spontaneous emission, and optical gain of dye-doped DNA biopolymers based on different surfactant systems. Results show that lower threshold and higher gain can be achieved using different surfactant in DNA biopolymer.

3700-PO-17

Yutaka Kondo¹, Seiji Watanabe¹, Tatsuya Igarashi¹, Yoshinobu Sasatani¹, Kenta Sasaki¹, Sakae Kawato^{1,2,4}, Hiroyuki Hitotsuya¹, Shinichi Matsubara^{2,3}

1. Graduate School of Engineering, University of Fukui, Japan
2. Japan Synchrotron Radiation Research Institute, Japan
3. The Institute of Physical and Chemical Research, Japan
4. Research and Education Program for Life Science University of Fukui, Japan

Ultrashort-pulse nonlinear Raman Yb:YAG laser with Raman medium

By using a Raman medium in the mode-locked Yb:YAG laser oscillator to generate broad emission spectra and ultrashort-pulses. We will use Raman medium for a Raman pulse Yb:YAG laser.

3700-PO-18

Kenta Sasaki¹, Hiroshi Furuta¹, Susumu Yonezawa¹, Shinichi Matsubara^{2,3}, Seiji Watanabe¹, Yoshinobu Sasatani¹, Tatsuya Igarashi¹, Hiroyuki Hitotsuya¹, Yutaka Kondo¹, Sakae Kawato^{1,2,4}

1. Graduate School of Engineering, University of Fukui, Japan
2. Japan Synchrotron Radiation Research Institute, Japan
3. The Institute of Physical and Chemical Research, Japan
4. Research and Education Program for Life Science, University of Fukui, Japan

Spectroscopic and Lasing Properties of Highly-doped Ytterbium-glasses

In this study, we make highly-doped Ytterbium-ions glasses (YbF₃-BaF₂-AlF₃-GeO₂, YbBAG), and succeeded laser oscillations of 20 mol.% Ytterbium-ions glass. The highly-doped Ytterbium-ions glasses are much suitable for short-fiber or waveguide lasers.

3700-PO-19

Sungmo Ahn¹, Hanbit Kim¹, Heonsu Jeon¹, Yojin Kim²

1. Department of Physics and Astronomy, Seoul National University, Korea
2. Photonics Device Team, Korea Photonics Technology Institute, Korea

Band-edge lasers from 2D photonic crystal slabs patterned by self-assembled nanosphere lithography

We demonstrate photonic crystal band-edge laser from a 2D photonic crystal slab of triangular-lattice type, which is patterned by self-assembled colloidal nanosphere lithography. Under pulsed 980-nm optical pumping scheme, a clear laser emission around 1.5 μm was observed.

3700-PO-20

Dong Hoon Song¹, Yong Ho Cha³, Kyung Nam Kim³, Sung In Hwang¹, Young Uk Jeong³, **Do-Kyeong Ko^{1,2}**

1. Graduate Program of Photonics and Applied Physics, Gwangju Institute of Science and Technology, Korea
2. Advanced Photonics Research Institute, Gwangju Institute of Science and Technology, Korea
3. Lab. for Quantum Optics, Korea Atomic Energy Research Institute, Korea

Simple Herriott-type High Energy Femtosecond Laser with Two Notched Mirrors

A simple Herriott-type high energy femtosecond laser with only two notched mirrors without any compensator for q-parameter preserving is reported.

3700-PO-21

Martin Fibrich¹, Helena Jelínková¹, Karel Nejezchleb², Václav Škoda²

1. Czech Technical University in Prague, Czech Republic
2. Crytur Ltd., Czech Republic

Pr,Ce:YAlO₃ Laser Operation at Room Temperature

Spectroscopic properties and laser results of GaN-diode pumped Pr,Ce:YAlO₃ crystal at room temperature are reported. Output power of 30 mW at 747 nm wavelength has been demonstrated.

3700-PO-22

Jan Sulc¹, Michal Nemeč¹, Helena Jelinkova¹, Witold Ryba-Romanowski², Tadeusz Lukaszewicz³

1. Czech Technical University in Prague, Czech Republic
2. Polish Academy of Sciences, Poland
3. Institute of Electronic Materials Technology, Poland

Comparison of CW Diode Pumped Er:YVO₄ and Er:GdVO₄ Lasers

Two vanadate crystals, YVO₄ and GdVO₄, were compared as a laser hosts for erbium ion. Spectroscopic and laser characteristics were measured. Power up to 0.4 W was obtained at 1.6 μm under CW diode pumping at 977 nm.

3700-PO-23

Michal Nemeč¹, Helena Jelinkova¹, Jan Sulc¹, Karel Nejezchleb², Vaclav Skoda²

1. Czech Technical University in Prague, Czech Republic
2. Crytur, Ltd., Czech Republic

Passive Q-switching at 1645 nm of Er:YAG Laser with Co:MALO Saturable Absorber

Passively Q-switched 1645nm Er:YAG laser resonantly pumped by 1535nm Er:glass laser radiation was constructed. The system was Q-switched by saturable absorber Co²⁺:MgAl₂O₄ and the giant pulses with 58ns duration and 1.6mJ energy were generated.

Applied Nonlinear Optics

3700-PO-24

Eun Lee¹, Jae Lee¹

1. Korea Research Institute of Standards and Sc, Korea

Use of all-reflecting objective for interferometric coherent anti-Stokes Raman scattering microscopy

Reflecting objective is compared to refracting one in an interferometric coherent anti-Stokes Raman scattering microscopy. We find that non-dispersive characteristic of reflection makes the reflecting objective more suitable for interferometric imaging than the refracting one.

3700-PO-25

Yi-Ci Li¹, Huei-Ling Lin¹, Tai-Huei Wei¹

1. National Chung Cheng University, Taiwan

Optical Nonlinearities of Antimony Thin Film Studied with Picosecond Laser Pulses

Using the transmittive and reflective Z-scan technique with a 10 Hz, frequency-doubled, Q-switched and mode-locked Nd:YAG laser, the beam shrinkage with an Sb thin film is confirmed. We infer that plasma reflection is the mechanism.

3700-PO-26

P Hosking¹, M Simpson¹, C Rohde¹

1. The Photon Factory, University of Auckland, New Zealand

Enhanced Isotropic Etching of Quartz with Femtosecond Laser Pre-processing

A femtosecond machining apparatus has been constructed for creating micro- to nanoscale features in quartz and fused silica of up to 20 mm in length through sub-ablation threshold laser pulses followed by enhanced anisotropic etching.

Infrared and THz Technology, and Astrophotonics

3700-PO-27

Kazuki Horita¹, Tetsuya Kinoshita¹, Christopher T. Que¹, Elmer Estacio¹, Michael I. Bakunov^{2,3}, Kohji Yamamoto¹, Koji Suizu⁴, **Masahiko Tani¹**, Kodo Kawase⁴

1. Research Center for Development of Far-Infrared Region University of Fukui, Japan
2. University of Nizhny Novgorod, Russia
3. Institute of Applied Physics, Russian Academy of Sciences, Russia
4. Nagoya University, Japan

Efficient electro-optic sampling detection and generation of intense THz radiation via Cherenkov-type phase matching in a LiNbO₃ crystal coupled to a Si prism

Efficient terahertz generation and electro-optic detection via Cherenkov-type phase matching are demonstrated using a thin lithium niobate crystal coupled to a Si prism. Crystal thickness dependence and comparison with ZnTe electro-optic detection are discussed.

3700-PO-28

EuiSu Lee¹, KyuWon Han², Ji-Ho Yoon², Tae-In Jeon¹

1. Division of Electrical and Electronics Engineering/Korea Maritime University, Korea
2. Department of Energy and Resources Engineering, Korea Maritime University, Korea

Hydroquinone Clathrates by Temperature-dependent Terahertz Time-domain Spectroscopy

Using Terahertz Time-Domain Spectroscopy, we measured the structural transition from hydroquinone clathrates having the storage properties to crystalline α -form hydroquinone as a function of temperatures.

3700-PO-29

Muhan Choi¹, Choon-Gi Choi¹, Byungsoo Kang², Bumki Min²

1. Creative Research Center for Graphene Electronics, ETRI, Korea
2. Department of Mechanical Engineering, KAIST, Korea

Flexible Terahertz Metamaterial Using Babinet's Principle

In this paper, a multi-layered flexible THz metamaterial for narrow bandpass filter is demonstrated. The flexible THz metamaterial consists of a combination of three metallic layers filled with the polyimide substrate.

3700-PO-30

Satoshi Tsuzuki¹, Kazuyoshi Kurihara², Fumiyoshi Kuwashima³, Takashi Furuya¹, Kohji Yamamoto¹, **Masahiko Tani**¹

1. Research Center for Development of Far-Infrared Region, University of Fukui, Japan
2. Faculty of Education and Regional Studies, University of Fukui, Japan
3. Department of Electrical and Electronics Engineering, Fukui University of Technology, Japan

Superfocusing Effect of V-Groove Metallic Structure for Terahertz wave

Super-focusing of THz radiation in a V-groove metallic structure with an opening angle of 10 degree is investigated. For a 2- μ m bottom-width an amplitude transmission as large as 17% has been observed without coupling lens.

3700-PO-31

Geraldine Mariën^{1,4}, **Nick Cvetojevic**^{1,4}, Nemanja Jovanovic^{1,2,4}, Judith Dawes^{1,4}, Roger Haynes³, Jon Lawrence^{1,2}, Quentin Parker^{1,2}, Michael J. Withford^{1,4}

1. Department of Physics and Astronomy, Macquarie University, Australia
2. Australian Astronomical Observatory, Australia
3. innoFSPEC - Astrophysikalisches Institut Potsdam, Germany
4. Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), Australia

The Uses of Fibre Bragg Gratings for Temporal Spectral Astronomy

Temporal spectral astronomy studies astrophysical phenomena showing spectral variability on very short timescales. The use of fibre Bragg gratings converts the spectral detection into a photometric one, allowing for short timescale variations to be resolved.

3700-PO-32

Yen-Chieh Huang¹, Tsong-Dong Wang¹, Ming-Yuen Chuang¹, Yen-Yin Lin¹, Fan-Yi Lin¹

1. Institute of Photonics Technologies, Department of Electrical Engineering, National Tsinghua University, Taiwan

Forward and Backward THz Difference Frequency Generation with Idler Loss Exceeding Parametric Gain

When the idler absorption loss exceeds parametric gain in THz DFG, the THz wave can still grow monotonically versus crystal length for forward DFG but saturates within a few absorption lengths for backward DFG.

Integrated and Guided-Wave Optics and Thin Film Optics

3700-PO-33

Steve Madden^{1,2}, Zhe Jin^{1,2}, Sukanta Debbarma^{1,2}, Douglas Bulla^{1,2}, Barry Luther-Davies^{1,2}

1. Centre for Ultrahigh Bandwidth Devices for Optical Systems, Australia
2. Laser Physics Centre, Australia

Low loss coupling to sub-micron thin film deposited rib and nanowire waveguides by vertical tapering

A vertical tapered waveguide of both rib and nanowire waveguides together with SU8 lateral tapered waveguide for mode size conversion to single mode fibre has been designed. Taper shape profile, offset tolerance have been investigated and get overlapping loss of less than 0.1 dB and 97% coupling efficiency.

3700-PO-34

Stevanus Darmawan¹, Landobasa Y.M. Tobing¹, Liliana Tjahjana¹, Yanbing Zhang¹, Dao Hua Zhang¹

1. Nanophotonics Lab, School of EEE, Singapore

Realization of coupled-resonator-induced transparency in silicon-on-insulator based ring-bus-ring geometry

We demonstrate coupled-resonator induced transparency by means of synergistic integration between the ring-bus-ring (RBR) configuration and the Mach-Zehnder interferometer (MZI) device, on silicon-on-insulator (SOI) material platform. Good agreement is obtained between experiment and the theory.
ACOFI Presentation

3700-PO-35

Kunlun Yan¹, Rongping Wang¹, Khu Vu¹, Robert Elliman², Kidane Belay², Barry Luther-Davies¹

1. CUDOS, Laser Physics Centre, ANU, Australia
2. Department of Electronic Materials Engineering, ANU, Australia

Photoluminescence in Er-doped Ge-As-Se Chalcogenide Thin Films

We report ion-implanted Er ions into Ge_{11.5}As₂₄Se_{64.5} thin films with different doses, and subsequently thermal-annealed the films with different times. The characterization results indicated that the thickness, refractive index and optical bandgap of the films can be stabilized with 3 hour thermal annealing. The 1.5 μ m emission arising from the ⁴I_{3/2} - ⁴I_{5/2} transition was observed and a lifetime of 1.35 ms was obtained in films annealed at 180°C.

3700-PO-36

Yin-Jung Chang¹, Yu-Ting Chen¹

1. Department of Optics and Photonics, National Central University, Taiwan

Broadband Omnidirectional Antireflection Coatings for CIGS Solar Cells Optimized Using Simulated Annealing Algorithm Incorporated with Solar Spectrum

Antireflection (AR) coatings for CIGS solar cells optimized using simulated annealing algorithm incorporated with solar spectrum are presented. Material dispersions and reflections from backside metal are considered. The effect of solar spectrum is analyzed.

3700-PO-37

KyoungHo Kim¹, Q-Han Park¹

1. Department of Physics, Korea Univ., Korea

Effective Medium Theory with Finite Boundaries

We present a way to control the refractive index inside of an otherwise empty metallic waveguide by inserting dielectric slabs. Our work provides a simple rule to design metamaterial inside finite boundaries.

3700-PO-38

Yung-Hsiang Lin¹, Chung-Lun Wu¹, Yi-Hao Pai¹, Gong-Ru Lin¹

1. National Taiwan University, Taiwan

Spectral Shift and Mode Extinction Degradation on Off-axis Luminescence of Photoemissive SiNx/SiOx Bragg Mirror

A narrow-band self-photoemissive SiNx/SiOx Bragg mirror with a transmittance fringe based notch filtering function is characterized to show its mode-extinction degraded luminescence with a spectral shift of 15 nm at off-axis angle of only 15°.

3700-PO-39

Landobasa Tobing¹, Liliana Tjahjana¹, Dao Hua Zhang¹

1. Nanyang Technological University, Singapore

Experimental Quantification of Coupling-Induced effects in Ring-enhanced Mach-Zehnder Interferometers

This work reports the experimental quantifications of coupling-induced phase shift (CIPS) in various resonant structures fabricated in silicon-on-insulator technology, and confirms the counter-intuitive results that CIPS may change sign at increasing gap separation.

Information Optics, Optical Storage and Displays

3700-PO-40

Tao Fang¹, Hua Cheng¹, Yong Bi¹, Ying Zhang¹, Guang Zheng¹, Yanwei Wang¹, Yan Qi¹, Bin Wang¹, Boxia Yan¹

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

Compact Fiber Coupled Laser Diodes Module at 635nm for Laser Projection

A compact 635nm laser diode (LD) module has been developed with a staircase architecture and multi-LD packages for laser projection. This module allows it to couple the light into a single fiber with 600- μm diameter, numerical Aperture (NA) 0.22. Optical output power of 5.1W and optical to optical efficiency of more than 80% were demonstrated.

3700-PO-41

Ki-Mun Pak¹, Hyun-Hwan Choi¹, **Yong-Hyub Won¹**

1. Department of Electrical Engineering, Korea Advanced Institute of Science and Technology, Korea

Demonstration of a Fast Computer Generated Hologram Algorithm based on Amplitude-phase Modulation with Random Mask for an Optical ID System

A amplitude and phase modulation computer-generated hologram algorithm with random mask is presented for use in an ID tag applications system and the process of generation and reconstruction of the optical ID pattern is described.

ACOFT Presentation

3700-PO-42

Md Azim Ullah¹, Xiangping Li¹, Xueming Cheng², Jianshe Ma², Min Gu¹

1. Swinburne University of Technology, Australia
2. Tsinghua University, China

Two-photon Induced Three-dimensional Optical Data Storage Based on a Compact DVD Optical Head

The point spread function of a compact DVD optical head under femtosecond pulsed laser illumination has been characterised. For the first time, using the compact DVD optical head for two-photon induced three-dimensional (3D) optical data storage has been demonstrated.

3700-PO-43

Cheng Hua¹, Zheng Guang¹, Bing Wang¹, Tao Fang¹, Yan Qi¹, Yong Bi¹, Yangwei Wang¹, Boxia Yan¹

1. Academy of opto-electronics, Chinese academy of sciences, China

The Improvement of Color Uniformity for Laser Digital Cinema Projector

The concept of discreteness of RGB fibers is put forward, and its algorithm is proposed.
ACOFT Presentation

3700-PO-44

Priyamvada Venugopalan¹, Xiangping Li¹, Min Gu¹

1. Swinburne University of Technology, Australia

Characterisation of a Plasmonic Lens for Super-resolution Optical Data Storage

Far-field super-resolution focusing by a plasmonic lens structure will be experimentally characterised by a near field scanning microscope. Application of such a plasmonic lens for super-resolution optical data storage in photorefractive polymers will be demonstrated.

3700-PO-45

Le Thanh Bang¹, Nam Kim¹, Jae-Hyeung Park¹

1. School of Electrical & Computer Engineering, Chungbuk National University, Korea

Reconstruction of Three-dimensional Object by Point Array Projection using Active Lens Array

Recently, integral imaging is of great importance in three-dimensional capture and display due to its distinctive advantages over other competing technologies. Integral imaging displays a 3D image in real time without the use of special glasses on the part of the viewer. Integral imaging can also capture three-dimensional object as a form of an array of elemental images. However, the resolution of the captured three-dimensional information is limited due to generally insufficient resolution of individual elemental image. In this paper, we use an active lens array combined with an algorithm that can improve the resolution of the captured three-dimensional information. Using the captured three-dimensional information, three-dimensional mesh model of the captured object can be constructed. The proposed algorithm is based on analysis of two-dimensional images of object on which the point array is projected by the active lens array of varying focal length. From the shape of the projected points, the depth of each position on the three-dimensional object is determined. Our simulation and experimental results show that the

proposed method has higher resolution than previous depth sensing methods based on integral imaging.

3700-PO-46

James Chon¹, Adam Taylor¹, Timothy Chow¹

1. Centre for Micro-Photonics, Swinburne Univ. of Tech, Australia

Plasmonic Random Media Based on Gold Nanorods as an Optical Storage Medium

In this paper, we present our recent study on the plasmonic random media based on gold nanorods doped in polymer matrix using image correlation spectroscopy for noise-free multidimensional optical recording medium.

3700-PO-47

Yia-Chung Chang¹, Li-Chuan Tang¹

1. Research Centre for Applied Sciences, Academia Sinica, Taiwan

Ray-tracing Simulation of Pixel-matched Lenticular Lens (LLA) for Auto-stereoscopic Display and 3D Imaging

We present numerical simulation of the intensity profile of light refracted through an lenticular lens array (LLA) placed on top of a liquid crystal display (LCD). The "cross-talk" effect due to light refracted through neighboring lens is examined. The efficient method presented here allows one to adjust the design parameters of LLA to minimize the "cross-talk" effect.

Optical Communications and Networking

3700-PO-48

Lenin Mehedy^{1,2}, Masuduzzaman Bakaul^{1,2}, Ampalavanapillai Nirmalathas^{1,2}, Stan Skafidas^{1,2}

1. NICTA Victorian Research Laboratory, Australia
2. Dept. of Electrical and Electronic Engineering, The University of Melbourne, Australia

100 Gb/s 1024-way-split 100-km Long-reach PON Using Spectrally Efficient Frequency Interleaved Directly Detected Optical OFDM

A spectrally efficient (4 bit/s/Hz) 100 Gb/s long-reach PON is demonstrated based on 64-QAM and frequency interleaved directly detected optical OFDM that can potentially operate over 100 km of single mode fiber with a 1024-way-split.

3700-PO-49

Weifan Qiao¹, Kiyonobu Mozawai¹, Ken Kashiwagi¹, Yosuke Tanaka¹, Takashi Kurokawa¹

1. Tokyo University of Agriculture and Technology, Japan

Generation of Phase Only Pulses and Their Fiber Transmission Characteristics

We have generated phase only pulses by using an optical synthesizer and a delayed interferometer. The phase only pulses had much less nonlinear effect comparing to the usual intensity pulse.

3700-PO-50

Jong-In Song¹, **Hyoung-Jun Kim¹**

1. GIST, Korea

Characteristics of simultaneous photonic frequency upconversion utilizing FWM in a single SOA for WDM RoF applications

Characteristics of simultaneous photonic frequency upconversion utilizing four-wave mixing in a semiconductor optical amplifier were investigated. The power penalties for simultaneous frequency upconversion at the bit-error-rate of 10⁻⁹ were less than 1.1 dB.

3700-PO-51

Norhakimah Md Samsuri¹, Asmahanim Ahmad¹, Zulhedry Abdul Manaf¹, Dedy Tarsono¹, Drees Andriyanto¹, Kharina Khairi¹, Muhammad Najib Abdul¹, Romli Mohamad¹

1. TM Research & Development, Malaysia

Extended EPON System Analysis on the First Fiber-To-The-School (FTTSchool) Deployment in Malaysia

An extended distance for FTTSchool deployment using a single OLT for a distance of 29km with 256 optical splitting ratio from the OLT to the furthest school deployed is demonstrated. An average of 2ms round trip time and 92.383 Mbps throughput is observed.

ACOFT Presentation

3700-PO-52

Chung Ghiu Lee¹, **Joon-Ho Choi**¹, Eun-byeol Cho¹, Z. Ghassemloooy²

1. Dept of Electronic Engineering, Korea

2. University of Northumbria, UK

1 Mb/s Data Transmission Employing NRZ-OOK in a Visible Light Communication System

We report 1 Mb/s data transmission using NRZ-OOK signal format in a visible light communication system. The data signal is independently controlled and transmitted upon PWM dimming signal. The eye diagram of the received optical signal diagram has been measured and the technical issues are discussed.

3700-PO-53

P.K.A. Wai¹, C.Y. Li¹

1. The Hong Kong Polytechnic University, China

The advantages of using fixed transmitter/tunable receivers in slotted WDM ring networks

We demonstrated with Integer Linear Programming (ILP) methods that using fixed transmitter/tunable receiver (FTx/TRx) in slotted WDM ring networks can achieve better bandwidth utilization and provide better multicasting support.

Laser Metrology and Remote Sensing

3700-PO-54

Maitreyee Roy¹, Peter Manson¹, Erik Thorvaldson¹, Errol Atkinson¹, Mark Ballico¹

1. National Measurement Institute, Department of Innovation, Industry, Science and Research, Australia

Aperture Area Metrology Using Confocal Laser Beam Scanning Technique

In precision optical radiometric and photometric measurements, one of the limiting factors is an accurate knowledge of the area of a beam-limiting aperture. We present an aperture-area measurement system based on a confocal laser beam scanning technique.

3700-PO-55

Jedsada Wongsaroj^{1,2}, Monludee Ranusawud¹, Montian Tianprateep²

1. National Institute of Metrology, Thailand

2. Chulalongkorn University, Thailand

Determination of Length Difference Between Two Gauge Blocks Using a Michelson Interferometer

The length difference between two gauge blocks were measured by using a Michelson interferometer with a stabilized laser. Five pairs of gauge blocks, grade K were measured and a measurement uncertainty of 20 nm was achieved.

3700-OP-56

Hyunmin Park¹, Lim Lee¹, Kwang-Hoon Ko¹, Taek-Soo Kim¹, Do-Young Jeong¹

1. Quantum Optics Division, Korea Atomic Energy Research Institute, Yuseong, Daejeon, Korea

Detection of Coolant Leakage in Nuclear Reactor Using Off-Axis Integrated Cavity Output Spectroscopy

The sensor-type instrument for heavy water vapor detection was developed by using the off-axis integrated output spectroscopic technique. The minimum detectable change of HDO concentration with this device was evaluated as 1.6 ppm.

3700-PO-57

Hajime Takahashi¹, Hiroki Yagishita¹, Hirokazu Nozue¹, Kazuyoku Tei¹, Shigeru Yamaguchi¹

1. Department of Physics, School of Science, Tokai University, Japan

Measurement of CO₂ Temperature using DFG (Difference Frequency Generation) of 2.7 μ m band

This paper reports CO₂ gas temperature diagnostics based on laser absorption spectroscopy in mid-infrared 2.7 μ m band. The error between optically measured temperature and conventionally measured one was found to be less than 1%.

3700-PO-58

Shine-Chieh Lin¹, Shin-Yu Lu¹, Che-Chung Chou¹, Tyson Lin¹

1. Department of Photonics, Feng Chia University, Taiwan

Optical Heterodyne Phase Detection and Frequency Stabilization of an External Cavity Diode Laser by Using Single Acousto-optics Frequency Shifter

We demonstrated an optical heterodyne scheme, based on single acousto-optic frequency shifter, to detect laser phase variation. The signal was used in laser frequency stabilization, and the estimated stability was about 2.28×10^{-9} .

3700-PO-59

Kenji Wada¹, Shumpei Takeshita¹, Yuki Hono¹, Tetsuya Matsuyama¹, Hiromichi Horinaka¹

1. Department of Physics & Electronics, Graduate School of Engineering, Osaka Prefecture University, Japan

Simple Distance Measurement Using a Gain-Switched DFB Laser as Two in One Light Source and Photodetector

We demonstrate a simple distance measurement using a gain-switched DFB laser operating as both a picosecond pulse oscillator and a photodetector with picosecond time-gate. As a result, 5-m optical distance was measured with sub-millimeter resolution.

3700-PO-60

Alexandre Santos^{1,2,3}, Mohammad Mohammadi^{1,2}, Shahraam Afshar^{1,3}

1. School of Chemistry and Physics, the University of Adelaide, Australia

2. Department of Medical Physics, Royal Adelaide Hospital, Australia

3. Institute for Photonics & Advanced Sensing, School of Chemistry & Physics, University of Adelaide, Australia

Optimal Light Collection in BeO Fiber Optic Dosimetry

The use of BeO ceramic in fiber optic dosimetry is investigated and also new probe setups for optimizing the light collection, where results show that they are more efficient than previously investigated methods.

Laser Processing, Laser Microfabrication, and Industrial Applications

3700-PO-61

Hezhu Shao¹, Yuan Li², Li Zhao², Qi Wang³, Jun Zhuang¹

1. Department of Optical Science and Engineering, Fudan University, China

2. Department of Physics, Fudan University, China

3. School of Information Science and Engineering, China

Below-band-gap light absorption of supersaturated S-doped silicon by femtosecond-laser irradiation: first-principles study

We investigate theoretically the structural and optical properties of supersaturated S-doped silicon by femtosecond-laser irradiation, and propose the microscopic mechanism for the annealing induced decreasing of infrared absorption.

3700-PO-62

D. Nakamura¹, K. Okazaki¹, I.A. Palani¹, M. Higashihata¹, T. Okada¹

1. Department of Electrical Engineering, Graduate School of Information science and Electrical Engineering, Kyushu University, Fukuoka, Japan

Synthesis and Characterization of Well-Aligned ZnO:Sb Nanowires

Vertically-aligned ZnO nanowires on a sapphire substrate have been synthesized by a nanoparticle-assisted pulsed-laser deposition using a Sb₂O₃ doped ZnO target. Uniform cone- shape core was formed at the bottom of each vertically-aligned ZnO nanowire. The nanowires consist of single-crystalline wurzite ZnO crystal with a growth direction along [0001]. The room- temperature photoluminescence spectrum exhibited a strong ultraviolet emission at around 380 nm.

3700-PO-63

Dingke Zhang¹, Gorgi Kostovski¹, Annan Mitchell¹

1. RMIT University, Australia

Observation of Random Lasing Action in Dye Doped Polymer Incorporating Semi-ordered Biological Nanostructures from the Wings of Cicadas

We present a study of random lasing action from dye doped polymer with the scattering role of cicada wing nanostructures. Multimode peaks at 605nm with a mode linewidth of 0.55nm emission spectra were observed.

3700-PO-64

Benjamin P. Cumming¹, Min Gu¹

1. Centre for Micro-Photonics and CUDOS, Swinburne University of Technology, Australia

Direct Laser Writing with a Slit-beam Dynamically Controlled with a Phase Spatial Light Modulator

A spatial light modulator operating as a phase modulator is utilised to create a dynamic slit at the pupil plane of a microscope objective to fabricate circularly symmetric microstructures by direct laser writing.

Laser Chemistry, Biophotonics and Applications

3700-PO-65

Doris Grosse¹, Nektarios Koukourakis¹, Nils C. Gerhardt¹, Tobias Schlauch¹, Jan C. Balzer¹, Günther Tränkle², Andreas Klehr², Martin R. Hofmann¹, Götz Erbert²

1. Chair for Photonics and Terahertztechnology, Ruhr University Bochum, Germany
2. Ferdinand Braun Institute, Germany

Single-shot Holography with Colliding Pulse Mode-locked Lasers as Light Source

The concept of single-shot holography, a 3D imaging technique based on swept source optical coherence tomography, is demonstrated with colliding pulse mode-locked laser diodes as light sources.

3700-PO-66

Takeshi Namita¹, Masayuki Kawashima¹, Yuji Kato¹, Koichi Shimizu¹

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

Reliable scattering coefficient estimation against absorption inhomogeneity by time-resolved measurement of backscattered light

The effect of absorption inhomogeneity on μ_s estimation of a scattering medium with a newly proposed technique was investigated. The estimation error was significantly reduced from that with a conventional technique.

ACOFI Presentation

3700-PO-68

Qiyuan Song¹, Fumihiko Kannari¹

1. Department of Electronics and Electrical Engineering, Keio University, Japan

Selective Two-photon Excitation with Simultaneous Spatial and Temporal Focusing

We add selective two-photon excitation (TPE) function for simultaneous spatial and temporal focusing using a femtosecond laser pulse shaper. Axial TPE resolution of 15 micrometer and linear axial scanning capability is achieved.

3700-PO-69

Bergoi Ibarlucea¹, Elisabet Fernández-Rosas², Jordi Vila-Planas¹, Stefanie Demming³, Carme Nogués², Jose A. Plaza¹, Carlos Domínguez¹, Stephanus Büttgenbach³, **Andreu Llobera^{1,3}**

1. Centre Nacional de Microelectrònica (IMB-CNM, CSIC), Spain
2. Universitat Autònoma de Barcelona, Spain
3. Institut für Mikrotechnik, Technische Universität Braunschweig, Germany

Poly(dimethylsiloxane) Photonic Lab on a Chip for Local Absorbance Measurement and Continuous Cell Counting

A photonic Lab on a Chip for real time cell analysis is presented with the possibility of measuring in three distinct regimes: absorption, scattering and scattering+absorption, with very low limit of detection (53 ± 1 cells).

3700-PO-70

Sairam Iyer¹, Frederique Vanholsbeeck¹, Luc Froehly²

1. Physics Department, The University of Auckland, New Zealand
2. Physics Department, The University of Auckland, New Zealand
3. Institut FEMTO-ST, Université de Franche-Comté, France

Using dual-fibre stretchers and coma as tools for independent 2nd and 3rd order tuneable dispersion compensation in a fibre-based 'scan-free' time domain optical coherence tomography system

Dispersion compensation is experimentally demonstrated by using a dual-fibre stretcher combined with the coma of an imaging lens in a fibre-based scan-free time domain optical coherence tomography system resulting in a resolution of 3 microns.

3700-PO-71

Joon Heon Kim¹, Sang-Youp Yim¹, Myoung-Kyu Oh¹, Hoonsoo Kang¹

1. APRI, GIST, Korea

Adsorption Kinetics at the Biomimetic Lipid Monolayer Studied by the Simultaneous Measurement of Optical Second Harmonic Generation and Surface Pressure

We studied adsorption kinetics of Malachite Green on the anionic lipid monolayer by the simultaneous measurement of time-dependent second harmonic generation and surface pressure. MG showed different adsorption characteristics depending on the initial surface pressure.

3700-PO-72

Jana Say^{1,2,3}, Carlo Bradac^{1,3}, Caryn van Vreden⁴, Cameron Hill², David Reilly⁵, Louise Brown², Nicholas King⁴, James Rabeau^{1,3}, Ben Herbert²

1. Centre for Quantum Science and Technology, Department of Physics, Macquarie Uni, Australia
2. Department of Chemistry and Biomolecular Science, Macquarie University, Australia
3. MQ Photonics Research Centre, Department of Physics, Macquarie University, Australia
4. Discipline of Pathology, School of Medicine, The University of Sydney, Australia
5. School of Physics, The University of Sydney, Australia

Fluorescent Nanodiamonds for Biological Applications

Nitrogen Vacancy centres in nanodiamonds make promising biological probes due to their optical stability. Here we address some of the challenges facing the widespread use of nanodiamonds including obtain small, separate optically active and functionalized nanodiamonds.

3700-PO-73

Seang Hor Eang¹, Youngkyu Park¹, Hee-Dok Choi¹, Seunghyun Yoon², Kyuman Cho^{1,2}

1. Department of Physics, Sogang University, Korea
2. Interdisciplinary Program of Integrated Biotechnology, Sogang University, Korea

Application of Heterodyne Double Pass Interferometer on the Readout Sensor for a Biochemical Fluidic Channel

The heterodyne interferometer using the double pass geometry of optical beams in the acousto-optic modulator (AOM) has been applied for measuring concentrations of ethylene glycol solution. Our preliminary studies show that 0.001% of ethylene glycol can be measured by using this new method.

3700-PO-74

Negar Mirjalili¹, Timo A. Nieminen¹

1. The University of Queensland, School of Mathematics and Physics, Brisbane, Australia

Research Applications of Theoretical and Computational Modelling of Optical Tweezers

A variety of methods can be and are used for modelling optical tweezers. We examine applications of such modelling in the research literature, and consider the applicability and appropriateness of different methods of modelling.

3700-PO-75

Norman Lippok^{1,2}, Poul Nielsen¹, **Frédérique Vanholsbeeck²**

1. Auckland Bioengineering Institute, Physics Department, The University of Auckland, New Zealand

Using the Continuum of Fractional Fourier Domains to Compensate Dispersion in Optical Coherence Tomography

The fractional Fourier transform was used to demonstrate its potential for dispersion compensation in OCT. Dispersion induced by a 26 mm water cell was compensated from 49 μ m. back to the theoretical axial resolution of 3.6 μ m.

3700-PO-76

George Brawley¹, Joachim Knittel¹, Warwick Bowen¹

1. School of Mathematics and Physics, University of Queensland, Australia

Improved Detection of Nanomechanical Motion Using a Coupled Microtoroid-Interferometer System

Using a microtoroid coupled to a fibre interferometer, we present experimental results demonstrating noise suppression in the measurement of kHz-range nanomechanical vibration of a microcantilever. Noise power was seen to be suppressed by up to 19dB.

Fiber Amplifiers, Lasers, Sensors and Devices

3700-PO-77

C.-L. Chang¹, **T.-D. Wang²**, C.-C. Chen²

1. Institute of Photonics and Optoelectronics, National Taiwan University, Taiwan

2. Department of Optics and Photonics, National Central University, Taiwan

Actively-Q-switched Yb-doped Photonics Crystal Fiber Laser for 10 Ns Pulse in Millijoule Level

A Q-switched Yb-doped PCF fiber laser generates a 1030-nm pulse with energy of ~1.2 mJ at 10 ns in near diffraction-limited beam quality. The system performance is characterized for the design of further power scaling.

ACOFT Presentation

3700-PO-78

Keiji Kuroda¹, Kohnosuke Sasahira¹, Yuzo Yoshikuni¹

1. Department of Physics, School of Science, Kitasato University, Japan

Pulse Generation System For Fiber Amplifier Optical Memory: Measurement Of Gain Saturation Properties

We report development of a pulse generation system for realization of optical memory based on optical interference inside a fiber amplifier. Properties of an erbium-doped fiber amplifier are evaluated and discussed as a memory medium.

3700-PO-79

Lingjie Kong¹, Xiaosheng Xiao¹, **Changxi Yang¹**

1. State Key Laboratory of Precision Measurement Technology and Instruments, Department of Precision Instruments, Tsinghua University, China

Operating Regime Analysis of Mode-locking Fiber Laser with Difference Equation

We proposed a difference equation model for fiber lasers mode-locked with nonlinear polarization evolution. It can be used to characterize intra-cavity nonlinear dynamics, such as steady one-pulse, period multiplication, multi-pulsing and chaos. The influence of adjusting wave-plate is also studied. By shifting linear phase bias, overdriving of saturable absorber is solved, and pulses of higher energy could be achieved. The modulation depth is found to affect the transition of intra-cavity dynamics.

3700-PO-81

Yuki Wada¹, Atsushi Taketomi¹, Takuya Inoue¹, Masataka Hashimoto¹, Yasuhiro Kamba¹, Shigeru Yamaguchi¹, Junichi Matsuura¹, Jun Enokidani², Kazuyoku Tei¹, Shin Sumida²

1. Tokai University, Japan

2. Seikoh Giken Co.,Ltd, Japan

A Study on Stabilization of Phase-Drift in a High-Extinction Guided-Wave Intensity Modulator

As a result of the optical pulse generation during the bias control of the modulator, the DERs of 38 dB and 35 dB were achieved for the duty cycles of 0.0056% and 1%, respectively.

3700-PO-82

Chen Chien-Hsing¹, Hsu Chih-Yu², Wang Jian-Neng³, Chau Lai-Kwan¹, Wu Wei-Te², Tang Jaw-Luen¹

1. National Chung Cheng University, Taiwan

2. National Pingtung University of Science and Technology, Taiwan

3. National Yunlin University of Science and Technology, Taiwan

A Novel Dual-Channel Fiber-Optic Particle Plasmon Resonance Sensor Realized by CO₂ Laser Engraving

We present a novel dual-channel fiber-optic particle plasmon resonance (FO-PPR) sensor for refractive index sensing. The sensor, fabricated by a CO₂ laser system, was realized by modification of gold sphere nanoparticles and gold nano-rods simultaneously in two different fiber sensing zones with a length of 2cm. This type of sensor has shown the capacity of simultaneously sensing two different channels of PPR signals with a relatively high refractive index sensitivity (~6.0/RIU).

3700-PO-83

Sun A Kim¹, Min-Hwan Lee¹, Eun-Sun Kim¹, In-Kag Hwang¹, Kyung-Hwan Oh²

1. Department of Physics, Chonnam National University, Korea

2. Photonic Device Physics Laboratory, Yonsei University, Korea

Theoretical and Experimental Characterization of Hollow Optical Fibers for Opto-fluidic Applications

We report optical properties of a hollow optical fiber depending on hole size and refractive index. This study will provide an important guideline for opto-fluidic devices based on hollow optical fibers.

3700-PO-84

Bo Zhou¹, Baojie Chen¹, Edwin Pun¹

1. City University of Hong Kong, China

Near-infrared Emission in Tm³⁺-Tb³⁺/Eu³⁺ Codoped Gallo-Germanate Glasses

Broadband 1.20 μ m emission (³G₄→³H₄ transition) in Tm³⁺-Tb³⁺/Eu³⁺ codoped gallo-germanate glasses was observed. The population inversion is realized by depleting the lower 3H₄ level, and the possible energy transfer processes involved are discussed.

3700-PO-85

Y.H. Cha¹, Y.G. Kim², **H.M. Park¹**, G.Lim¹, K.H. Ko¹, J.M. Han¹, T.S. Kim¹, D.Y. Jeong¹

1. Quantum Optics Division, Korea Atomic Energy Research Institute, Korea

2. Department of Physics, Kongju National University, Korea

3.3-mJ 13-ns Q-switched laser based on a 100- μ m-core rod-type ytterbium-doped photonic crystal fiber

We have developed a Q-switched laser based on a 100- μ m-core rod-type ytterbium-doped photonic crystal fiber. The maximal output energy is 3.3 mJ with a 13-ns pulse duration, and the maximal average power is 267 W.

3700-PO-86

Fotios Sidirolou¹, Tinh Nguyen²

1. Centre for Telecommunications and Microelectronics, Victoria University, Australia

2. School of Engineering and Science, Victoria University, Australia

Synthesis of Chitosan Films on Optical Fibers for Detection of Ammonia Vapors

A chitosan-coated optical fiber sensor for the detection of ammonia chemical vapors is presented. Exposing the chitosan to ammonia gas causes a change in its refractive index that it is detected by the fiber end.

ACOFT Presentation

3700-PO-87

Harpreet K. Bal¹, Will Brown², Nicoleta M. Dragomir¹, Scott A. Wade², Fotios Sidirolou¹, 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

Comparison of Spectra and Images of Bragg Gratings Written in three Different Optical Fibres

Optical fibre Bragg gratings were fabricated in 3 different fibres, and their spectra at 3 harmonics were measured and cross-compared with images of their internal complex refractive index profiles obtained via differential interface contrast imaging.

ACOFT Presentation

3700-PO-88

Alexei Tikhomirov¹, Scott Foster¹

1. MOD, DSTO, Australia

Towards a Splice-free Fibre Laser Array

We present a novel splice-free laser array architecture that uses a double-core fibre. Fibre tapers are used to couple the active and passive core. Results on coupling between cores is presented for two different fibres.

ACOFT Presentation

3700-PO-89

George Huyang^{1,2}, Ingamar Petermann^{1,2}, John Canning^{1,2}, Maxwell J Crossley²

1. Interdisciplinary Photonic Laboratories (iPL), the University of Sydney, Australia

2. School of Chemistry, the University of Sydney, Australia

Cold Preparation of Titania Sol-gel for Optical Fibre Applications

Titanium dioxide isopropyl sol-gels layers have been constructed for use within optical fibres in a simplified method based on cold drying as compared to common methods of sol-gel preparation that rely on heat treatment. The surface uniformity of these titania sol-gels are analyzed by spectroscopy in order to assess their properties and suitability for functionalised substrates such as porphyrin.

ACOFT Presentation

IQEC

Quantum Optics

3700-PO-90

Helen Chrzanowski¹, Julien Bernu¹, Ben Sparkes¹, Boris Hage¹, Austin Lund^{1,2}, Thomas Symul¹, Timothy Ralph^{1,3}, Ping Koy Lam¹

1. Centre for Quantum Computation and Communication Technology, Department of Quantum Science, Australia

2. Centre for Quantum Dynamics, Griffith University, Australia

3. Department of Physics, University of Queensland, Australia

Photon Number Discrimination Without a Photon Counter and Reconstructing non-Gaussian States of Light

We demonstrate a new approach to photon number discrimination, relying only on continuous variable homodyne measurements. We apply this technique to the reconstruction of the non-Gaussian one, two and three photon subtracted squeezed vacuum states.

3700-PO-91

S.J. Whalen¹, M.J. Collett¹, A.S. Parkins¹, H.J. Carmichael¹

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

Open Quantum Systems with Delayed Feedback

We consider two models for the decay of a harmonic oscillator, which couples to the reservoir at two spatial locations (i.e., exhibits a delay): one with the standard quantum-optical rotating-wave and resonance approximations, and one without.

3700-PO-92

Morgan Tacey¹, J.F. Corney¹

1. School of Mathematics and Physics, The University of Queensland, Australia, China

Use of Longer Soliton Pulses to Reduce Raman Noise in Fibre Squeezing

Noise sources such as Raman and GAWBS set the lower limit for squeezing in optical fibres. We found that longer soliton pulses improve squeezing, so long as residual phase noise from GAWBS is well controlled.

3700-PO-93

Wakana Ueno¹, Fumihiro Kaneda¹, Hirofumi Suzuki¹, Shigehiro Nagano¹, Atsushi Syouji¹, Keiichi Edamatsu¹, Ryosuke Shimizu², Koji Suizu³

1. Research Institute of Electrical Communication, Tohoku University, Japan

2. Center for Frontier Science and Engineering, University of Electro-Communication, Japan

3. Department of Electrical Engineering, Nagoya University, Japan

Generation of Polarization-entangled Photon Pairs using Two-period Quasi-phase Matched LiNbO₃

We demonstrate the generation of polarization-entangled photon pairs at telecommunication wavelengths with type-II quasi-phase matched spontaneous

parametric down-conversion (QPM-SPDC) having two poling periods. The generated two-photon polarization state was analyzed by the quantum state tomography.

3700-PO-94

T.J. Karle¹, A. Stacey¹, B.C. Gibson¹, K. Ganesan¹, S. Tomljenovic-Hanic¹, A.D. Greentree¹, C. Santori², R. Beausoleil², S. Praver¹

1. School of Physics, University of Melbourne, Australia

2. Hewlett Packard Laboratories, USA

Effects of process plasma on nitrogen-vacancy density in ultra-high purity diamond

We report on optical measurements which assess the impact of processing plasmas on the density of Nitrogen-Vacancy centres in ultra-high purity diamond. In particular we look at the depletion of NV before and after exposure to a hydrogen plasma using confocal microscopy.

3700-PO-95

Devon Biggerstaff^{1,2,3}, James Owens^{1,2,3}, Matthew Broome^{1,2,3}, Alessandro Fedrizzi^{1,2,3}, Michael Goggin^{1,2,3,4}, Graham Marshall^{6,7,8,5}, Trond Linjordet^{1,5}, Jason Twamley^{1,4}, Martin Ams^{5,7,8,5}, Michael Withford^{6,7,8,5}

1. ARC Centre for Engineered Quantum Systems, Australia

2. ARC Centre for Quantum Computer and Communication Technology, Australia

3. School of Mathematics and Physics, University of Queensland, Australia

4. Department of Physics, Truman State University, USA

5. Department of Physics and Astronomy, Macquarie University, Australia

6. ARC Centre for Ultrahigh Bandwidth Devices for Optical Systems, Australia

7. Centre for Quantum Science and Technology, Australia

8. MQ Photonics Research Centre, Australia

Continuous- and Discrete-time Quantum Walks with Non-classical Two-Photon Inputs

We present two-photon continuous- and discrete-time quantum walks, respectively implemented in an integrated coupled waveguide array and a polarization-based beam-displacer network. We observe distinctly non-classical signatures, constituting progress towards quantum simulation capabilities.

Quantum Science in Atoms, Molecules and Solids

3700-PO-96

Nadezhda P. Stagnaya¹, Hang T.T. Nguyen¹, Peter A. Meleshenko¹, Alexander F. Klinskikh¹

1. Voronezh State University, Russia

Can the Aharonov-Bohm effect be observed using spectroscopic methods?

We have shown that the presence of the Aharonov-Bohm flux affects the radiation spectrum of the electron in a 2D Coulomb potential. Question about observation of the Aharonov-Bohm effect using spectroscopic methods is also discussed.

Cold Atoms and Molecules

3700-PO-97

Zhenglu Duan¹

1. Jiangxi normal university, China

The Focusing and Collimation Effects of Cold Atomic Clouds Passing Through a Far Red-detuned Focused Gaussian Beam

This work has studied the focusing and collimation of atomic clouds when it passes through the atom-optical lens created by a far red-detuned Gaussian laser beam.

ACOFT Presentation

3700-PO-98

S.J. Rooney¹, P.B. Blakie¹, B.P. Anderson², A.S. Bradley¹

1. Jack Dodd Center for Quantum Technology, University of Otago, New Zealand

2. College of Optical Sciences, University of Arizona, USA

Suppression of Kelvin-induced Decay of Quantized Vortices in Trapped Bose-Einstein Condensates

We study the Kelvin mode excitations on a vortex line in a three-dimensional trapped Bose-Einstein condensate at finite temperature, finding activation of these modes strongly enhances vortex decay.

3700-PO-99

M. Egorov¹, V. Ivannikov¹, B. Opanchuk¹, B.V. Hall¹, P. Hannaford, A.I. Sidorov¹

1. Centre for Atom Optics and Ultrafast Spectroscopy, Swinburne University of Technology, Australia

Precision Measurements of s-wave Scattering Lengths in a Two-component Bose-Einstein Condensate

We developed a new method of measuring s-wave scattering lengths with a high precision ($a_{12} = 97.993(20) a_0$ and $a_{22} = 95.41(7) a_0$ in ^{87}Rb) using collective oscillations and Ramsey interferometry in a two-component Bose-Einstein condensate.

3700-PO-100

Mark Baker¹, Leif Humbert¹, Daniel Sigle¹, Erik van Ooijen¹, Simon Haine¹, Halina Rubinsztein-Dunlop¹, Matthew Davis¹, Norman Heckenberg¹

1. University of Queensland, School of Mathematics and Physics, Australia

Time-averaged Optical Dipole Traps for Bose-Einstein Condensates

We present here details of our all optical BEC apparatus, and our progress towards realisation of a ring trap using time averaged optical dipole potentials.

3700-PO-101

Marcus Lingham¹, Kristian Fenech¹, Sascha Hoinka¹, Paul Dyke¹, Eva Kuhnle¹, Hui Hu¹, Marion Delehay¹, Peter Hannaford¹, Alexei Orel¹, Chris Vale¹

1. Swinburne University of Technology, Australia

Crossover From 2D to 3D in a Weakly Interacting Fermi Gas

We present a characterisation of the crossover from two dimensions to three dimensions in a weakly interacting Fermi gas. We also report our progress towards creating an improved two-dimensional trap with a higher aspect ratio.

Quantum Information and Cryptography

3700-PO-102

Yuki Tagawa¹, Holger F. Hofmann^{1,2}

1. Hiroshima University, Japan

2. JST, CREST, Japan

Analysis of the Contextuality Paradox using Weak Measurement Statistics

We present a measurement strategy for the analysis of the state independent contextuality paradox in the quantum statistics of a pair of qubits using a sequence of state preparation, weak measurement and output post-selection.

3700-PO-103

D.J. Saunders¹, **M.S. Palsson¹**, G.J. Pryde¹, A.J. Scott¹, S.M. Barnett², H.M. Wiseman¹

1. Centre for Quantum Computation and Communication Technology, Centre for Quantum Dynamics, Griffith University, Australia

2. Department of Physics, University of Strathclyde, UK

Maximally Parsimonious Demonstrations of Quantum Nonlocality

Bell-nonlocality, EPR-steering, and entanglement are distinct phenomena that form a strict hierarchy of non-classicality. We show that the complexity of minimal tests for these phenomena formally exhibits the same hierarchy, and experimentally implement these tests with photons.

3700-PO-104

Rose Ahlefeldt¹, Wayne Hutchison², Matthew Sellars¹

1. The Australian National University, Australia

2. UNSW@ADFA, Australia

Characterisation of $\text{EuCl}_3 \cdot 6\text{H}_2\text{O}$ for Multi-Qubit Quantum Processing

We describe a quantum computing architecture that uses satellite lines in rare earth doped $\text{EuCl}_3 \cdot 6\text{H}_2\text{O}$ as qubits. We identify the crystallographic sites to which these lines belong and predict the performance of the quantum processor.

Precision Measurements and Fundamental Tests

3700-PO-105

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

1. Electrical & Electronic Engineering, Nanyang Technological University, Singapore

Phase Noise at Harmonic Frequencies of a Mode-locked Fiber Laser and Low-timing-jitter Microwave Extraction

The relation between the phase noise and the order of harmonic frequencies of a mode-locked fiber laser is experimentally investigated. The lowest timing jitter is 73 fs obtained at 11th harmonic frequency of 1619 MHz.

3700-PO-106

Ying Li¹, Kentaro Wakui¹, Tetsuya Ido¹, Shigeo Nagano¹, Kensuke Matsubara¹, Yuko Hanado¹, Kazuhiro Hayasaka¹

1. National Institute of Information and Communications Technology, Japan

New Strategy for an Indium Ion Optical Frequency Standard

We report on the progress toward 115ln+ optical frequency standard by new approaches. The report is focused especially on the clock laser locked to a novel rectangular-shaped cavity.

ACOFT Presentation

3700-PO-107

Michael Taylor¹, Alex Szorkovszky¹, Joachim Knittel¹, Kwan Lee¹, Warwick Bowen¹

1. University of Queensland, Australia

Regenerative Amplification in a Microtoroid by Electrical Actuation

We investigate mechanical regenerative amplification in a microtoroid by electrical actuation, and compare the linewidths achievable to that found with optical driving. We find an order of magnitude lower linewidth by this method.

Fundamentals of Nonlinear Optics

3700-PO-108

Chih-Rong Chen¹, Ming-Feng Shih¹, Hsiao-Chih Huang¹

1. Department of Physics, National Taiwan University, Taiwan

Propagation of Half-Charge Vortex Light Beams in a Self-Focusing Medium

We observe experimentally half-charge vortex light beams in a self-focusing medium. They break up into parts due to azimuthal instability, confirmed by our analysis. We find a way to stabilize them to form vector solitons.

3700-PO-109

Po-Chi Ou¹, **Ja-Hon Lin²**, Wen-Feng Hsieh^{1,3}

1. Department of Photonics & Institute of Electro-Optical Engineering, National Chia Tung University, Taiwan

2. Department of Electro-Optical Engineering & Institute of Electro-Optical Engineering, National Taipei University of Technology, Taiwan

3. Institute of Electro-Optical Science and Engineering, National Cheng Kung University, Taiwan

Optical nonlinear absorption of ZnO/ZnMgO multiple quantum wells at room temperature

Wavelength- and pumping-dependent optical nonlinear absorption was investigated in ZnO/ZnMgO multiple quantum wells by using the z-scan and pump-probe methods. The nonlinear response transits from saturable absorption into two-photon absorption as excitation below excitonic state.

ACOFT Presentation

Joint IQEC/CLEO Pacific Rim

Nanophotonics

3700-PO-110

Jun Oi¹, Shutaro Onishi¹, Keiichiro Matuishi¹, Takuya Harada¹, Fumihiko Kannari¹

1. Keio University, Japan

Measurement of Femtosecond Plasmon Response with Cross-correlation Dark-field Microscopy

We demonstrate an electric-field cross-correlation imaging technique to obtain a response function of localized plasmon generated by femtosecond laser pulses on gold nanostructures, which allows deterministic spatiotemporal plasmon control using femtosecond laser pulse shaping.

3700-PO-111

Jiong Shan¹, Wei Shi¹, Shen Xu¹, Liying Liu¹, **Lei Xu**¹

1. Key Lab for Micro and Nanophotonic Structures (Ministry of Education) Department of Optical Science and Engineering, School of Information Science and Engineering, Fudan University, China

Au-Nanoparticle Induced Large Enhancement of Optical Reorientation in Nematic Liquid Crystals

We found that when nematic liquid crystal (LC) cell surfaces were Au-nanoparticle modified, light intensity to induce LC reorientation can be 100 times less at Au surface plasmon resonance (SPR) wavelength.

3700-PO-112

Xavier Zambrana¹, Gabriel Molina-Terriza¹

1. Macquarie University, Australia

Control of Optical Resonances in Dielectric Spheres Using Laguerre-Gaussian Beams

In the conventional Mie scattering theory with dielectrics, resonances only appear in the optical range when the refractive index tends to infinity. A method to obtain optical resonances using Laguerre-Gaussian beams is presented.

ACOFT Presentation

3700-PO-113

Hironori Hattori¹, Shimpei Hidaka¹, Takuya Iida^{1,2}

1. Nanoscience and Nanotechnology Research Center, Osaka Prefecture University, Japan
2. PRESTO, Japan Science and Technology Agency, Japan

Theory of Configuration Control of Metallic Nanocomposites by Light Fields with Designed Polarization Distributions

We have theoretically demonstrated the dynamics control of metallic nanoparticles by light-induced force with axially-symmetric polarized laser beam. We clarify the possibility of fabrication of metallic nanocomposite with high rotational symmetry.

3700-PO-114

Eui Young Song¹, Sookyoung Roh¹, **Byoung Ho Lee**¹

1. National Creative Research Center for Active Plasmonics Application Systems, Korea

Plasmonic Nano-rods Structure Generating Rotational Fields for Polarization Sensing

We numerically analyze a plasmonic nano-rods structure generating rotational fields. The circularly symmetric nanostructure can induce rotational fields in opposite directions when illuminated with two orthogonally circularly polarized lights.

3700-PO-115

J.H. Woo¹, E.S. Kim¹, Boyoung Kang¹, E.Y. Choi¹, Hyun-Hee Lee¹, J.W. Wu¹, J. Kim¹, Tae Y. Hong², Y.U. Lee¹, Jae H. Kim²

1. Department of Physics & Quantum Metamaterials Research Center, Ewha Womans Univ, Korea

2. Department of Physics, Yonsei Uni, Korea

Cryogenic temperature measurement of THz meta-resonance in symmetric metamaterial superlattice

We investigated a change in the Q-factor of THz meta-resonance as a function of temperature in a symmetric metamaterial superlattice. Contributions of radiative damping and Drude damping are discussed in determining Q-factors of meta-resonances.

3700-PO-116

SeokJae Yoo¹, Q-Han Park¹

1. Department of Physics, Korea University, Korea

Improvement of Effective Medium Approximation for Dense Plasmonic Nanoparticle Monolayers

We present improved effective medium approximation (EMA) for plasmonic nanoparticle monolayers. Our EMA model shows optical properties of plasmonic nanoparticle monolayers: (1) anisotropy of monolayers, (2) perturbation of resonance frequency, and (3) long-wavelength transparency.

3700-PO-117

S. H. Eah¹, H.W. Kihm¹, Q.H. Kim¹, W.S. Bak¹, Dai-Sik Kim¹, S.M. Koo², N.K. Park²

1. Department of Physics and Astronomy, Seoul National University, Korea

2. Photonic Systems Laboratory, School of EECS, Seoul National University, Korea

Optical Activity of Subwavelength Single Hole

We investigated the magnetic light-matter interaction with subwavelength metallic single holes and find the optical properties of that are entirely determined by the interaction with the magnetic field of light as postulated by Bethe.

3700-PO-118

Shutaro Onishi¹, Jun Oi¹, Keiichiro Matsuishi¹, Takuya Harada¹, Fumihiko Kannari¹

1. Keio University, Japan

Measurement of Plasmon Response Function by Spectral Interferometry with NSOM for Spatiotemporal Plasmon Control

We measure spatiotemporal characteristics of femtosecond localized plasmon at gold nanostructures. Based on the plasmon response function deduced from these measurements, the femtosecond localized plasmon pulse is deterministically shaped using shaped femtosecond excitation laser pulses.

ACOFT Presentation

3700-PO-119

Chris Poulton¹, Adel Rahmani¹, Michael Steel²

1. School of Mathematical Sciences, University of Technology, Sydney (UTS), Australia

2. Department of Physics and Astronomy, Macquarie University, Australia

Radiation Dynamics in a Magneto-dielectric Metamaterial Cylinder

We study the radiation dynamics of an electric line current source in a homogeneous, magneto-dielectric cylinder. We find that radiation by the source is most enhanced by maximizing the magnetic response of the cylinder.

3700-PO-120

Kwang Jin Lee¹, **Kihong Kim**¹

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

Influence of Nonlinearity on the Optical Tamm Plasmons in One-dimensional Metal-less Structures

We show theoretically that the electromagnetic field enhancement and the influence of nonlinearity due to the excitation of Tamm plasmons are much stronger than those due to conventional surface plasmons.

3700-PO-121

Landobasa Tobing¹, **Liliana Tjahjana**¹, Dao Hua Zhang¹

1. Nanyang Technological University, Singapore

Low Voltage sub-30nm Dielectric and Metal Nanopatterning for Plasmonic and Metamaterial Applications

We present a simple approach for sub-30nm dielectric and metal patterning based on low voltage electron beam lithography and standard lift-off process by using 42nm hydrogen silsesquioxane and 200nm ZEP resist.

3700-PO-122

Ingemar Petermann¹, **John Canning**¹, Matthew Foley²

1. Interdisciplinary Photonics Laboratories (iPL), School of Chemistry, The University of Sydney, Australia

2. Australian Centre for Microscopy & Microanalysis, The University of Sydney, Australia

Fabrication of Gold-based Fractal Surfaces

Fractal aggregations of EDTA chelates formed during solvent evaporation are used as masks for gold plating. SEM analysis shows evidence of features down to less than 100 nm with complete metal coverage.

Ultrafast Optics and Photonics

3700-PO-123

W. Xu¹, **D. Y. Tang¹**, X.D. Xu², L.H. Zheng³, J. Zhang¹, W.D. Tan¹, D.Z. Li², B.L. Su³, J. Xu³, Qing Wang¹

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

2. Key Laboratory of Materials for High Power Laser, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China

3. Key Laboratory of Transparent and Opto-functional Inorganic Materials, Shanghai Institute of Ceramics, Chinese Academy of Sciences, China

Diode-pumped Passively Mode-locked Yb:LPS Laser

A diode-pumped passively mode-locked Yb:Lu₂Si₂O₇ (Yb:LPS) laser is firstly demonstrated. The shortest pulse duration is about 96fs. We found that the Yb:LPS crystal could have small normal group velocity dispersion near the mode locking wavelength of 1058nm and a large nonlinear optical Kerr coefficient.

3700-PO-124

Yongdong Zhang¹, Zhiyi Wei¹, Zhenlin Wang², Zhiguo Zhang¹, Haojia Zhang³, QiuHong Yang³

1. Joint Laboratory of Advanced Technology in Measurement, Institute of Physics, Chinese Academy of Sciences, China

2. School of Technical Physics, Xidian University, China

3. School of Materials Science and Engineering, Shanghai University, China

Efficient Diode-pumped Continuous-wave and Picosecond Lasers with Ceramic Yb:(Y_{0.9}La_{0.1})₂O₃ as Gain Medium

We generated 1.73 W CW laser from a diode pumped ceramic Yb:(Y_{0.9}La_{0.1})₂O₃ laser, corresponding to a slope efficiency of 60.2 % . Mode-locking the laser with SESAM results in 3.1 ps pulse duration at 1075nm.

Ultrafast Laser Science

3700-PO-125

Shinichi Yamashita¹, Takahumi Kozai¹, Kosuke Hirochi¹, Hayato Miyagawa¹, Noriaki Tsurumachi¹, Hiroshi Itoh¹, Shun Koshiba¹, Syunsuke Nakanishi¹

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

Femtosecond Coherent Vibrational Relaxation in PMMA Measured by Coherent Anti-Stokes Raman Spectroscopy

We have performed femtosecond coherent anti-Stokes Raman spectroscopy to study vibrational dynamics in polymethylmethacrylate. We measured the coherent vibrational relaxation rates of CH₂ symmetric and anti-symmetric modes and observed the signal beats between CH₂ modes.

3700-PO-126

Maruthi Manoj Brundavanam¹, Nirmal Kumar Viswanathan², Yoko Miyamoto³, Narayana Rao Desai²

1. Institute for Laser Science, The University of Electro-Communications, Japan

2. School of Physics, University of Hyderabad, India

3. Department of Engineering Science, The University of Electro-Communications, Japan

Spectral Correlation of Refocused Collinear Filaments Using Femtosecond Pulses

We present experimental results on the estimation of temporal separation between the refocused collinear filaments formed inside BK7 glass using spectral-correlation-induced modulations observed in the output spectrum due to focused femtosecond laser pulses.

3700-PO-127

Igor Litvinyuk¹, Irina Bocharova², Jean-Paul Brichta³, Emmanuel Penke⁴, Andre Bandrauk⁴, Francois Legare⁶, Joseph Sanderson⁵, Jean-Claude Kieffer⁶

1. Centre for Quantum Dynamics, Griffith University, Australia

2. Lawrence Berkeley National Laboratory, USA

3. University of Ottawa, Canada

4. University of Sherbrooke, Canada

5. University of Waterloo, Canada

6. INRS-EMT, Canada

Enhanced Ionization in Di- and Tri-atomic Molecules Observed with Coulomb Explosion Imaging

We used Coulomb explosion imaging (CEI) to observe enhanced ionization (EI) in nitrogen and carbon dioxide molecules. In N₂ we observed electron localization with time-resolved CEI using few-cycle laser pulses. In CO₂ we reconstructed molecular structure from triple coincidence measurements while varying pulse duration from 7 fs to 200 fs.

Wednesday 31 August 2011

1730-1930 POSTER SESSION 3 (4700)

Room: Bayside Terrace Level 2

Green Photonics

4700-PO-1

Yu-Kuang Liao¹, Shou-Yi Kuo², Fang-I Lai³, Tung-Po Hsieh⁴, Hao-Chung Kuo⁵

1. Department of Electrophysics, National Chiao Tung University, Taiwan
2. Department of Electronic Engineering, Chang Gung University, Taiwan
3. Department of Photonic Engineering, Yuan Ze University, Taiwan
4. Industrial Technology Research Institute, Taiwan
5. Department of Photonics, National Chiao Tung University, Taiwan

Photoluminescence and Time-resolved Photoluminescence of Cu(In,Ga)Se₂ Thin Film

We investigated Cu(In,Ga)Se₂ (CIGS) thin film with TR-PL to study its carrier dynamics. Different peaks in PL spectrum showed similar lifetime suggests different recombination mechanisms can equally affect the photocurrent in CIGS solar cells.

ACOFI Presentation

CLEO Pacific Rim

Semiconductor and Electro-Optic Devices

4700-PO-2

Mizuki Shirao¹, Nobuhiko Nishiyama¹, Shigehisa Arai^{1,2}

1. Department of Electrical and Electronic Engineering, Tokyo Institute of Technology, Japan
2. Quantum Nanoelectronics Research Center, Tokyo Institute of Technology, Japan

Numerical Analysis of Optical Gain of a 3-terminal HBT-SOA

A numerical simulation of a hetero-junction bipolar transistor (HBT) SOA was successfully demonstrated considering the effect of carrier pulling out. Short carrier recovery time of the HBT-SOA can provide large operation bandwidth and high gain.

4700-PO-3

Tupe Chen¹, Zhanhong Cen¹

1. Nanyang Technological University, Singapore

Electroluminescence from Si-implanted Silicon Nitride Thin Films

In this work, light emission excited electrically from Si-implanted silicon nitride thin films has been investigated.

4700-PO-4

Pei-Hsuan Huang¹, Hsun Wen Wang², Shou-Yi Kuo³, Min-An Tsai², Fang-I Lai¹, H. C. Kuo², Sien Chi¹

1. Department of Photonics Engineering, Yuan-Ze University, Taiwan
2. Department of Electrophysics, National Chiao Tung University, Taiwan
3. Department of Electronic Engineering, Chang Gung University, Taiwan

Optimum Design of Triple-junction Solar Cells with Sub-wavelength Surface

We design the solar cells by optimizing current matching between top and middle cells. For the optimized solar cell with surface texture structure, the enhancement of the Isc and the efficiency were 13.68 % and 12.24 %

4700-PO-5

Hsin-Chu Chen¹, Kuo jo Chen¹, Cheng Wei Hung¹, Chao-Hsun Wang¹, Min-Hsiung Shih¹, Hao-Chung Kuo¹, Chien-Chung Lin¹

1. Department of Photonic & Institute of Electro-Optical Engineering, National Chia
2. Institute of Photonic System, National Chiao Tung University

Thermal Effect of GaN-based Light-emitting Diodes with CdSe/ZnS Quantum Dots

Thermal effect of GaN-based light-emitting diodes with CdSe/ZnS quantum dots is investigated. Phosphor conversion efficiency and junction temperature were studied to understand thermal properties under different injected currents and environmental temperatures.

4700-PO-6

Sook-Hui Lee¹, In-Kag Hwang¹, Hyun-Ee Shin², Hee-Dae Kim²

1. Department of Physics, Chonnam National University, Korea

Post-contraction of Oxide Aperture of VCSEL and Prediction of Its Effect on Reliability

We report post-contraction of oxide aperture and potential degradation of reliability of oxide-VCSEL which was exposed to KOH solution. We also suggest that ideality factor can be used to predict reliability of the damaged devices.

4700-PO-7

Yi Chen Huang¹, Y. S. Wang², W.J. Wang¹, N.C. Chen¹

1. Institute of Electro-Optical engineering, Department of Engineering, Chang Gung, Taiwan
2. Department of Electrophysics, National Chiao Tung University, Taiwan

AlGaInP LEDs Reliability Dependence on Different Mg Doping Concentration

In this study, we report the influence mechanism of different Mg doping concentration in LED P- type layer. We concluded from analyses of the I-V ~ C-V and Lop that this process is due to Mg out diffusion.

4700-PO-8

Yasar Kutuvantavida^{1,2}, Grant Williams³, Stefaan Janssens^{1,4}, Sebastia Pillai Raymond¹, Delower Bhuiyan¹, Andrew Kay¹

1. Industrial Research Limited, New Zealand
2. Institute of Fundamental Sciences, Massey University, New Zealand
3. MacDiarmid Institute, Industrial Research Limited, New Zealand
4. Victoria University of Wellington, New Zealand

Photostability Study of Structurally Modified Electro-Optic Chromophores and the Effect of Singlet Oxygen Quenchers

Structural modifications to enhance the temporal stability of the electro-optic chromophore, PYR-3, have not adversely affected the photostability. We find that the photostability can be enhanced by the addition of singlet oxygen quenchers.

4700-PO-9

Chia-Hsin Chao¹, Wen-Yung Yeh¹, Ming-Hsien Wu¹, Chao-Chyun An¹, Yu-Hung Chuang¹, Kuang-Yu Tai¹, Ying-Chien Chu¹, Mu-Tao Chu¹, Hsi-Hsuan Yen¹

1. Industrial Technology Research Institute, Taiwan

Preliminary Demonstration of Ultra Compact Pico Projector with Micro-Pixelated GaN LED Imager

Preliminary demonstration of ultra-compact pico-projector with micro-pixelated GaN LED imager was given. With 1.5cm³ projection lens, projector size of around 2 cm³ was achieved. The micro-pixelated LED imager features high luminance and collimating beams.

High Power Laser Technology and High Energy Density Physics

4700-PO-10

Heinrich Hora², Hui-Chun Wu¹, Kirk Flippo¹

1. P-24 Plasma Physics, Los Alamos National Laboratory, USA
2. Department of Theoretical Physics, University of New South Wales, Australia

Relativistic Laser Beam Stabilization of Plane Geometry Target Interaction by Nonlinear Forces

For quiver energies of electrons in a laser field close to the relativistic threshold, the interaction front with a target is stabilized based on relativistic properties against Rayleigh-Taylor instabilities

4700-PO-11

Jaehoon Kim¹, Seung Hoon Yoo¹, Geun Ju Kim¹

1. Korea Electrotechnology Research Institute, Korea

Electron Energy Enhancement using Plasma Density Increment in Laser Wakefield Acceleration

The effect of the density increment structure in the laser wakefield acceleration on the electron energy is studied using 2D PIC simulation and experiment with 20 TW laser. Due to the acceleration field structure the electron energy can be enhanced. The experimental results show the electron energy enhancement by using density increment structure.

4700-PO-12

Lai Lin¹, Zhou Jin¹, Zhao Yuxin¹, Shao Yan¹

1. National University of Defence Technology, China

Application Study of ALN Method on the Gasdynamic Laser Nozzle Design

ALN method which can obtain shorter nozzle length and bigger small signal gain than MLN method is applied to nozzle design of gasdynamic lasers and is proved to be the most advanced design method.

Solid-State Laser and Other Lasers, and Laser Materials

4700-PO-13

Heonsu Jeon^{1,2}, Sihan Kim¹, Sunghwan Kim¹

1. Department of Physics and Astronomy & ISRC, Seoul National University, Korea
2. Department of Biophysics and Chemical Biology, Seoul National University, Korea

Room-temperature Continuous-wave Operation of Photonic Crystal Band-edge Laser with Long Lifetime

We report continuous-wave (CW) operation of photonic crystal (PC) lasers with long lifetime over 10 hours, a challenging task for PC lasers to be considered as realistic and viable photonic devices.

4700-PO-14

Ja-Hon Lin¹, Pao-Keng Yang²

1. Department of Electro-Optical Engineering, National Taipei University of Technology, Taiwan
2. Department of Opto-electronic System Engineering, Ming-Hsin University of Science and Technology, Taiwan

Passive Mode Locking of C-cut Nd:LuVO₄ Laser by the SESAM at 1086 nm

By proper design the reflectance band of the SESAM, the passive mode locking has been first time demonstrated in c-cut Nd:LuVO₄ laser with the center wavelength at 1086 nm and the pulsewidth about 144 ps.

4700-PO-15

Junichiro Kojou¹, Yusuke Kikuchi¹, Fumihiko Kannari¹

1. Keio University, Japan

Characteristics of Multi-line Oscillation of Visible Pr³⁺-doped ZBLAN Fiber Lasers Pumped by GaN Diode Lasers

Multi-line oscillation characteristic of Pr³⁺-doped ZBLAN fiber and its tunability are experimentally studied in the visible regions (green (522nm), orange (604nm), red (635nm)). Single line oscillation is also demonstrated with birefringent filters.

4700-PO-16

Daniel J. Thompson¹, Robert E. Scholten¹

1. Centre of Excellence for Coherent X-ray Science, School of Physics, The University of Melbourne, Australia

Narrow linewidth tunable ECDL using wide bandwidth filter

We show how an external cavity diode laser with interference filter for wavelength selection can operate on a single external cavity mode, even when the filter bandwidth is hundreds of times greater than the external cavity mode spacing, and many times greater than the intrinsic laser diode mode spacing.

4700-PO-17

Boxia Yan¹, Yong Bi¹, Dong Dong Wang², Yan Qi¹, Guang Zheng¹, Hua Cheng¹, Tao Fang¹, Bin Wang¹, Yanwei Wang¹

1. Academy of Opto-Electronics, Chinese Academy of Science, China
2. Phoebus Vision Opto-Electronics Technology Ltd, China

Compact and Highly Efficient 3.4W Intracavity Frequency-doubled Green Laser Based on PPMgLN

A compact and highly efficient green-light source has been demonstrated based on periodically poled MgO:LiNbO₃ (PPMgLN). A maximum power of 3.4 W at 532 nm is obtained by a 6.0W LD pumped, the PPMgLN length is only 2mm, and the corresponding optical to optical conversion efficiency is 56%.

4700-PO-18

Gerald M Bonner^{1,2}, Huaijin Zhang³, Jiyang Wang³, Alan J Kemp², Helen M Pask¹

1. MQ Photonics, Macquarie University, Australia
2. Institute of Photonics, University of Strathclyde, UK
3. State Key Laboratory of Crystal Materials, Shandong University, China

Continuous-wave SrMoO₄ Intracavity Raman Laser Pumped Using a Disk Laser

The use of disk lasers to pump continuous-wave (cw) intracavity Raman lasers is discussed with respect to power scaling these devices via improved thermal management. One such laser based on SrMoO₄ and Nd:YVO₄ is reported.

4700-PO-19

Qing Wang¹, Zhiyi Wei¹, Zhiguo Zhang¹, Shenzhou Lu², Qihong Yang²

1. Beijing National Laboratory for Condensed Matter Physics, Institute of Physics, Chinese Academy of Sciences, China
2. School of Materials Science and Engineering, Shanghai University, China

Diode-pumped Continuous-wave Triwavelength Ceramic Nd:Y_{1.8}La_{0.203} Laser

We demonstrated triwavelength operation in a diode pumped ceramic Nd:Y_{1.8}La_{0.203} laser. Output power of 546 mW was achieved under an absorbed pump power of 6.2 W, corresponding to a slope efficiency of 10.9%.

4700-PO-20

O. Kitzler¹, A. Sabella¹, B.F. Johnston¹, A. McKay¹, R.P. Mildren¹

1. MQ Photonics Research Centre, Macquarie University, Sydney, Australia

Design and Characterisation of Optical Quality Single Crystal Diamond for Raman Laser Applications

We report measurements of parameters important to Raman laser design for single crystal synthetic diamond. Raman laser operating space is assessed as functions of the pump wavelength, temporal format and design architecture.

4700-PO-21

Michal Jelínek¹, Ondrej Kitzler¹, Helena Jelinkova¹, Jan Sulc¹, Michal Nemeč¹, Vaclav Kubeček¹

1. Czech Technical University in Prague, Faculty of Nuclear Sciences and Physical Education, Czech Republic

CVD-Diamond External Cavity Raman Laser Operating at 1632 nm

CVD diamond Raman laser with external cavity operating at 1632 nm is demonstrated for the first time. Output energy of 25 uJ in the 6 ns long pulse with the fundamental spatial profile was obtained.

Applied Nonlinear Optics

4700-PO-22

Changsoo Jung¹, Woojin Shin¹, Bong-Ahn Yu¹, Yeung Lak Lee¹, Young-Chul Noh¹

1. Advanced Photonics Research Institute, Gwangju Institute of Science and Technology, Korea

Efficient 355-nm beam generation using a birefringent walk-off compensator

We demonstrate a simple method for compensating walk-off in frequency tripling of 1064-nm beam. A birefringent crystal was used as the compensator and improved the tripling efficiency by 19%.

4700-PO-23

Feng Sujuan¹, Mao Qinghe¹, Chang Jianhua¹, Jiang Jian¹, Liu Wenqing¹

1. Anhui Institute of Optics and Fine Mechanics, China

Mid-IR Difference Frequency Generation Based on Fiber Lasers

We demonstrate a new miniaturized fiber-type CW mid-IR DFG laser source based on the QPM technique, which uses a PPLN as the nonlinear crystal, and an YDFL and an EDFL as the fundamental sources.

4700-PO-24

Kevin Cook², **John Canning**², Roberson A. Oliveira¹, Alexandre A. P. Pohl¹

1. Federal University of Technology, Brazil

2. Interdisciplinary Photonics Laboratories, School of Chemistry, University of Sydney, Australia

The Acousto-Optic Effect Applied to Bragg Grating Writing

The application of the acousto-optic effect to an optical fibre during Bragg grating inscription is demonstrated. Through the excitation of flexural or longitudinal acoustic waves, different permanent effects are achieved in the gratings.

4700-PO-25

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

Multimode Waveguides in Nematic Liquid Crystals

We report on the first experimental observation of higher-order modes guided by soliton-induced waveguides in nematic liquid crystals, identifying the power domains where guided modes are supported.

4700-PO-26

Do-Kyeong Ko^{1,2}, Nan Ei YU¹, Ju Won Choi², Heejong Kang², Jung Hoon Ro³

1. Advanced Photonics Research Institute, GIST Korea

2. Graduate program of Photonics and Applied Physics, GIST, Korea

3. Department of Biomedical Engineering School of Medicine, Pusan Nat'l Univ, Korea

Fabrication of Uniform QPM Device using Negative Multiple Pulse Poling Method

We introduced a novel negative multiple pulse poling (NMP) method for uniform device fabrication of quasi-phase matching using an in-situ visualization system. Diffraction pattern analysis showed the duty ratio of 0.42, and the standard deviation of 0.02 which means the uniform quality of the whole poled area.

4700-PO-27

Li-Chuan Tang¹, Yia-Chung Chang^{1,2}, Jung-Yau Huang², Chen-Shiung Chang²

1. Research Center for Applied Sciences (RCAS), Academia Sinica, China

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

The frequency-dependent nonlinear optical responses of the ternary nitrides via the first-principles calculations

We study the frequency-dependent nonlinear optical properties of the orthorhombic (wurtzite) ternary nitride tetrahedral semiconductors, i.e. ZnGeN₂ and the related ternary nitrides based on the Linear Augmented Slater-Type Orbitals (LASTO) method.

Infrared and THz Technology, and Astrophotonics

4700-PO-28

Anthony Horton¹, Michael Goodwin¹, Brian Baumgartner¹, Tobias Feger¹

1. Australian Astronomical Observatory, Australia

The Effect of Core Geometry on Focal Ratio Degradation in Optical Fibres for Astronomy

Focal ratio degradation (FRD) in multimode optical fibres is an important constraint on the design of fibre fed astronomical instrumentation. We have investigated the on FRD of fibre core geometry, including square and hexagonal cross-sections.

4700-PO-29

Nick Cvetojevic^{1,2,3}, Nemanja Jovanovic^{1,2,3}, Chris Batters⁴, Jon Lawrence^{1,2,3}, Joss Bland-Hawthorn⁴, Mick Withford^{1,2,3}

1. MQ Photonics research centre, Dept. of Physics & Astronomy, Macquarie University, Australia

2. Centre for Astronomy, Astrophysics and Astrophotonics, Dept. of Physics & Astronomy, Macquarie University, Australia

3. Australian Astronomical Observatory, Australia

4. Sydney Institute for Astronomy, School of Physics, University of Sydney, Australia

5. Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), Macquarie University, Australia

Technology for Telescope Integration of the Integrated Photonic Spectrograph Prototype

We provide details on recent the characterization of arrayed-waveguide based Integrated Photonic Spectrograph chips, in particular the demonstration of simultaneous multiple input fibers that greatly increase its observational efficiency, and the three-fold increase in resolving power with slight modification of the chip structure. Further, we outline the setup that will be used in the first on-telescope prototype at the Anglo-Australian Telescope (AAT).

4700-PO-30

Nemanja Jovanovic^{1,2,3}, Sarah Armatys^{1,2}, Simon Gross^{1,4}, Peter Tuthill⁵, Jon Lawrence^{1,2,3}, Michael Withford^{1,4}

1. MQ Photonics research centre, Macquarie University, Australia

2. Centre for Astronomy, Astrophysics and Astrophotonics, Macquarie University, Australia

3. Australian Astronomical Observatory, Australia

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

5. Sydney Institute for Astronomy (SIFA), Australia

Prospects for Integrated Photonics in Space Applications

In this paper we explore the effects of space-like conditions, including temperature, pressure, and exposure to x-rays and gamma rays, on waveguides fabricated in glass by the femtosecond laser direct write technique.

ACOFT Presentation

4700-PO-31

Do-Kyeong Ko^{1,2}, Kyu-Sup Lee¹, S. Takekawa³, K. Kitamura³, Nan Ei Yu²

1. School of Photon Science and Technology, Gwangju Institute of Science and Technology, Korea

2. Advanced Photonics Research Institute, Gwangju Institute of Science and Technology, Korea

3. National Institute for Materials Science, Japan

Simultaneous Generation and Detection of Narrow-band Terahertz Waves with a Quasi-phase Matching Crystal

We present a more-developed method where narrow-band terahertz (THz) waves are simultaneously generated and detected at one quasi-phase matching crystal. For THz detection, we used a photodiode as a THz detector via parametric interaction between THz wave and weak probe beam, compare to the photoconductive antenna or electro-optic sampling methods.

ACOFT Presentation

4700-PO-32

Jung-Sheng Chiang¹, Yun-Hsuan Hsu¹, Nai-Hsiang Sun¹, Shih-Chiang Lin²

1. Department of Electrical Engineering, I-Shou University, Taiwan

2. Department of Communication Engineering, I-Shou University, Taiwan

A Novel Approach for Modal Analysis of Terahertz Photonic Crystal Fibers

Vector boundary element method is proposed to analyse the guided modes of terahertz photonic crystal fibers. The results are evaluated the fundamental mode and high-order mode field distribution for terahertz photonic crystal fiber.

4700-PO-33

Julian Steele¹, Roger Lewis¹

1. University of Wollongong, Australia

Optical Reflectance Studies of GaAs1-xBix

Here we investigate the optical reflectance of GaAs_{1-x}Bi_x of He-Ne laser irradiation and employing a geminated ellipsoidal mirror apparatus to vary the incidence angle. We find that the refractive index determined in this way is lessened by the incorporation of Bi relative to the case of pure GaAs. We conclude this direct optical method may serve as a useful means of estimating Bi incorporation.

Integrated and Guided-Wave Optics and Thin Film Optics

4700-PO-34

Thomas Meany^{1,2}, Qiang Liu^{1,2}, Nemanja Jovanovic^{1,2}, Graham D. Marshall^{1,2}, M. J. Steel^{1,2}, Michael J. Withford^{1,2}

1. Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), Australia
2. MQ Photonics Research Centre, Dept. of Physics and Astronomy, Macquarie University, Australia

Polarization Dependent Coupling in Waveguide Arrays

Photonic devices for quantum logic require tight control over their birefringent properties. In this study we seek to better understand the influence of birefringence in coupled waveguide systems and establish boundary conditions for future quantum photonic systems.

4700-PO-35

Jongki Kim¹, Woosung Ha¹, Junki Kim², Bjorn Paulson¹, Kyunghwan Oh¹

1. Institute of Physics and Applied Physics, Yonsei University, Korea
2. Wellman Center for Photomedicine, Harvard Medical School, USA

Variation of Beam Shape Properties with Multimode Emergence in Optical Fiber

We calculated and observed FZP focusing properties with HPCF. The simulated beam waist was 6.91 μ m when 22 modes were mixed. The predicted value when 100,000 modes were mixed was 35 μ m, which was similar to the value of the observed beam waist, at 45 μ m.

4700-PO-36

Yang-Tung Huang¹, Ming-Shun Hsu¹

1. Institute of Electronics, National Chiao Tung University, Taiwan

Design, Fabrication, and Characterization of Si-Based Dual ARROW Power Splitters

Si-based dual ARROW power splitters with a separation width of 30 μ m and a length of coupling region as 2150 μ m were designed and fabricated. The average imbalances, standard deviations, and propagation losses of the fabricated devices will be discussed.

4700-PO-37

Kyungtaek Min¹, Yun-Kyoung Choi¹, Heonsu Jeon^{1,2}

1. Department of Physics and Astronomy, Seoul National University, Korea
2. Department of Biophysics and Chemical Biology (WCU), Seoul National University, Korea

Enhanced photoluminescence from one-dimensional photonic crystal light-emitting structure

We propose a novel scheme for enhanced photoluminescence. This enhancement is due to photon-recycling near the photonic band-edge. Performance of the proposed structure is examined using transfer-matrix method and plane-wave expansion method.

4700-PO-38

Huai-Yi Xie¹, Shih-Hsin Hsu¹, Yia-Chung Chang¹

1. Research Centre for Applied Sciences, Academia Sinica, Taiwan

Spherical Harmonics-Based Green's Function Approach For Light Scattering From Periodically Or Randomly Distributed Spherical Metallic Nanoparticles On A Substrate

We present high-efficient Green's function method based on expansion in terms of spherical harmonics to investigate the optical properties of periodically or randomly distributed spherical metallic particles on a substrate.

4700-PO-39

Alex Fuerbach¹, Christopher Miese¹, Michael J. Withford¹

1. Centre for Ultra-high bandwidth Devices for Optical Systems, Macquarie University, Australia

Femtosecond Laser Direct-written Waveguides in Bismuth Germanate for Spatial Resolved Radiation Detection

We demonstrate direct laser written low loss waveguides in bismuth germanate for sensing applications in high energy physics. We discuss the suitability of waveguide arrays in this material for spatial resolved radiation detection.

Information Optics, Optical Storage and Displays

4700-PO-40

Junghun Jung¹, Byoung-Sub Song¹, Sang-cheol Yoon¹, Gilbae Park², Byoung-ho Lee², Sung-Wook Min¹

1. Department of Information Display, Kyung Hee University, Korea
2. School of Electrical Engineering, Seoul National University, Korea

Real-time Depth-fused Three-dimensional Display System

Real-time depth-fused three-dimensional display which consists of the projector, the polarization modulator, the selective scattering film and the depth camera is proposed. The proposed system gives the depth using the accommodation cue not the binocular disparity.

4700-PO-41

Bin Wang¹, Minyuan Sun¹, Yong Bi¹, Yan Qi¹, Guang Zheng¹, Tao Fang¹, Yanwei Wang¹, Boxia Yan¹, Hua Cheng¹

1. Academy of Opto-electronics, China Academy of Science, China

Embedded Speckle Measurement Instrument Design and Quantified Speckle Evaluation of A 71 inch Laser TV

An embedded speckle measurement instrument was designed for the quantified evaluation of the 71 inch laser TV. The validity of the result is verified. The effect of the speckle removal unit is characterized.

4700-PO-42

Minyuan Sun¹, Bin Wang¹, Yong Bi¹, Yan Qi¹, Guang Zheng¹, Tao Fang¹, Yanwei Wang¹, Boxia Yan¹, Hua Cheng¹

1. Academy of Opto-electronics, Chinese Academy of Science, China

Application of Auto White Balance Control in Giant Screen Splicing Laser Projection System

The splicing laser projection system is reported which consist of five splicing subsystems. The total projection area covers 100 square meters and the system has total flux output of 75000lm. The fluctuation of luminance is 2% and chromaticity drift is 0.002 with the auto white balance controller we designed.

4700-PO-43

Hee-Jin Choi¹

1. Sejong University, Korea

Analysis on the Required MPRT of Stereoscopic 3D Display

An analysis on the required motion picture performance of stereoscopic 3D image is proposed. The proposed analysis is based on the human visual system and the motion picture response time (MPRT).

4700-PO-44

Shiuan Huei Lin¹, Po-lin Chen², Ken Y. Hsu²

1. Department of Electrophysics, National Chiao Tung University, Taiwan
2. Institute of Electro-Optical Engineering & Department of Photonics, National Chiao Tung University, Taiwan

Polarization Holographic Recording in Bulk Phenanthrenequinone-doped Poly (methyl methacrylate) Photopolymer

In this paper, we present our investigations on polarization holographic recording in 9, 10-phenanthrenequinone-doped poly (methyl methacrylate) photopolymer. We demonstrate that a polarization grating can be recorded in such material using two orthogonal polarization beams. The experimental results show that the diffraction efficiency of the hologram reaches to ~40%, and the dynamic range of material (M#) reaches to 1.82 by using two orthogonal circularly-polarized beams.

4700-PO-44B

Hone-Ene Hwang¹, Hsuan-Ting Chang Chang², Cheng-Ling Lee³, Ming-Chun Chien¹

1. Department of Electronic Engineering, Chung Chou Institute of Technology, Taiwan
2. Photonics and Information Laboratory, Department of Electrical Engineering, Taiwan
3. Department of Electro-Optical Engineering, National United University Taiwan

Multiple-image Encryption Based on Position Multiplexing in Fresnel Transform Domain

A method of position multiplexing based on modified Gerchberg-Saxton algorithm and cascaded phase modulation scheme in Fresnel-transform domain is proposed in multiple-image-encryption framework. Simulation results show that crosstalk between multiplexed images has been significantly reduced.

Optical Communications and Networking

4700-PO-45

Kiyonobu Mozawa¹, Weifan Qiao¹, Ken Kashiwagi¹, Takashi Kurokawa¹

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

Dark Soliton Generation using Optical Pulse Synthesizer

We have successfully generated dark solitons with pi phase shift using an optical pulse synthesizer. The fiber transmission characteristics of the generated dark solitons have been investigated by both a measurement and a simulation.

4700-PO-46

Shunsuke Hohchido¹, Yu Matsunaga¹, Ken Kashiwagi¹, Yosuke Tanaka¹, Takashi Kurokawa¹

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

Heterodyne Detection in DWDM Transmission using Frequency-Comb Light Source

We have demonstrated a heterodyne detection in a DWDM transmission system with an OFC-based multicarrier light source. The error-free 1-Gbps DWDM transmission with 25-GHz spacing has been achieved over 10-km.

4700-PO-47

Adam Mullavey¹, Bram Slagmolen¹, Daniel Shaddock¹, Jong Chow¹, John Miller¹, David McClelland¹

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

Fibre Phase Noise Cancellation for Long Baseline Optical Networks

We demonstrate a technique for the stable transfer of an optical frequency reference over a kilometre scale optical fibre link. The fractional frequency stability achieved is as low as 1.7×10^{-18} /√Hz.

4700-PO-48

Jhe-Min Lin¹, Wen-Jeng Ho¹, Jheng-Jie Liu¹, Yi-Yu Lee¹, Yi-Chia Hsieh¹, Hsuan-Ming Tang¹

1. *Institute of Electro-Optical Engineering, National Taipei University of Technology, Taiwan*

Reducing in Dark Count Rate Using a Dual-APDs Balanced-Capacitance Self-Differencing Scheme for 1550 nm Single Photon Detection Applications

Single-photon performances characterization of InGaAs/InP avalanche photodiodes (APDs) using a dual-APDs balanced-capacitance self-differencing operation was proposed. Small spike-noise and low discrimination-level were simultaneously achieved. Reducing in dark-count rate was also presented in the proposed scheme.

ACOFI Presentation

Laser Metrology and Remote Sensing

4700-PO-49

Silvie Ngo¹, John Miller¹, Adam Mullavey¹, Daniel Shaddock¹, David McClelland¹

1. *Centre for Gravitational Physics, Australia*

Control of Optical Resonators Using Digital Interferometry

We discuss a new table-top experiment to investigate using digital interferometry, which combines heterodyne interferometry with (de)modulation techniques, as a tool for lock acquisition and cavity alignment control for future gravitational wave detectors.

4700-PO-50

Ketsaya Vacharanukul¹, Wiroj Sudatham¹, Anusorn Tonmueanwai¹

1. *National Institute of Metrology, Thailand*

Real-time Air Refractive Index Compensation of Laser Interferometer System for Step Gauge Calibration with CMM Technique

Step gauge interferometry calibrator has been developed using a four-path laser interferometer with the implementation of the real-time air refractive index compensation system. The system achieves the uncertainty of 0.7 mm (k=2) at 1 m.

4700-PO-51

Zhenyu Xu¹, Wenqing Liu¹, Ruifeng Kan¹, Jianguo Liu¹, Yujun Zhang¹, Liang Zhang¹

1. *Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, China*

Line-of-sight Temperature Measurement based on TDLAS Two-line Thermometry using a Single Diode Laser

An optical sensor for line-of-sight temperature measurements based on TDLAS two-line thermometry has been developed; it utilizes a pair of water vapor absorption lines near 1.4 μm. Promising results have been demonstrated on a furnace and on an engine combustor.

4700-PO-52

Christopher Artlett¹, Helen Pask¹

1. *MQPhotonics Research Centre, Macquarie University, Australia*

Optical Remote Sensing of Water Temperature by Raman Spectroscopy Techniques

We investigate Raman-based remote sensing for the measurement of water temperature. Statistical analysis of spectral parameters is used to develop an approach for rapid temperature monitoring. A system designed to complement this technique is described.

4700-PO-53

Monludee Ranusawud^{1,2}, Pichet Limsuwan², Jedsada Wongsaroj¹, Rojana Leecharoen¹

1. *National Institute of Metrology, Thailand*

2. *King Mongkut's University of Technology Thonburi, Thailand*

Modulation Free Beam of Rubidium Stabilized Diode Laser for Short Gauge Block Interferometer

A Rubidium stabilized diode laser has been developed and has been used as standard wavelength to determine length of gauge block. The measurement uncertainty of 54 nm for 100 mm gauge block measurement was achieved.

Laser Processing, Laser Microfabrication, and Industrial Applications

4700-PO-54

David Death¹, Pavel Yaroshchik¹, John Eberhardt¹, Steve Spencer¹, Alastair McEwan¹, Dragoslav Miliinkovic¹, Vic Sharp¹, Adam Williams¹, Alvaro Catanzano¹, Stephen Rainey¹

1. *CSIRO Division of Process Science & Engineering, Australia*

Application of Laser Induced Breakdown Spectroscopy for in Situ Multi-Element Analysis of Mineral Ores

CSIRO has developed a mobile LIBS spectrometer for routine in situ quantitative multi-element analysis of mineral ores. Multivariate data analysis methods are used to facilitate analysis for a number of elements at major, minor and trace concentrations.

4700-PO-55

Chih Wei Luo¹, H. I. Wang¹, L. W. Liao¹, C. S. Yang², T. Kobayashi^{1,3}

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

2. *Graduate Institute of Electro-optical Engineering, Tatung University, Taiwan*

3. *Faculty of Informatics and Engineering, The University of Electro-Communications, Japan*

Preparation of ZnSe Nanoparticles with Femtosecond Laser

We demonstrated that a large amount of hexagonal and spherical-shape ZnSe nanoparticles with an average diameter of 16-22 nm forms on the surface of the wafer by the irradiation of fs laser pulses.

4700-PO-56

Qiang Liu¹, Martin Ams¹, Peter Dekker¹, Benjamin Johnston¹, Michael Withford¹, Michael Steel¹

1. *CUDOS, Department of Physics & Astronomy, Macquarie University, Australia*

Laser Written Waveguides in Magneto-optical Glass

For the first time we explore femtosecond laser writing of waveguides in magneto-optical glasses using athermal writing inscription. Single mode guidance at visible is demonstrated and opportunities for optional isolators will be reported.

4700-PO-57

Charles A. Rohde¹, Hayley Ware¹, Fraser MacMillan¹, Malkhaz Meladze², M. Cather Simpson¹

1. The Photon Factory, University of Auckland, New Zealand
2. Rakon Limited, New Zealand

Selective Gold Film Removal from Multilayer Substrates

Pulsed UV laser ablation is used to remove single 250nm thick gold films from doubly coated, transparent, 130- μm thick, quartz substrates (gold-quartz-gold.) Precise laser machining conditions, allow the bottom gold layer to be left unaffected.

Laser Chemistry, Biophotonics and Applications

4700-PO-58

Seungduk Lee¹, Dalkwon Koh², Areum Jo³, Hae Young Lim³, Choong-Ki Kim², Beop-Min Kim^{1,2}, Youngwook Seo², Minah Suh³

1. Department of Biomicrosystem Engineering, Korea
2. Department of Biomedical Engineering, Korea
3. Department of Life Science, Korea

Hemodynamic Responses to Direct Epidural Stimulation using NIRS (near-infrared spectroscopy) and ORIS (optical recording of intrinsic signal)

In this study, we applied simultaneous ORIS-NIRS approach to measure a cortico-cortical and cortico-thalamic interaction of hemodynamic perfusion. Our result shows that the hemodynamic responses depend on the cortical depth. Also, the outer cortex layer showed faster reaction to hemodynamic perfusion than the deep layer both for long and short term observations.

4700-PO-59

Andy Chen¹, Frederique Vanholsbeeck¹, Dean Tai³, Martin Svrcek⁴, Bruce Small²

1. Physics Department, University of Auckland, New Zealand
2. Department of Physiology, University of Auckland, New Zealand
3. Institute of Bioengineering & Technology, Singapore
4. Department of Biomedical engineering, Brno University of Technology, Czech Republic

Spectrally Resolved Measurement of Cardiac Action Potentials

Spectroscopic measurements of cardiac action potential using a high resolution spectrometer offers more insights into the complex process of spectral modulation associated with membrane potential and mechanical activity. This shows the dependence of the ratiometric behavior of Di-4-Anepps for different excitation wavelengths.

4700-PO-60

Guillaume Maucort^{1,2}, Timo Nieminen¹, Norman Heckenberg¹, Fred Meunier², Halina Rubinsztein-Dunlop¹

1. School of Mathematics and Physics, The University of Queensland, Australia
2. The Queensland Brain Institute, Australia

Biophysical Studies Of The Actin Network Action On Neurosecretory Vesicles During Stimulation Of Exocytosis.

We studied the dynamics of neurosecretory vesicles during stimulation of exocytosis and developed new analysis tools to get deeper analysis and reveal new pathways within the cell.

4700-PO-61

Hyun-Woo Jeong^{1,2}, Jung Suk Kim^{1,2}, Kyu Back Lee^{1,2}, Beop-Min Kim^{1,2}

1. Department of Biomedical Engineering, Korea University, Korea
2. Research Institute of Health Sciences, Korea University, Korea

Wetting Property Estimation of Surface Modified Micro-channels by ODT Technique

In this study, we fabricated micro-fluidic chambers (0.4mm x 0.4mm) with surface modified quartz plates and estimated flow dynamics correlated with different contact angles of chamber walls using optical Doppler tomography technique

4700-PO-62

Yiqing Lu^{1,2}, James A. Piper¹, Yujing Huo², Dayong Jin¹

1. Advanced Cytometry Labs, MQ Biofocus Research Centre, Macquarie University, Australia
2. Department of Electronic Engineering, Tsinghua University, China

Cytometric Investigation of Rare-Events Featuring Time-Gated Detection and High-Speed Stage Scanning

We report a time-gated luminescence cytometric strategy to detect rare-event waterborne pathogens. The prototype system is capable of analysing a 15mm x 15mm slide containing as rare as 13 europium-labeled Giardia cysts within 5 minutes.

4700-PO-63

James Bennett¹, Bastian Baudisch¹, Daryl Preece¹, Timo Nieminen¹, Norman Heckenberg¹, Halina Rubinsztein-Dunlop¹

1. The University of Queensland, School of Mathematics and Physics, Australia

'Wiggler-Waggler'- Optical Measurements of Complex Viscoelastic Moduli

We demonstrate the simultaneous optical measurement of the viscoelastic modulus at many frequencies by active rotational 'Fourier' microrheology. This was achieved by employing a birefringent vaterite microsphere probe in a dual-beam optical tweezers apparatus.

4700-PO-64

Seunghyun Yoon¹, Youngkyu Park², Hee-Dok Choi², Kyuman Cho^{1,2}

1. Interdisciplinary Program of Integrated Biotechnology, Sogang University, Korea
2. Department of Physics, Sogang University, Korea

High Sensitivity Readout Sensor for a Fluidic Channel Using an Exactly Balanced Heterodyne Interferometer

A new, very well balanced heterodyne interferometer scheme which suffers very low common mode drift is described. Potential use of this novel interferometer for readout sensor of a biochemical reaction is discussed. Our preliminary measurement results show that an 8.7x10⁻⁷ refractive index unit can be measured.

4700-PO-65

Timo A. Nieminen¹, Alexander B. Stilgoe¹, Lan T. P. Nguyen¹, Halina Rubinsztein-Dunlop¹

1. The University of Queensland, Australia

Thermodynamics of Optical Tweezers

We discuss the measurement of the gradient and scattering forces based on a thermodynamic treatment of optical tweezers.

4700-PO-66

Myoung-Kyu Oh¹, Joon Heon Kim¹, Young-Ho Park¹, Hoonsoo Kang¹

1. Gwangju Institute of Science and Technology, Korea

Frequency-Shifted Optical Feedback-Cavity Ring-down Spectroscopy

Cavity ring-down spectroscopy employing self-injection seeding lock of diode laser by frequency-shifted optical feedback was introduced. Experiments unveiled the mechanisms locking the laser frequency to the cavity resonance and showed that our scheme is very useful for compact and hyper-sensitive gas analyzers.

Fiber Amplifiers, Lasers, Sensors and Devices

4700-PO-67

Asrul Izam Azmi^{1,3}, Deep Sen¹, John Canning², Gang-Ding Peng¹

1. School of Electrical Engineering, The University of New South Wales, Australia
2. School of Chemistry, University of Sydney, Australia
3. Faculty of Electrical Engineering, University Teknologi, Malaysia

Intensity-Type Vibration Sensor Based on Multiple Subchannels Sensing Scheme

A novel intensity-type vibration sensor using multiple phase-shifted fiber Bragg grating (MPS-FBG) pair is proposed to improve vibration sensitivity of a system interrogated by broadband source. The enhanced vibration sensitivity compared to normal FBG is accomplished by the increased of total intensity change produced by multiple subchannels operation. Significant vibration sensitivity enhancement has been achieved compared to the normal FBG in experiment (e.g. nearly 20 dB using 17 phase shifted FBG), which

agrees with the theoretical expectation. The improved sensitivity of the proposed scheme would be highly desirable for cost effective wavelength multiplexed vibration sensing system based on single broadband source.

ACOFT Presentation

4700-PO-69

Zhiyong Yang¹, Megan Fah¹, Kelly Reynolds², Jonathan Sexton², Pierre Lucas¹

1. Department of Materials Science and Engineering, University of Arizona, USA
2. Mel and Enid Zuckerman College of Public Health, University of Arizona, USA

Detection of Bio-molecules using Conductive Chalcogenide Glass Sensor

Novel telluride glasses with high electrical conductivity, wide mid-infrared transparency and good resistance to crystallization are used to design an opto-electrophoretic sensor for detection and identification of hazardous microorganisms.

4700-PO-70

Kuo-Hsiang Lin¹, Cheng-Ling Lee¹

1. Department of Electro-Optical Engineering, National United University, Taiwan

Analysis of Leaky-Guided Modes in Multimode Fiber Interferometers

We have proposed a multimode fiber interferometer based on leaky-guided modes interference mechanism. The interference fringes of the leaky-guided modes in the device are observed experimentally and analytically investigated in the study.

ACOFT Presentation

4700-PO-71

Changxi Yang¹, Lingjie Kong¹, Xiaosheng Xiao¹

1. State Key Laboratory of Precision Measurement Technology and Instruments, Department of Precision Instruments, Tsinghua University, China

Polarization Dynamics in Dissipative Soliton Fiber Lasers Mode-Locked by Nonlinear Polarization Rotation

Based on coupled Ginzburg-Landau equations and Jones matrixes, we numerically studied the polarization dynamics in dissipative soliton fiber lasers mode-locked by nonlinear polarization rotation. It is found that the components at two polarization axes are of different energies and spectra, which are intrinsic conditions of high-energy pulse generation. Besides, the non-uniform polarization rotation in dissipative soliton fiber lasers can act as a spectral filter, assisting mode-locking.

4700-PO-72

Atsushi Taketomi¹, Yuki Wada¹, Takuya Inoue¹, Junichi Matsuura¹, Yasuhiro Kamba¹, Jun Enokidani², Kazuyoku Tei¹, Shin Sumida², Shigeru Yamaguchi¹

1. Tokai University, Japan
2. Seikoh Giken Co.Ltd., Japan

All fiber high power picosecond laser

A high power picosecond laser was demonstrated in an all fiber MOPA configuration. The maximum power was 12W and the UV output at 355nm was 2.9W with 44MHz repetition rate and 5.6ps duration.

4700-PO-73

Tetsuya Matsuyama¹, Kenji Wada¹, Hiromichi Horinaka¹

1. Osaka Prefecture University, Japan

Simple Method For Reconstructing Amplitude and Phase of Optical Pulse Free From Autocorrelation Measurement

We investigate the feasibility of the simple method for reconstructing an optical pulse free from autocorrelation measurements, which is based on the iterative calculation using only the fundamental and the second harmonic power spectrum.

4700-PO-74

Gino Putrino¹, Adrian Keating², Mariusz Martyniuk¹, Lorenzo Faraone¹, John Dell¹

1. School of Electrical, Electronic, and Computer Engineering, The University of Western Australia, Australia
2. School of Mechanical Engineering, The University of Western Australia, Australia

A Novel Optical Read-out Technology for Large Arrays of Micromachined Cantilever Sensors

A novel, optical approach to the interrogation of MEMS cantilever sensors is discussed. We investigate the effects of placing a diffraction grating in a Si waveguide below a

cantilever arm, to create a resonant cavity.

4700-PO-75

Shao Hao Wang¹, **P. K. A. Wai²**

1. Fuzhou University, China
2. The Hong Kong Polytechnic University, China

Phase Contribution of Raman Assistance to Phase Sensitive Fiber Optical Parametric Amplifiers

We demonstrated that the phase contribution from Raman assistance can increase not only the peak gain and bandwidth of individual gain band of phase-sensitive fiber optical parametric amplifiers, but the number of gain bands.

4700-PO-76

JerShien Chen¹, San-Liang Lee², Hen-Wai Tsao³, Sheng-Xian Wang³

1. Intellectual Property Office, Taiwan
2. Department of Electronic Engineering, National Taiwan University of Science and Technology, Taiwan
3. Graduate Institute of Electronic Engineering, National Taiwan University, Taiwan

Modeling Grating Phase Variation at Facet for Two-Section DFB Lasers Internal Optical Field Patterns

We apply the finite-difference method to the dynamic internal optical field analysis for a two-section distributed feedback laser, get the dynamic internal optical field patterns under high frequency self-pulsation, and compare the cases with/without AR-coating. The relationship among output waveform, dynamic internal optical field patterns, and phase variation is also studied.

4700-PO-77

Tae-Jung Ahn¹, Hoe Seok Jeong¹, José Azaña²

1. Department of Photonic Engineering, Chosun University, Korea
2. Institut National de la Recherche Scientifique, Canada

Optical differentiators based on directional coupler with dissimilar waveguides

We have proposed wavelength-selective directional couplers with dissimilar waveguides designed for ultrafast optical differentiation within the femtosecond regime (corresponding to processing bandwidths > 10 THz) in simulation.

4700-PO-78

Christopher Kalnins¹, Heike Ebendorff-Heidepreim¹, Alastair Dowler¹, Tanya Monro¹

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

Fabrication of fluoride phosphate glass optical fibres for UV applications

Fluoride phosphate glasses have been studied as an alternative glass material to lead silicate for fabricating optical fibres for sensing applications. Fabrication and characterisation results are presented.

4700-PO-80

S.T. Lin³, T.D.Wang¹, H.L. Chang², Chii-Chang Chen¹

1. Department of Optics and Photonics, National Central University, Taiwan
2. Chung-Shan Institute of Science & Technology, Taiwan
3. Department of Photonics, Feng Chia University, Taiwan

High-power Master Oscillation Power Amplifier with Large-mode-area Yb-doped Fiber

In this paper, we report a master-oscillator fiber power amplifier system at 1061 nm by using a 4 m long Yb-doped large mode area (LMA) double-clad fiber as the gain medium. ACOFT Presentation

4700-PO-81

Yoshinobu Maeda¹, Hirokazu Tanimoto¹

1. School of Science and Engineering, Kinki University, Japan

Negative Feedback Optical Amplification Effect in Erbium-doped Fiber Amplifiers

A negative feedback optical amplifier was demonstrated using negative feedback based on cross-gain modulation in an erbium-doped fiber amplifier. The optical amplifier is capable of providing an output signal whose gain and waveforms are stabilized.

4700-PO-81B

Honggu Choi¹, Minkyu Park¹, Woosung Ha¹, Kyunghwan Oh¹

1. Department of Physics, Yonsei University, Korea

Micro Fluidic Channel Actuator by Photon Momentum Transition

We have demonstrated optical force induced by photon momentum transition within optical fiber. By filling Refractive Index Liquid (RIL) in Hollow Optical fiber the radiation pressure at liquid core region manipulates RIL.

IQEC

Quantum Optics

4700-PO-82

Xiaoying Li¹, Liang Cui¹, Ningbo Zhao¹, Kang Gao¹

1. Tianjin University, China

Spectral Properties of Photon Pairs Generated by Spontaneous Four Wave Mixing in Inhomogeneous Photonic Crystal Fibers

The theoretical analysis shows the un-uniform dispersion of photonic crystal fiber with inhomogeneous structure will lead to modulated spectra of photon pairs, and our experimental observations agree with the theoretical predictions.

4700-PO-83

William Soo¹, Andrew Doherty¹

1. University of Sydney, Australia

Switching Phenomena in Bifurcation Amplifiers

4700-PO-84

Yoko Miyamoto¹, Daisuke Kawase², Mitsuo Takeda¹, Keiji Sasaki², Shigeki Takeuchi^{2,3}

1. Department of Engineering Science, The University of Electro-Communications, Japan

2. Research Institute for Electronic Science, Hokkaido University, Japan

3. The Institute of Scientific and Industrial Research, Osaka University, Japan

Verification of Non-classical Correlation in Orbital Angular Momentum of Photons without Excess Components

We propose a method to detect photons in superposition of orbital angular momentum states without excess components using a hologram and path interferometer, and its application to verification of non-classical correlation in photon pairs.

4700-PO-85

Xiaoying Li¹, Xiaoxin Ma¹, Liang Cui¹, Xueshi Guo¹, Lei Yang¹, Nannan Liu¹

1. Tianjin University, China

Temporal Coherence Property of Individual Beam Generated from Spontaneous Four Wave Mixing: Influence of Chromatic Dispersion Induced Chirp

The temporal coherence property of individual beam from spontaneous four wave mixing in optical fibers is experimentally investigated by introducing different amount of chirp into either the pulsed pump or individual signal (idler) beam.

4700-PO-86

Bixuan Fan¹, Thomas Stace¹, Gerard Millburn¹, Göran Johansson², Christopher Wilson²

1. School of Mathematics and Physics, The University of Queensland, Australia

2. Microtechnology and Nanoscience, Chalmers University of Technology, Sweden

A Practical Photon-number-resolving Detector in the Microwave Regime

We present a scheme for microwave photon detection via cross Kerr nonlinearity between two microwave fields mediated by a transmon. We demonstrate that every control photon can induce about 0.02 rad probe phase shift.

ACOFI Presentation

4700-PO-87

Till Weinhold^{1,2,3}, Matthew Broome^{1,2,3}, Andrew White^{1,2,3}

1. Centre for Engineered Quantum Systems, Australia

2. Centre for Quantum Computation and Communication Technology, Australia

3. School of Mathematics and Physics, The University of Queensland, Australia

Creating Narrow-band Single Photons Suitable for Gradient Echo Quantum Memories

Quantum memories based on atomic systems have bandwidth many orders of magnitude narrower than single photons from parametric down-conversion. Tailored made cavity systems are required to shape the photons bandwidth for storage in the memory.

Quantum Science in Atoms, Molecules and Solids

4700-PO-88

Torsten Gaebe¹, Carlo Bradac¹, Jerson Chen², Philip Hemmer², James Rabeau¹

1. Macquarie University, Australia

2. Texas A&M, USA

Size Reduction of Nanodiamonds Hosting NV Centres via Air Oxidation

Annealing nanodiamonds in air can be used as a simple tool to reduce the size of the nanodiamond, which is crucial for some diamond based applications like bio tracking and magnetometry.

Cold Atoms and Molecules

4700-PO-89

Ki-Se Lee¹, Sang Bum Lee², Sang Eon Park², Taeg Yong Kwon², Jaewan Kim¹

1. Department of Physics, Myongji University, Korea

2. Division of Physical Metrology, KRIS, Korea

A Compact Low Noise High Power Phase-Locked Laser System for Atom Interferometry

A compact phase-locked laser system of low noise and high power is built for our mobile atom interferometer. Light from a single laser diode is modulated by an EOM, carrier mode removed by a Fabry-Perot cavity, and amplified by a single TA chip.

4700-PO-90

Danny Baillie¹, Blair Blakie¹, Ashton Bradley¹

1. Jack Dodd Centre for Quantum Technology, Dept. of Physics, University of Otago, New Zealand

Finite Temperature Theory of Cold Gases in Interesting Potentials

We present a range of applications of finite temperature meanfield theory to cold gas systems including optical lattices, toroidal traps and dipolar interactions.

4700-PO-91

J.E. Debs¹, P.A. Altin¹, T.H. Barter¹, D. Öring¹, G.R. Dennis¹, R.P. Anderson², G. McDonald¹, J.D. Close¹, N.P. Robins¹

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

2. School of Physics, Monash University, Australia

Comparing Thermal and Lasing Atomic Sources for Precision Inertial Measurement

We present the first experimental comparison of thermal and lasing atomic sources used in gravimeter. We achieve the highest fringe visibility to date, and show that dephasing will not limit precision at beyond state-of-the-art sensitivity.

4700-PO-92

Stuart Szigeti¹, John Debs¹, Joseph Hope¹, Paul Altin¹, Thomas Barter¹, Nick Robins¹, Daniel Doering¹, John Close¹, Gordon McDonald¹

1. *The Australian National University, Australia*

Why Momentum Width Matters for Atom Interferometry

We theoretically investigate how the momentum width of an atomic source affects the efficiency of Bragg beam-splitters and mirrors. We conclude that narrow momentum width sources are significantly more efficient than larger momentum width sources for higher order Bragg processes.

4700-PO-93

W. T. Hill, III¹ J. Lee¹

1. *Joint Quantum Institute, University of Maryland, College Park, USA*

Arbitrary Dipole Potentials for Ultracold Atoms: Free-Space Atom Chips

A phase-contrast approach to generate arbitrary, low-noise dipole potentials is described. These potentials are dynamic and can be exploited for matter simulators and investigations from novel quantum behaviour in 1-3 dimensions to atomtronics.

Quantum Information and Cryptography

4700-PO-94

Kenji Toyoda¹, Kensuke Uchida¹, Shinsuke Haze¹, Shinji Urabe¹

1. *Osaka University, Japan*

Realization of Robust Single-Qubit Operations with Purely Geometric Phase Factors

Single-qubit operations in a single trapped ion are performed by means of purely geometrical phase factors. Multiple dark states in a tripod system are manipulated adiabatically to perform the gate operations.

4700-PO-95

R.N. Stevenson¹, J.J. Hope¹, A.R.R. Carvalho¹

1. *Department of Quantum Sciences, Research School of Physics and Engineering, The Australian National University, Australia*

Engineering Steady States Using Jump-Based Feedback for Multipartite Entanglement Generation

We investigate using quantum-jump-based feedback to manipulate the stability of multipartite entangled states in an open quantum system. We use quantum trajectory methods to show a general strategy to isolate entangled states.

4700-PO-96

Andrew Ringsmuth^{1,2}, Tom Stace², Gerard Milburn²

1. *Institute for Molecular Bioscience, The University of Queensland, Australia*

2. *Centre for Engineered Quantum Systems, The University of Queensland, Australia*

Insights Into Long-Range, High-Temperature Quantum Coherence in Quantum Dot Networks from Photosynthesis

Through a renormalisation analysis, we suggest the possibility of sustained, long-range, high-temperature quantum coherence in a chromophore or quantum dot exciton transport network, with implications for quantum information systems in condensed matter.

4700-PO-97

M. S. Palsson¹, B.L. Higgins^{1,2}, G.Y. Xiang^{1,3}, G.J. Pryde¹

1. *Centre for Quantum Computation and Communication Technology, Centre for Quantum Dynamics, Griffith University, Australia*

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

3. *Key Laboratory of Quantum Information, University of Science and Technology of China, China*

Violation of Bell's Inequality via Weak Values

We used experimental weak measurement with post-selection to simultaneously gain information about non-commuting measurements on a maximally entangled state, demonstrating CHSH inequality violation of 40 and measuring 'unrealistic' joint probabilities of 1.172 ± 0.008 and -0.171 ± 0.002 . This result is consistent with a description of nature that is local but unreal.

Precision Measurements and Fundamental Tests

4700-PO-98

Evgeny Kovalchuk¹, Klaus Döringshoff¹, Katharina Möhle¹, Moritz Nagel¹, Matthias Reggentin¹, Achim Peters¹

1. *Humboldt-University, Germany*

Towards a New Generation of Ultra-Stable Molecular Optical Frequency Standards

We present different versions of an iodine stabilized Nd:YAG laser with a frequency stability of $5 \cdot 10^{-15}$ between 100 and 1000 s. Current work towards a compact setup and further improvements will be discussed.

4700-PO-99

Achim Peters¹, Moritz Nagel¹, Katharina Möhle¹, Klaus Döringshoff¹, Evgeny V. Kovalchuk¹

Humboldt-Universität zu Berlin, Institut für Physik, Germany

Ultra-Stable Cryogenic Optical Sapphire Resonators for Tests of Fundamental Physics

We present a design for an ultra-stable cryogenically cooled sapphire optical cavity system, with fractional frequency stability better than 10^{-16} at one second integration. We plan to use the ultra-stable cavities to perform a test of the isotropy of light propagation at the 10^{-20} level.

4700-PO-100

D.M. Kane¹, R.J. Chater², D.S. McPhail²

1. *Department of Physics and Astronomy, Macquarie University, Australia*

2. *Department of Materials, Imperial College London, UK*

Imperfections in Micro-optics Characterised Using Focussed Ion Beam Sectioning and Imaging

Focussed ion beam milling, combined with secondary ion and secondary electron imaging, is used to evaluate internal imperfections in glass microspheres. Flaws on the nano-scale and micro-scale are exposed. Glass aging can also be characterised.

ACOFT Presentation

Fundamentals of Nonlinear Optics

4700-PO-101

Ting-Wei Chen¹, Szu-Cheng Cheng², Wen-Feng Hsieh³

1. *Institute of Electro-Optical Science and Engineering, NCKU, Taiwan*

2. *Department of Physics, Chinese Culture University, Taiwan*

3. *Department of Photonics and Institute of Electro-Optical Engineering, NCTU, Taiwan*

Bogoliubov Excitations of Inhomogeneous Polariton Condensates

We obtain steady-state density and velocity profiles of polariton condensate in a trapped non-equilibrium system. Through small excitations, the oscillatory, instability stable, and dynamical instability modes are indicated in diagram of pump spot and strength.

4700-PO-102

Junichi Hamazaki¹, Shigeo Nagano¹, Norihiko Sekine¹, Iwao Hosako¹

1. *National Institute of Information and Communications Technology (NICT), Japan*

Blue and Green Cooperative Luminescence of Highly Yb-doped Optical Fiber

Blue luminescence emitted from ytterbium-doped fiber under infrared excitation was observed, along with well-known green cooperated luminescence. We suggest blue luminescence is due to higher-order cooperated luminescence related three excited ytterbium ions.

4700-PO-103

Li-Shu Lee¹, Tai-Huei Wei²

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

2. *Department of Physics, National Chung Cheng University, Taiwan*

Study of Soret Effect and Convection in an Organic Solution

We verify that solute migration induced by CW laser light is quasistatic and that by 19 ps pulses is nonquasistatic. We explain the difference by light width relative to the local thermal equilibrium time.

Joint IQEC/CLEO Pacific Rim

Nanophotonics

4700-PO-104

Nikita Korolev V.¹, Sergey Starodubtcev S.¹, Peter Meleshenko A.¹, Alexander Klinskikh F.¹

1. Voronezh State University, Russia

On the Theory of Exciton States Polarizability in Open Spherical Quantum Dot

We analyze theoretically the polarizability features in exciton's regime for an open spherical quantum dot. Based on the polarizability features the method of self-consistent calculation of the dielectric constant for nanoparticles array is proposed.

4700-PO-105

Cheng-Wen Huang¹, Chin-Yi Liu², Ren-Jye Shiue³, Wei-Hua Wang³, Juen-Kai Wang^{3, 4}, Hsiang-Chen Chui¹

1. Inst. Eleo-Opt Sci and Eng, National Cheng Kung University, Taiwan
2. Department of Electro-Optical Engineering, National Cheng Kung University, Taiwan
3. Institute of Atomic and Molecular Sciences, Taiwan
4. Center for Condensed Matter Sciences, National Taiwan University, Taiwan

Scrutinizing Graphene with Polarized Raman Spectroscopy

The authors report polarized Raman measurement of single-layer graphene. The G peak position shows polarization dependence, because of the stress on the sample. The relation between the local stress and the polarization will be discussed.

4700-PO-106

Ivan Sinev^{1,2}, Anton Samusev^{1,2}, Kirill Samusev^{1,2}, Natali Grigoryeva³, Aleksandr Mistonov³, Sergei Grigoriev⁴, Dmytro Byelov⁴, Andrei Petoukhov⁵

1. Research University of Information Technologies, Mechanics and Optics, Russia
2. Ioffe Physical Technical Institute, Russia
3. Faculty of Physics, St. Petersburg State University, Russia
4. Petersburg Nuclear Physics Institute, Russia
5. Debye Institute for Nanomaterials Science, The Netherlands

Optical and Microradian X-ray Diffraction from Opal-like Films: Transition from 2D to 3D Regimes

During microradian x-ray diffraction experiments we obtained unprecedented angular resolution, which is crucial to characterize the large scale structures ordered on the large distances (100 lattice periods). The unique approach to the optical diffraction experiments allowed us to distinguish 2D and 3D diffraction regimes. In addition, using immersion spectroscopy method we concluded the possibility of the selective control over the intensity of Bragg diffraction reflexes in low-contrast multi-component photonic crystals.

4700-PO-107

Soan Kim¹, Chul-Sik Kee¹, Bok Hyeon Kim¹, Chung Ghiu Lee²

1. Advanced Photonics Research Institute, Gwangju Institute of Science and Technology Korea
2. Department of Electronics Engineering, Chosun University Korea

The Influence of an Elliptical Center Defect on the Polarization Properties of Elliptical Air Hole Photonic Crystal Fibers

High birefringence induced by an elliptical center defect for elliptical air hole photonic crystal fiber (EPCF) is analyzed numerically using plane wave expansion method. We compared the triangular lattice EPCF (TL-EPCF) and the square lattice EPCF (SL-EPCF) with same size center defect hole. It is shown that high birefringence in the order of 10-2 is achievable by using the elliptical center defect for the SL-EPCF.

4700-PO-108

Amir Djalalian-Assl¹, Xiao Ming Goh¹, Ann Roberts¹, Tim J. Davis²

1. School of Physics, The University of Melbourne, Australia
2. CSIRO Material Science & Engineering, Australia

Optical Nano-antennas

Optical nano-antennas are nano-scaled metallic devices capable of manipulating and controlling visible light at sub-wavelength scales. Here we discuss the development of novel nanometric slot antennas and their complementary nanoparticle antennas.

ACOFT Presentation

4700-PO-109

Dougal Kan¹, Lindsay Botten¹, Chris Poulton¹, Ara Asatryan¹, Kokou Dossou¹

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

Semi-analytical Formulations for the Surface Modes of Photonic Woodpiles

We describe semi-analytical methods for modeling the optical surface modes of finite and semi-infinite photonic woodpiles, and describe the various coupling regimes that arise when the structure is finite. We also consider the surface modes that result when two woodpiles are used to create a Fabry-Pérot cavity.

4700-PO-110

Dae Jung Yu¹, Kihong Kim¹

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

Giant Amplification of Electromagnetic Waves due to Inverse Mode Conversion in a Transition Layer of Metamaterials

We study theoretically the giant amplification effect of electromagnetic waves in a transition layer of metamaterials with gain, which occurs due to inverse mode conversion phenomena.

ACOFT Presentation

4700-PO-111

Henrique Baltar¹, Krystyna Drozdowicz-Tomsia¹, Ewa Goldys¹

1. Department of Physics and Astronomy, Macquarie University, Australia

Tuning Resonant Modes in a Plasmonic Array of Nanocylinders by a Mirror

In order to advance in the development of nanodevices, we simulated silver nanocylinders arrays over mirrors and compared with experimental data. They match and we can tune resonant modes by modifying environmental and geometric properties.

4700-PO-112

Judith Dawes^{1,2}, Matthias Brendle^{1,2}, Michaela Micko^{1,2}, Markus Pasch^{1,2}, Eric Magi^{1,3}

1. ARC Centre of Excellence CUDOS, Australia
2. MQPhotonics Macquarie University, Australia
3. School of Physics, University of Sydney, Australia

Functionalising Opals: Versatile Self-assembled Photonic Crystal Devices

Opals offer a practical way to realize 3D bandgap functional materials. We have fabricated and optically characterized opals incorporating optical fibre tapers. Opals assembled from silver coated microspheres exhibit enhanced the refractive index contrast and bandgap effects.

4700-PO-113

Alexander Minovich¹

1. Nonlinear Physics Centre, Centre for Ultrahigh-bandwidth Devices for Optical Systems (CUDOS), Research School of Physics and Engineering, Australian National University, Australia

Two Methods to Achieve the Tunability of Optical Fishnet Metamaterials

We propose two ways of tuning of the optical properties of a fishnet metamaterial infiltrated by liquid crystal. The first method is to control the hole mode of the structure and the second method is realised via the tuning of surface-plasmon polariton modes. We show that the last allows for more than 300 times refractive index enhancement.

4700-PO-114

Hsiang-Chen Chui¹, Chen-Han Huang^{1,2}, Hsing-Ying Lin^{1,2}, Shih-tse Chen², Chih-Yi Liu³, Yonhua Tzeng², Chien-Hsiang Fan¹

1. Inst of Electro-Optical Science and Engineering, National Cheng Kung University, Taiwan
2. Institute of Microelectronics, National Cheng Kung University, Taiwan
3. Department of Electro-Optical Engineering, National Cheng Kung University, Taiwan

Optical Characteristics of Porous Anodic Aluminium Oxide Films with Varied Pore Sizes with Embedded Silver Nanoparticles

The dielectric porous anodic aluminum oxide films with embedded silver nanoparticles arrays have photo-induced plasmon-coupling and can be applied to photo-absorption sensors. We systematically change the pore diameter and inter-pore spacing to investigate their influence.

4700-PO-115

Takuya Iida^{1,2}

1. Nanoscience and Nanotechnology Research Center, Osaka Prefecture University, Japan
2. PRESTO, Japan Science and Technology Agency, Japan

Theory of structure control of nanocomposites by multiple laser beams and thermal fluctuations

I theoretically investigate the possibility of configuration control of metallic nanocomposites by light-induced force with multiple Gaussian beams. It has been clarified that we can control their structural transition with the help of thermal fluctuations.

4700-PO-116

D.K. Gramotnev^{1,2}, S.J. Tan³, S.I. Bozhevolnyi¹

1. Institute for Technology and Innovation, University of Southern Denmark, Denmark
2. Nanophotonics Pty Ltd, Australia
3. Applied Optics and Nanotechnology Program, Faculty of Science and Technology, Queensland University of Technology, Australia

A New Type of Gap Plasmon Waveguides for Integrated Nano-Optics

Gap plasmon waveguides with dielectric and metal layers and 2D localization are proposed and analyzed for integrated nanophotonics applications. Advantages of these waveguides for the design of highly integrated plasmonic interconnects and components are discussed.

4700-PO-117

Jia-Han Li¹, Shih-Wen Chen¹, Yu-Sheng Wang¹, Yung-Ming Yeh¹

1. National Taiwan University, Taiwan

Effect of Nanoparticle Distribution on Light Transmission through the Silicon Substrate

We study the light transmissions for periodic and non-periodic arrangements of the nanoparticle distributions atop the silicon substrate by finite-difference time-domain method. Our results give the guidelines of the nanoparticle distribution for better light transmission.

Ultrafast Optics and Photonics

4700-PO-118

D.Y. Tang¹, C.W. Xu¹, W.D. Tan¹, J.Zhang¹, R.J. Knize²

1. School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore
2. Department of Physics, United States Air Force Academy, USA

Dark Pulse Emission from a 780nm Diode Laser with External Cavity Feedback

Dark pulse emission from a 780nm diode laser was observed. The laser consists of a simple laser diode module and a planar mirror. The obtained maximum output power for dark pulse operation is 97mW. But the duration and darkness of the pulses, as well as the formation mechanism need to be confirmed.

4700-PO-119

Matthew Petrasianus¹, Andreas Jechow¹, John Canning², Michael Stevenson², Paul Westbrook³, Kenneth Feder³, David Kielpinski¹

1. Centre for Quantum Dynamics, Griffith University, Australia
2. Interdisciplinary Photonics Laboratories (iPL), University of Sydney, Australia
3. OFS Laboratories, USA

A High-power Ultrafast Laser Source with 300 MHz Repetition Rate for Trapped-ion Quantum Logic

We implement a mode-locked UV laser source at 300 MHz repetition rate for use in fast quantum logic gates with trapped ions. The architecture allows scaling of repetition rate into the GHz range.

4700-PO-120

Mitsuru Kuzuwata¹, Toshiaki Yamazaki¹, Hiroshi Ono¹, Tatsutoshi Shioda¹

1. Nagaoka University of Technology, Japan

Spectral Waveform Measurement of 500 GHz pulse by Dual Heterodyne Mixing Method

A novel holographic analyzer to measure phase and amplitude spectra has been proposed named as Dual Heterodyne Mixing Method. As a demonstration, 500 GHz band optical frequency comb was measured successfully.

Ultrafast Laser Science

4700-PO-121

Hiroyoshi Kozai¹, Yuusuke Hirotsawa¹, Hayato Mitagawa¹, Noriaki Turumati¹, Shyun Kosiba¹, Mitsuru Ishikawa², Syunsuke Nakanishi¹, Vasudevan Pillai Biju²

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

Effect of solvents on optical coherence properties of CdSe/ZnS quantum dots in solution detected by femtosecond four-wave mixing

We report novel effect of solvents on optical coherence properties of CdSe/ZnS semiconductor quantum dots (QDs) in solution detected by femtosecond four-wave mixing (FWM) spectroscopy.
ACOFI Presentation

4700-PO-122

Xiaonong Zhu¹, Nan Zhang¹, Zehua Wu¹, Kuanhong Xu¹

1. Institute of Modern Optics, Nankai University; Key Laboratory of Opto-electronic, China

Investigation of Air Plasma Produced by Double Femtosecond Laser Pulses

Physical mechanisms of multiple fluorescence regions and strong scattered light observed in the fluorescence images of the micro air plasma generated by double femtosecond laser pulses are investigated using time-resolved shadowgraphic method.

4700-PO-123

William Wallace^{1,2}, Michael Pullen^{1,2}, Dane Laban^{1,2}, Adam Palmer^{1,2}, Friedrich Hanne³, Klaus Bartschat⁴, Alexei Grum-Grzhimailo^{4,5}, Daniel Weflen⁴, Brant Abeln⁴, Igor Ivanov⁶

1. ARC Centre of Excellence for Coherent X-Ray Science, Griffith University, Australia
2. Australian Attosecond Science Facility and Centre for Quantum Dynamics, GU Australia
3. Atomic and Electronics Physics Group, Westfälische Wilhelms-Universität, Münster, Germany
4. Department of Physics and Astronomy, Drake University, Des Moines, USA
5. Institute of Nuclear Physics, Moscow State University, Russia
6. Research School of Physical Sciences, The Australian National University, Australia
7. ARC Centre of Excellence for Coherent X-Ray Science, University of Melbourne, Australia

Above-threshold Ionization In Atomic Hydrogen Using Intense Few-cycle Laser Pulses

We have performed the first strong-field ionization experiment in atomic hydrogen using few-cycle laser pulses. Quantitative agreement between experimental data and advanced ab initio simulations has been achieved at the 10% level.



IQEC/CLEO PACIFIC RIM 2011

Sydney, Australia

POST DEADLINE SESSIONS

1600-1700 Thursday 1 September 2011

Post Deadline Session 1 – Bayside Auditorium A

Chair: Martijn de Sterke, The University of Sydney, AUSTRALIA

<p>1600-1610</p>	<p>Ping-Fung Ng¹, Mary Ann Go², Bérenger Seelweger³, Hans-A. Bachor¹, Vincent R. Daria¹</p> <p>1. Research School of Physics and Engineering, The Australian National University, Australia 2. The John Curtin School of Medical Research, The Australian National University, Australia 3. École Nationale Supérieure D'Ingénieurs de Caen, Caen, France</p> <p>Non-linear Transfer of Orbital Angular Momentum The orbital angular momentum (OAM) carried by Laguerre-Gaussian beams can be transferred to move particles along its ring-shaped intensity distribution. Here, we show a unique non-linear effect where a fluorescent microbead is moved in the opposite direction as the OAM.</p>
<p>1610-1620</p>	<p>Isabelle Staude¹, Christopher McGuinness^{2,3}, Andreas Frich¹, Robert L. Byer², Eric Colby³, Martin Wegener^{1,4}</p> <p>1. Institut für Angewandte Physik and DFG-Center for Functional Nanostructures (CFN), Karlsruhe Institute of Technology (KIT), Germany 2. Ginzton Labs, Nano Center, USA 3. SLAC National Accelerator Laboratory, USA 4. Institut für Nanotechnologie, Karlsruhe Institute of Technology, Germany</p> <p>Waveguides in Three-Dimensional Photonic Bandgap Materials for Particle-Accelerator on a Chip Architectures Following a theoretical proposal by B. M. Cowan we fabricate and optically characterize pilot samples of three-dimensional photonic crystal waveguides for laser-driven particle acceleration, which offer the potential for future 'particle-accelerator on a chip' architectures.</p>
<p>1620-1630</p>	<p>Ondrej Kitzler¹, Aaron McKay¹, Richard Mildren¹</p> <p>1. MQ Photonics Research Centre, Macquarie University, Australia</p> <p>CW diamond laser architecture for high average power Raman beam conversion We report a cw 1064 nm-pumped external cavity diamond Raman laser operating at the 1240 nm. The slope efficiency was 42% and maximum output power, currently limited by the available pump power, was 7.5 W.</p>
<p>1630-1640</p>	<p>Jindan Shi¹, Shaif-ul Alam¹, Morten Ibsen¹</p> <p>1. Optoelectronics Research Centre, University of Southampton, UK</p> <p>High Power, Low Threshold, Raman DFB Fibre Lasers We demonstrate highly efficient Raman gain based distributed-feedback fibre-lasers at $\sim 1.11\mu\text{m}$ with up to 2W CW output-power with $<0.01\text{nm}$ linewidth. The lasers are 30cm long and UV-written directly into two types of passive germanosilicate fibres.</p>
<p>1640-1650</p>	<p>S. Stark¹, P. Russell¹</p> <p>1. Max Planck Institute for the Science of Light, Germany</p> <p>Extreme Supercontinuum Generation to the Deep-UV Pumping a sharply tapered (5-30 mm taper lengths) solid-core photonic crystal fiber with 130 fs, 2 nJ pulses at 800 nm generates an efficient supercontinuum down to a record-breaking 280 nm in the deep-UV.</p>

Post Deadline Session 2 – Bayside Room 102

Chair: Ben Eggleton, The University of Sydney, AUSTRALIA

<p>1600-1610</p>	<p>Ming Lun Tseng^{1,2}, Cheng Hung Chu^{1,2}, Chia Min Chang^{1,2}, Wei Chih Lin^{1,2}, Nien-Nan Chu³, Masud Mansuripur⁴, Ai Qun Liu⁵, Din Ping Tsai^{1,2,3,6}</p> <p>1. Graduate Institute of Applied Physics, National Taiwan University, Taiwan 2. Department of Physics, National Taiwan University, Taiwan 3. Instrument Technology Research Center, National Applied Research Laboratories, Taiwan 4. College of Optical Sciences, The University of Arizona, USA 5. School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore 6. Research Center for Applied Sciences, Academia Sinica, Taiwan</p> <p>Femto-second laser fabrication of phase change material nanostructures for novel applications In this paper, we will demonstrate our recent results of laser lithography of nanostructures of phase change material for novel nanophotonic application.</p>
<p>1610-1620</p>	<p>N. Jovanovic^{1,2,3}, B. Norris⁴, S. Gross^{1,6}, P. Stewart⁴, N. Charles⁴, M. Ams^{1,6}, J. Lawrence^{1,2,3}, S. Lacour⁵, G. Marshall^{1,6}, G. Robertson⁴, M. Ireland^{1,2,3}, M. Withford^{1,6}, P. G. Tuthill⁴,</p> <p>1. MQ Photonics research centre, Dept. of Physics and Astronomy, Macquarie University, Australia 2. Centre for Astronomy, Astrophysics and Astrophotonics, Dept. Physics and Astronomy, Macquarie University, Australia 3. Australian Astronomical Observatory, Australia 4. Sydney Institute for Astronomy (SIFA), School of Physics, University of Sydney, Australia 5. Observatoire de Paris, 5 place Jules Janssen, Meudon, France 6. Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS), Australia</p> <p>First Stellar Photons Through an Integrated Photonic Pupil Remapping Interferometer Integrated photonics offer numerous advantages for developing high dynamic range stellar interferometers for exoplanetary science. We report on the results from the first successful on-telescope tests of an integrated photonic pupil remapping interferometer.</p>
<p>1620-1630</p>	<p>Jialiang Jin¹, Lei Wang¹, Tingting Yu¹, Yin Wang¹, Jian-Jun He¹</p> <p>1. Centre for Integrated Optoelectronics, State Key Laboratory of Modern Optical Instrumentation, Zhejiang University, China</p> <p>16x100GHz Digitally Wavelength Switchable V-Coupled-Cavity Laser with 40dB SMSR A simple and compact wavelength switchable laser based on V-coupled cavities is presented. Single-electrode-controlled wavelength switching over 16 channels with 100GHz spacing is demonstrated for the first time with side-mode-suppression-ratio as high as 40dB.</p>

<p>1630-1640</p>	<p>Timothy T-Y. Lam¹, Jong H. Chow¹, Daniel A. Shaddock¹, Malcolm B. Gray², David E. McClelland¹</p> <p><i>1. Centre for Gravitational Physics, Department of Quantum science, Research of Physics and Engineering, The Australian National University, Australia</i> <i>2. Length, Time and Optical Standards Section, National Measurement Institute, Australia</i></p> <p>Sub-frequency noise optical fibre strain sensing We present a new interferometric technique for fibre strain sensing, where the system is immune to laser frequency fluctuations. We implement this digital post processing technique experimentally, demonstrating improvements of over 30 dB in resolution.</p>
<p>1640-1650</p>	<p>Scott Foster¹, Alexei Tikhomirov¹, Joanne Harrison¹</p> <p><i>1. Defence Science and Technology Organisation, Australia</i></p> <p>Fundamental limits on low frequency cavity fluctuations in optical fibre lasers We present new experimental measurements of cavity fluctuations in short cavity fibre lasers at frequencies below 100Hz. The measured strain spectral density is less than 1picostrain/Hz^{1/2} in a 0.6cm cavity at 5Hz corresponding to an equivalent length fluctuation of less than 10fm/Hz^{1/2}. We believe these results are the most sensitive measurements of free running cavity fluctuations in optical fibre yet reported.</p>

Post Deadline Session 3 – Bayside Room 103

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

<p>1600- 1610</p>	<p>Haruka Tanji-Suzuki^{1,2,3}, Wenlian Chen¹, Renate Landig¹, Jonathan Simon², Vladan Vuletic¹</p> <p><i>1. MIT-Harvard Center for Ultracold Atoms, Research Laboratory of Electronics, Massachusetts Institute of Technology, USA</i> <i>2. Department of Physics, Harvard University, USA</i> <i>3. NTT Basic Research Laboratories, NTT Corporation, Japan</i></p> <p>Vacuum-Induced Transparency Using a cold atomic ensemble strongly coupled to an optical cavity, we demonstrate cavity-vacuum-induced transparency in a resonant medium, an accompanying group delay of the input pulse, and few-photon optical nonlinearity in the system.</p>
<p>1610-1620</p>	<p>H. M. Wiseman^{1,2}, D. A. Evans^{1,2}, C. Branciard³, E. G. Cavalcanti², A. J. Bennet^{1,2}, D. J. Saunders^{1,2}, G. J. Pryde^{1,2}</p> <p><i>1. Centre for Quantum Computation and Communication Technology (Australian Research Council), Australia</i> <i>2. Centre for Quantum Dynamics, Griffith University, Australia</i> <i>3. School of Mathematics and Physics, University of Queensland, Australia</i></p> <p>Einstein-Podolsky-Rosen Steering with No Detection Loophole over 1 km of Optical Fibre Demonstrations of nonclassical effects over long distances suffer from photon loss, opening the “detection loophole”. Using new, loss-tolerant tests, we perform the first detection-loophole-free demonstration of EPR-steering with entangled photon pairs, over a 1km fibre.</p>
<p>1620-1630</p>	<p>Syed Assad¹, Helen Chrzanowski¹, Thomas Symul¹, Ping Koy Lam¹, Tim Ralph², Mile Gu³, Vlatko Vedral³</p>

	<p>1. Centre for Quantum Computation and Communication Technology, Department of Quantum Science, The Australian National University, Australia 2. Centre for Quantum Computation and Communication Technology, Department of Physics, University of Queensland, Australia. 3. Centre for Quantum Technologies, National University of Singapore, Singapore.</p> <p>A Functional Interpretation of Continuous Variable Quantum Discord We show that quantum discord can quantify the information advantage of a quantum processing over an optimal classical processing. We experimentally extract a lower bound on the quantum discord of a non-entangled continuous-variable quantum system.</p>
1630-1640	<p>Damien Bonneau¹, Mirko Lobino¹, Pisu Jiang¹, Chandra M. Natarajan², Michael G. Tanner², Robert H. Hadfield², Sanders N. Dorenbos³, Val Zwiller³, Mark G. Thompson¹, Jeremy L. O'Brien¹</p> <p>1. Centre for Quantum Photonics, H. H. Wills Physics Laboratory & Department of Electrical and Electronic Engineering, University of Bristol, UK 2. Scottish Universities Physics Alliance and School of Engineering and Physical Science, Heriot-Watt University, Edinburgh, UK 3. Kavli Institute of Nanoscience, The Netherlands</p> <p>Fast Path and Polarisation Manipulation of Telecom Wavelength Single Photons in Lithium Niobate Waveguide Devices We demonstrate fast electro-optic control of photons at 1550nm in lithium niobate waveguide devices. We show heralded single photon state engineering, fast state preparation of two entangled photons and feedback control of quantum interference.</p>
1640-1650	<p>R. E. Scholten¹, D. Murphy¹, A. J. McCulloch¹, S. D. Saliba¹, C. T. Putkunz¹, D. V. Sheludko¹</p> <p>1. ARC Centre of Excellence for Coherent X-ray Science, School of Physics, The University of Melbourne, Australia</p> <p>Arbitrarily shaped high-coherence electron and ion bunches from laser-cooled atoms Cold electron and ion bunches are generated by laser excitation and photoionisation of laser cooled atoms. Arbitrary and real-time control of the electron and ion bunch shapes allows measurement of the source coherence and space-charge interactions.</p>
1650-1700	<p>L. Huet^{1,2}, M. Ammar^{1,3}, E. Morvan⁴, N. Sarazin⁴, J.-P. Pocholle¹, J. Reichel³, C. Guerlin^{1,5}, S. Schwartz¹</p> <p>1. Thales Research and Technology, France 2. Thales Underwater Systems, France 3. Laboratoire Kastler-Brossel, Ecole Normale Supérieure Paris, France 4. Thales III-V Lab, France 5. LNE-SYRTE, Observatoire de Paris, France</p> <p>Magneto-optical Trapping and Detection of Atoms Through a Transparent Atom Chip A magneto-optical trap with 10^8 ⁸⁷Rb atoms was formed near a transparent silicon carbide atom chip, with several beams propagating through the chip. Atomic detection through the chip and trap characterization are also reported.</p>