OSA's Photonics and Fiber Technology Conference

5 - 8 September 2016

SMC Conference & Function Centre

Sydney, Australia

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Welcome to Sydney, Australia! We have allocated three meetings for the Photonics and Fiber Technology Congress to discuss advances in guided wave photonics and fiber optics that are continuing to add new capabilities to our ability to transmit and manipulate data, and to sense various aspects of the world in which we live. In this Congress, a collection of papers will be presented which represent the latest results in the fields of data transfer and optical effects in guided wave optics and materials.

Australian Conference on Optical Fibre Technology (ACOFT) meeting covers new developments and innovation in the fields of optical fibre and waveguide devices. Key topics include mid-infrared photonics, integrated photonics, optical communications and sensing. The meeting will feature a plenary talk by Thomas Koch on the recently launched American Institute for Manufacturing Integrated Photonics (AIM Photonics) and advances in electronic/photonic integration. He will be joined by 16 invited speakers, and 73 oral and poster contributed presentations. The meeting includes a special tribute session to ACOFT co-founder John Love who passed away on the 19^{th} June.

Bragg Gratings, Photosensitivity and Poling in Glass Waveguides (BGPP) meeting will address all aspects of grating structures, photosensitivity, glass relaxation and poling in optical fiber and waveguides from physical and chemical fundamentals, properties and fabrication approaches to applications. BGPP continues to be a popular meeting covering the state-of-the-art advances in fiber and waveguide gratings in a relaxed and non-pressured atmosphere. The program is tailored for informal exchanges , forming new partnerships and reconnecting with colleagues. Attendees come from around the world to participate in this exchange of knowledge. This year, the meeting program will have an emphasis on the applied nature of Bragg grating technology. Our plenary speaker, Alan Kersey will present a review of 30 Years of Fiber Bragg Grating Sensor Technology. To continue with this applied theme, a symposium focusing on efforts to increase the readiness level of Bragg grating technology has been organized which is entitled Fiber Bragg Gratings - From Laboratory to the Real World. The meeting features 14 invited speakers and 61 oral and poster contributed presentations.

Nonlinear Photonics (NP) Meeting will cover all aspects of nonlinear optical phenomena in various systems, novel optical materials and wave-guiding structures. The meeting scope covers both fundamental and applied nonlinear photonics with topics including: temporal, spatial and spatio-temporal nonlinear effects, experimental techniques, nonlinear materials, nonlinear optical systems, novel optical fibers and waveguides, including multimode structures, ultrafast processes, photonic chaos, mode-locking and ultrafast laser sources, solitons and rogue waves, frequency combs, supercontinuum generation, pattern formation and dissipative structures, nonlinearity in nanophotonics, metamaterials, plasmonics, 2D materials, optical communication systems, high field physics, quantum optics and filamentation. Sergey Turitsyn, will present an overview of the Nonlinear World of Commercial Photonic Systems. The meeting will feature 14 invited speakers and 126 oral and poster presentations. A special session is dedicated to the memory of George Stegeman, who was a co-founder and strong supporter of the Nonlinear Photonics conference and its predecessor - Nonlinear Guided Waves meeting.

We thank the committee members and the sponsors for supporting this meeting. We hope you enjoy all the meetings, and take full advantage of the scientific sessions and networking opportunities before you.

Sincerely,

Benjamin J. Eggleton, University of Sydney, Australia, Congress Chair

ACOFT
Michael Withford, Macquarie University, Australia, Chair
Stuart Jackson, Macquarie University, Australia, Program Chair

BGPP
Stephen Mihailov, National Research Council of Canada, Canada, General Chair
John Canning, University of Sydney, Australia, Conference Chair
Morten Ibsen, University of Southampton, UK, Conference Chair
Matthieu Lancry, Universite de Paris Sud, France, Program Chair

NP
Alexander Gaeta, Columbia University, United States, General Chair
Yaroslav Kartashov, ICFO - The Institute of Photonic Sciences, Spain, General Chair
Gian-Luca Oppo, University of Strathclyde, UK, Program Chair
Andrey Sukhorukov, Australian National University, Australia, Program Chair
Stefan Wabnitz, Universita degli Studi di Brescia, Italy, Program Chair

Program Committees

Australian Conference on Optical Fibre Technology (ACOFT)

General Chair
Michael Withford, *Macquarie University, Australia*

Program Chair
Stuart Jackson, Macquarie University, Australia

Program Committee Members
Adrian Carter, *Nufern, Australia*
Simon Gross, *Macquarie University, Australia*
Alexander Hemming, *Defence Science Tech. Group, Australia*
Steven Hinckley, *Edith Cowan University, Australia*
Brendan Kennedy, *The University of Western Australia, Australia*
David Lancaster, *University of South Australia, Australia*
Sergio Leon-Saval, *University of Sydney, Australia*
Stephen Madden, *Australian National University, Australia*
Ampalavanapilla Nirmalathas, *University of Melbourne, Australia*
Frederique Vanholsbeeck, *University of Auckland, New Zealand*

Bragg Gratings, Photosensitivity and Poling in Glass Waveguides (BGPP)

General Chairs
Stephen Mihailov, *National Research Council of Canada, Canada*
John Canning, *University of Sydney, Australia*
Morten Ibsen, *University of Southampton, UK*

Program Chair
Matthieu Lancry, *Universite de Paris Sud, France*

Program Committee Members
Fundamentals of Photosensitivity, Glass Relaxation and Poling

Saulius Juodkazis, *Swinburne University of Tech., Australia, **Subcommittee Chair***
Sylvain Girard, *Université Jean-Monnet, France*
Yasuhiko Shimotsuma, *Kyoto University, Japan*
Christopher Smelser, *Carleton University, Canada*
Marc Dussauze, *Université de Bordeaux, France*
Stavros Pissadakis, *FORTH-IELS, Greece*
Ole Bang, *DTU FOTONIK, Denmark*
Junji Nishii, *Hokkaido University, Japan*
Cyril Hnatovsky, *Australian National University, Australia*
Arnan Mitchell, *RMIT University, Australia*

Properties of Grating Structures, Poled Devices and Techniques used in Their Fabrication

Peter Herman, *University of Toronto, Canada, **Subcommittee Chair***
Kevin Chen, *University of Pittsburgh, USA*
Martin Bernier, *Université Laval, Canada*
Mykhaylo Dubov, *Aston University, UK*
Dan Grobnic, *National Research Council Canada, Canada*
Tristan Kremp, *OFS, USA*
Manfred Rothhardt, *IPHT Jena, Germany*
Aping Zhang, *The Hong Kong Polytechnic University, Hong-Kong*
Dmitrii Stepanov, *Defence Science and Tech. Org., Australia*
Scott Foster, *Defence Science and Tech. Org., Australia*
Stephen Collins, *Victoria University, Australia*

Industrial Standardization and Applications of Gratings, Glass Relaxation and Poled Glass

Gang-Ding Peng, *UNSW, Australia, **Subcommittee Chair***
Cicero Martelli, *Federal Technological University of Parana, Brazil*
Andrea Cusano, *University of Sannio, Italy*
Réal Vallée, *Université Laval, Canada*
Hwa-yaw Tam, *The Hong Kong Polytechnic University, Hong Kong*
Guillaume Laffont, *CEA, France*
Stefan Nolte, *Friedrich-Schiller-University Jena, Germany*
Bai-ou Guan, *Jinan University, China*
Yunjiao Rao, *Univ. of Electronic Science and Tech. of China, China*
Martin Ams, *Macquarie University, Australia*
Kevin Cook, *The University of Sydney, Australia*
John Arkwright, *John Arkwright - Flinders University, Australia*
Laurent Lablonde, *iXBlue, France*

Nonlinear Photonics (NP)

General Chairs
Alexander Gaeta, *Columbia University, USA*
Yaroslav Kartashov, *ICFO -The Institute of Photonic Sciences, Spain*

Program Chairs
Gian-Luca Oppo, *University of Strathclyde, UK*
Andrey Sukhorukov, *Australian National University, Australia*
Stefan Wabnitz, *Universita degli Studi di Brescia, Italy*

Optical Pulses in Nonlinear Waveguides

Fabio Biancalana, *Heriot-Watt University,UK, **Subcommittee Chair***
Milivoj Belic, *Texas A & M University at Qatar, Qatar*
John Dudley, *Universite de Franche-Comte, France*
Boris Malomed, *Tel-Aviv University, Israel*
Curtis Menyuk, *University of Maryland Baltimore County, USA*
Arnaud Mussot, *Univ Lille 1 Laboratoire PhLAM, France*
Dmitry Skryabin, *University of Bath, United Kingdom*
John Travers, *Max-Planck-Inst Physik des Lichts, Germany*
Stefano Trillo, *Universita degli Studi di Ferrara, Italy*
Sergei Turitsyn, *Aston University, United Kingdom*
Aleksei Zheltikov, *M. V. Lomonosov Moscow State Univ., Russia*

Spatial and Temporal Nonlinear Interactions in Classical and Quantum Photonics

Roberto Morandotti, *INRS-Energie Mat & Tele Site Varennes, Canada, **Subcommittee Chair***
Fatkhulla Abdullaev, *International Islamic Univ Malaysia, Malaysia*
Alejandro Aceves, *Southern Methodist University, USA*
Gaetano Assanto, *Universita degli Studi Roma Tre, Italy*
Cornelia Denz, *Westfaelische Wilhelms Univ Munster, Germany*
Miro Erkintalo, *University of Auckland, New Zealand*
Antonio Picozzi, *Centre National Recherche Scientifique, France*
Sergey Polyakov, *National Inst of Standards & Technology, USA*
Kestutis Staliunas, *Universitat Politecnica de Catalunya, Spain*
Alexander Szameit, *Friedrich-Schiller-Universität Jena, Germany*
Frank Wise, *Cornell University, USA*

Program Committees– Continued

Nonlinear Cavities, Active Photonics with Gain and Dissipation, and Light-Matter Interactions

Stephane Barland, *Universite de Nice Sophia Antipolis, France, Subcommittee Chair*
Salvador Balle, *Universitat de les Illes Balears, Spain*
Joachim Brand, *Massey University, New Zealand*
Neil Broderick, *University of Auckland, New Zealand*
Stephane Coen, *University of Auckland, New Zealand*
Massimo Giudici, Universite de Nice Sophia Antipolis, *France*
Philippe Grelu, *CNRS, France*
Bernd Krauskopf, *University of Bristol, UK*
Elena Ostrovskaya, *ANU, Australia*
Ulf Peschel, *Friedrich-Schiller-Universität Jena, Germany*
Ping Kong Wai, *Hong Kong Polytechnic University, Hong Kong*

Nonlinear Nanophotonics, Plasmonics, and Metamaterials

Dragomir Neshev, *Australian National University, Australia, Subcommittee Chair*
Andrea Alu, *University of Texas at Austin, USA*
Costantino De Angelis, *Universita' degli Studi di Brescia, Italy*
Andrea Di Falco, *University of St Andrews, UK*
Andrea Fratalocchi, *King Abdullah Univ of Sci & Technology, Saudi Arabia*
Javier García de Abajo, *The Institute of Photonic Sciences, Spain*
Harald Giessen, *Universität Stuttgart, Germany*
Ortwin Hess, *Imperial College London, UK*
Martti Kauranen, *Tampere University of Technology, Finland*
Boris Lukyanchuk, *Data Storage Institute, Singapore*
Fangwei Ye, *Shanghai Jiao Tong University, China*

All-Optical Nonlinear Devices and Applications

Ady Arie, *Tel-Aviv University, Israel, Subcommittee Chair*
Heike Ebendorff-Heidepriem, *University of Adelaide, Australia*
Guillaume Huyet, *Tyndall National Inst., Ireland*
Colin McKinstrie, *Applied Communication Sciences, USA*
David Moss, *University of Sydney, Australia*
Masaya Notomi, *NTT Basic Research Laboratories, Japan*
Francesca Parmigiani, *University of Southampton, UK*
Anna Peacock, *University of Southampton, UK*
Wang Pu, *School Info Sci & EnginShandong Univ, China*
Chester C.T. Shu, *Chinese University of Hong Kong, Hong Kong*
Dingyuan Tang, *Nanyang Technological University, Singapore*
Chunle Xiong, *University of Sydney, Australia*

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Nail Akhmediev, *Australian National University, Australia*
Yuri S. Kivshar, *Australian National University, Australia*
Barry Luther-Davies, *Australian National University, Australia*
Thomas Pertsch, *Friedrich-Schiller-University Jena, Germany*
Mordechai Segev, *Technion, Israel*
Lluis Torner, *ICFO - The Institute of Photonic Sciences, Spain*

Thank you to all the

Committee Members for contributing many hours to maintain the high technical quality standards of OSA meetings.

General Information

Registration

Entrance Foyer of the SMC Conference & Function Centre. Please note: Registration desk will be closed during scheduled lunch times.

Sunday, 4 September	15:00—18:00
Monday, 5 September	07:30—17:30
Tuesday, 6 September	07:30—17:30
Wednesday, 7 September	08:00—17:30
Thursday, 8 September	08:00—17:30

Online Access to Technical Digest

Full Technical Attendees have both EARLY and FREE continuous online access to the Congress Technical Digest and Postdeadline papers through OSA Publishing's Digital Library. The presented papers can be downloaded individually or by downloading .zip files (.zip files are available for 60 days).

1. Visit the conference website at www.osa.org/PhotonicsandFiberOPC
2. Select the "Access digest papers" link on the right hand navigation.
3. Log in using your email address and password used for registration. You will be directed to the conference page where you will see the .zip file link at the top of this page. [Note: if you are logged in successfully, you will see your name in the upper right-hand corner.]

Access is limited to Full Technical Attendees only. If you need assistance with your login information, please use the "forgot password" utility or "Contact Help" link.

About OSA Publishing's Digital Library

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Poster Presentation PDFs

Authors presenting posters have the option to submit the PDF of their poster, which will be attached to their papers in OSA Publishing's Digital Library. If submitted, poster PDFs will be available about two weeks after the meeting. While accessing the papers in OSA Publishing's Digital Library look for the multimedia symbol shown above.

Special Events

Congress Welcome Reception

Sunday, 4 September 2016; 18:00 - 19:30, Marble Foyer

Join your fellow attendees for light fare and networking. The event is open to committee/presenting author/student and full conference attendees. Conference attendees may purchase extra tickets for their guest(s).

Joint Poster Sessions

Session I: *Monday, 5 September, 18:30– 20:30, Banquet Hall;*
Session II: Tuesday, 6 September, 14:00—16:00, Banquet Hall

Poster presentations offer an effective way to communicate new research findings and provide a venue for lively and detailed discussion between presenters and interested viewers. Don't miss this opportunity to discuss current research one-on-one with the presenters. Please note the below set-up times:

Monday's poster session

Set-up: anytime on Monday

Take down: immediately after session, no later than 20:30

Tuesday's poster session

Set-up: anytime after 23:30 on Monday

Take down: immediately after session, no later than 16:00pm

Posters remaining at the end of the session will be removed and discarded by staff.

A Love of Photonics: Tribute Session for John Love

Tuesday, *6 September 2016, 13:00 - 14:00, Ionic*

A special session has been scheduled to pay tribute to Professor John Love. The session will include short talks from some of John's colleagues celebrating his key contributions to Australian Photonics. The session will be chaired by Ken Baldwin and speakers will include John Arkwright, Francois Ladouceur, Simon Fleming, and Nicolas Riesen. Sandwiches will be provided. RSVP required, please see registration.

Conference Banquet

Tuesday, *6 September 2016, 18:00 - 21:00, Waterfront on the Rocks*

Join your fellow attendees for a festive evening and another opportunity to network with your colleagues. Guest tickets are available for $90 USD, as extra guest tickets are limited, please check registration for availability.

OSAF Meet the Professionals Happy Hour

Wednesday, 7 September, 20:00 – 21:30; Marble Foyer

The Optical Society and OSA Foundation invite students and early career professionals who are OSA Members to attend a happy hour with leaders from the meeting fiber technology field. This is an opportunity to network with industry representatives, meeting chairs/committee members and exhibitors over light fare and drinks. Hosted by OSA Ambassador Chad Husko. Please RSVP online at osa.org/PhotonicsandFiberOPC.

Plenary Speakers

Joint Plenary Session
Monday, 5 September, 8:30-9:15
Grand Lodge Room

30 Years of Fiber Bragg Grating Sensor Technology

Alan D. Kersey; *CiDRA Precision Services, USA*

Alan Kersey has been engaged in sensor technology research and commercialization for more than the past 3 decades. His research work began in 1981 at the University of Kent, which was followed by a 14 year tenure at the Naval Research Laboratory (NRL) in Washington DC. At NRL his focus on advanced fiber optic based sensing concepts, led to some of the seminal research on Bragg grating sensor systems.

In 1997, Alan joined a start-up, CiDRA, as it's founding Chief Technology Officer, to develop fiber Bragg grating sensors for the Oil & Gas industry. He served on CiDRA's board from 2001 to 2003. From 2003 to 2005, he was CEO of CyVera, a spin-out from CiDRA which developed a genetic analysis/assay platform – BeadXpress which was based on Bragg grating technology as an encoding mechanism for particles in a bio-assay system. Prior to the commercial launch of the platform, CyVera was acquired by the leading genetic sequencing company, Illumina. Following this acquisition, Alan was VP & General Manager of Illumina's division based in Cambridge, UK. Most recently, he re-joined CiDRA in an M&A role, to bring new sensor technologies to the suite the company has already developed & successfully deployed in industrial applications.

Currently Alan serves as a Non-Executive Director on the Boards of Industrial Tomography Systems (ITS) in the UK, and ReadyDock in the US. He is a member of the Technical Advisory Boards of Insight Photonics, and Taff Optical. He is also currently engaged in the formation of several new biotech start-ups under a new entity, CyOmics LLC, and a venture capital fund, Cycle Venture Partners.

Alan holds a B.Sc in Physics & Electronics at the University of Warwick, a Ph.D. from the University of Leeds, and is a Fellow of The Optical Society. He has published extensively in journal and conference forums, and holds over 100 patents in optical sensing and instrumentation.

Joint Plenary Session
Tuesday, 6 September, 8:30-9:15
Banquet Hall

Photonic Integration: Building the Ecosystem

Thomas L. Koch; *University of Arizona, USA*

Thomas L. Koch is the dean of the University of Arizona's College of Optical Sciences, a professor of Optical Sciences, and professor of Electrical and Computer Egineering. Previously he held the Smith Endowed Chair of Director, Center for Optical Technologies at Lehigh University.

Prior to his academic roles, he spent many years in research at Bell Laboratories, and held R&D Vice President positions at SDL, Lucent Technologies, and Agere Systems where he was responsible for both research as well as optical and IC technology platform development in support of broad product portfolios.

Tom received his BA in physics in 1977 from Princeton University and his Ph.D. in applied physics in 1982 from Caltech studying under Amnon Yariv. He has published more than 350 papers and presentations, holds 36 patents, and has served in many advisory or board capacities for public and private enterprises.

Tom is a member of the National Academy of Engineering, where he served as Chair of the Electronics, Communication and Information Systems Engineering section. He has also been recognized for his many contributions to semiconductor optoelectronics, photonic integrated circuits, and optical fiber communications, including the IEEE Eric E. Sumner Award, the IEEE LEOS William Streifer Award for Scientific Achievement, the IEEE LEOS Distinguished Lecturer Award, and IEEE Fellow, OSA Fellow, and Bell Laboratories Fellow.

Joint Plenary Session
Wednesday, 7 September, 8:30-9:15
Grand Lodge Room

Nonlinear World of Commercial Photonic Systems

Sergei K. Turitsyn; *Aston University, UK*

Sergei K. Turitsyn graduated from the Department of Physics of the Novosibirsk University, in 1982 and received his Ph.D. degree in Theoretical and Mathematical Physics from the Budker Institute of Nuclear Physics, Novosibirsk, Russia in 1986. In 1992 he moved to Germany, first, as a Humboldt Fellow and then working in the collaborative projects with Deutsche Telekom. Currently, he is a director of the Aston Institute of Photonic Technologies. He was a Principal Investigator in 52 national and international, research and industrial projects. Sergei was the recipient of a Royal Society Wolfson Research Merit Award in 2005. In 2011 he was awarded the European Research Council Advanced Grant. In 2014 he received Lebedev medal by the Rozhdestvensky Optical Society and in 2016 Aston 50th Anniversary Chair medal. He is a Fellow of The Optical Society and the Institute of Physics.

Exhibition

Monday, 5 September —Tuesday, 6 September, Banquet Hall

The Congress exhibit is open to all registered attendees. Visit these companies and find out what they can do for your organization. Coffee breaks and poster session will be held with exhibits during the Congress.

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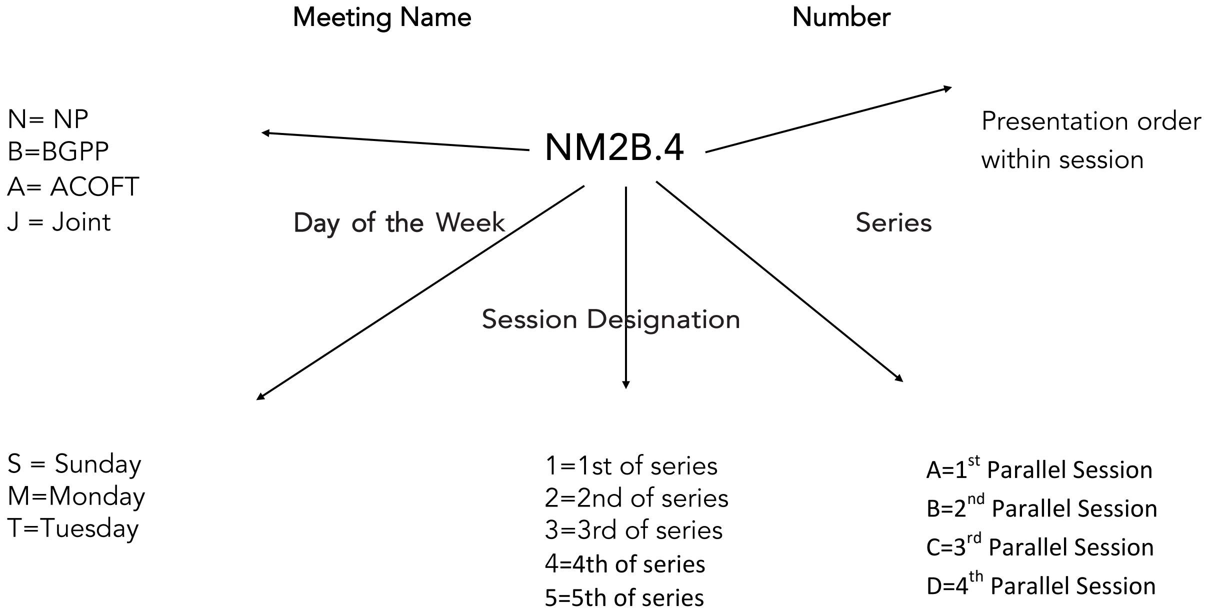
Explanation of Session Codes



The first letter of the code designates the meeting (N=NP, B=BGPP, A=ACOFT, J=Joint). The second element denotes the day of the week (Sunday=S, Monday=M, Tuesday=T, Wednesday=W), Thursday=Th). The third element indicates the session series in that day (for instance, 1 would denote the first sessions in that day). Each day begins with the letter A in the fourth element and continues alphabetically through the parallel session. The lettering then restarts with each new series. The number on the end of the code (separated from the session code with a period) signals the position of the talk within the session (first, second, third, etc.). For example, a presentation coded NM2B.4 indicates that this paper is being presented as part of the NP meeting on Monday (M) in the second series of sessions (2), and is the second parallel session (B) in that series and the fourth paper (4) presented in that session.

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As access is limited to Full Technical Conference Attendees only, you will be asked to validate your credentials by entering the same login email address and password provided during the Conference registration process.

If you need assistance with your login information, please use the "forgot password" utility or "Contact Help" link.

AGENDA OF SESSIONS

Sunday, 4 September	
15:00 - 18:00	Registration, *Entrance Foyer*
18:00-19:30	Welcome Reception, *Marble Foyer*

Monday, 5 September			
	Nonlinear Photonics (NP)	Bragg Gratings, Photosensitivity and Poling in Glass Waveguides (BGPP)	Australian Conference on Optical Fibre Technology (ACOFT)
	Ionic	*Doric*	*Corinthian*
07:30 - 17:30	Registration, *Entrance Foyer*		
08:20 - 08:30	Opening Remarks, *Grand Lodge*		
08:30 - 09:15	JM1A · Plenary: 30 Years of Fiber Bragg Grating Sensor Technology (BGPP), *Grand Lodge*		
09:15 - 10:00	NM2A · Nonlinear Integrated Optics	BM2B · Properties: Gratings I	AM2C · Mid-Infrared Fibre Sources II
10:00 - 10:30	Coffee Break & Exhibits, *Banquet Hall*		
10:30 - 12:30	NM3A · Nonlinear Frequency Conversion	BM3B · Gratings Applications	AM3C · Advances in Guided Wave Physics
12:30 - 14:00	Lunch (on Your Own)		
14:00 - 16:00	NM4A · Nonlinear Nanophotonics I	BM4B · From Laboratory to the Real World I	AM4C · Integrated Photonics and Applications
16:00-16:30	Coffee Break & Exhibits, *Banquet Hall*		
16:00—18:30	NM5A · Cavity Solitons and Micro-resonators	BM5B · From Laboratory to the Real World II	AM5C · Emerging Themes in Integrated Photonics
18:30 - 20:30	JM6A · Joint Poster Session I, *Banquet Hall*		

AGENDA OF SESSIONS

Tuesday, 6 September			
	Nonlinear Photonics (NP)	Bragg Gratings, Photosensitivity and Poling in Glass Waveguides (BGPP)	Australian Conference on Optical Fibre Technology (ACOFT)
	Ionic	*Doric*	*Corinthian*
07:30 - 17:30	Registration, *Entrance Foyer*		
08:30 - 9:15	JT1A · Plenary: Photonic Integration: Building the Ecosystem (ACOFT), *Banquet Hall*		
09:15 - 10:00	NT2A · Topological solitons and Exciton-Polaritons	BT2B · Properties: Gratings II	AT2C · Mid-infrared Fibre Sources III
10:00 - 10:30	Coffee Break & Exhibits, *Banquet Hall*		
10:30 - 12:30	NT3A · Nonlinear Nanophotonics II	BT3B · Fundamentals: Femtosecond Photosensitivity	AT3C · Biosensing and Chemical Sensing
12:30 - 14:00	Lunch (on Your Own)		
13:00-14:00	A Love of Photonics Tribute Session for John Love, *Ionic*		
14:00 - 16:00	JT4A · Joint Poster Session II and Coffee, *Banquet Hall*		
16:00 - 18:00	NT5A · George Stegeman Memorial Session	BT5B · Fundamentals: Poling	AT5C · Optical Sensors I
18:00-21:00	Conference Banquet, *Waterfront on The Rocks*		

AGENDA OF SESSIONS

Wednesday, 7 September			
	Nonlinear Photonics (NP)	Bragg Gratings, Photosensitivity and Poling in Glass Waveguides (BGPP)	InfraAustralian Conference on Optical Fibre Technology (ACOFT)
	Ionic	*Doric*	*Corinthian*
08:00 - 17:30	Registration, *Entrance Foyer*		
8:30—9:15	JW1A · Plenary: Nonlinear World of Commercial Photonic Systems (NP), *Grand Lodge*		
9:15 - 10:00	NW2A · Novel Phenomena	Free time for Networking	AW2B · Mid-Infrared Fibre Sources IV
10:00-10:30	Coffee Break, *Banquet Hall*		
10:30 - 12:30	NW3A · Nonlinear Nanophotonics III	NW3B · Solitons, resonators and rogue waves	AW3C · Optical Sensors II
12:30 - 14:00	Lunch (on Your Own)		
14:00 - 16:00	NW4A · Nonlinear Guided Waves	BW4B · Properties: Femtosecond Writing	AW4C · Novel Fibre Technologies
16:00 - 16:30	Coffee Break, *Banquet Hall*		
16:30-18:00	NW5A · Spatio-temporal Effects I	BW5B · Fundamentals: Radiation Effects	AW5C · Optical Communications and Networks I
18:00-19:30	JW6A · Postdeadline Papers, *Ionic*		
20:00 - 21:30	OSAF Meet the Professionals Happy Hour (Students Only), *Marble Foyer*		

AGENDA OF SESSIONS

Thursday, 8 September			
	Nonlinear Photonics (NP)	Bragg Gratings, Photosensitivity and Poling in Glass Waveguides (BGPP)	InfraAustralian Conference on Optical Fibre Technology (ACOFT)
	Ionic	*Doric*	*Corinthian*
08:00 - 17:30	Registration, *Entrance Foyer*		
8:30- 10:00	NTh1A · Spatio-Temporal Effects II	BTh1B · Properties: UV writing	ATh1C · Optical Communications and Networks II
10:00-10:30	Coffee Break, *Foyer*		
10:30 - 12:30	NTh2A · Nonlinear Quantum Photonics	NTh2B · Nonlinear Signal Processing	AWATh2C · Novel Fibre Technology and Applications
12:30 - 14:00	Lunch (on Your Own)		
14:00 - 16:00	NTh3A · Nanolasers, resonators and photonic circuits	BTh3B · Fundamentals: Photosensitivity	ATh3C · Metamaterials and Micromaterials
16:00 - 16:30	Coffee Break, *Foyer*		
16:30-18:00	NTh4A · Optical Pulse Phenomena	BTh4B · Properties: Sensors and Lasers	ATh4C · Mid-infrared Fibre Sources I

07:30—17:30 • **Registration**, *Ground Foyer*

Grand Lodge

Opening Remarks and Plenary Session

08:20-08:30
Opening Remarks

JM1A .1 • 08:30 Plenary

30 Years of Fiber Bragg Grating Sensor Technology, Alan D. Kersey[1]; [1]*CiDRA Precision Services, USA.* TThe first publication on the sensing potential for side-written Bragg gratings in optical fiber appeared as a patent PCT publication by the Meltz et al. group from UTC in 1986. In the 30 years that have followed, we have seen an extraordinary series of developments in fiber Bragg grating (FBG) sensor technology, taking it from early conceptual laboratory demonstrations to powerful commercial distributed sensing platforms, with many companies now developing and marketing FBG systems and 'interrogator' units. This paper will review this history, highlight some of the key developments in the sensing capabilities developed and touch on some truly novel applications of the technology. The paper will also review more recent applications based on the use of extremely weak draw-tower written grating arrays that exploit the unique properties of Bragg gratings in ways to enable creative & differentiated sensing capabilities.

Ionic	Doric	Corinthian
NP	BGPP	ACOFT

09:15 -- 10:00
NM2A • Nonlinear Integrated Optics
Presider: David Moss; Swinburne Univ. of Technology, Australia

NM2A.1 • 09:15 Invited
Nonlinear Optical Functionalities Of Graphene Integrated In Silicon Photonics, Nathalie Vermeulen[1]; [1]*Brussels Photonics Team / IR-TONA, Vrije Universiteit Brussel, Belgium.* We experimentally investigate the fundamental nonlinear optical properties of graphene integrated into silicon photonics. To optimally exploit these properties, we also develop a novel approach to pattern graphene on top of silicon waveguides.

NM2A.2 • 09:45
Spectroscopy Application of Linearly Polarized 2-10 µm Supercontinuum in a Chalcogenide Rib Waveguide, Yi Yu[1], Xin Gai[1], Pan Ma[1], Khu Vu [1], zhiyong yang[2], Rongping Wang[1], Duk-Yong Choi[1], Stephen Madden[1], Barry Luther-Davies[1]; [1]*Australian National Univ., Australia;* [2]*Jiangsu Normal Univ., China.* Supercontinuum spanning from ≈ 2 to >10 µm is generated in a chalcogenide rib waveguide pumped with 330 fs pulses at 4.184 µm and is used in dual beam spectrophotometry demonstration benefitted from its high birefringence.

09:15 -- 10:00
BM2B • Properties: Gratings I
Presider: Kevin Chen; Univ. of Pittsburgh, USA

BM2B.1 • 09:15 Invited
Structural slow light in Fiber Bragg Gratings and its Applications in Ultra-high-resolution Sensing, Michel J. Digonnet[1]; [1]*Stanford Univ., USA.* We review the principle of structural slow light in strong fiber Bragg gratings and their unique applications, including delay lines with group velocities of only hundreds of km/s and femtostrain sensors that can resolve thermodynamic phase noise.

BM2B.2 • 09:45
Type In microfiber Bragg gratings, Fu-Rong Feng[1], Yang Ran[1], Long Jin[1], Bai-Ou Guan[1]; [1]*Jinan Univ., China.* Type In Bragg gratings are inscribed in microfibers, which exhibit 800°C temperature resistance. The formation efficiency of those abnormal-type gratings can be improved by use of the microfibers with smaller diameters.

09:15 -- 10:00
AM2C • Mid-infrared Fibre Sources II
Presider: Alexander Hemming; Defence Science Technology Group, Australia

AM2C.1 • 09:15 Invited
Recent Development In Mid-Infrared Fluoride Glass Fiber Lasers, Real Vallee[1], Vincent Fortin[1], Martin Bernier[1], Simon Duval[1], Frédéric Maes[1], Frédéric Jobin[1]; [1]*Universite Laval, Canada.* Fiber lasers based on fluoride glass are serious contenders to address the growing challenges of the mid-infrared. We present recent developments of those lasers with respect to their spectral coverage and average and peak power.

AM2C.2 • 09:45
Efficient in-band pumped Dy:ZBLAN mid-infrared fiber laser, Matthew Majewski[1], Stuart D. Jackson[1]; [1]*Macquarie Univ., Australia.* A slope efficiency of 51% at a wavelength of 3.04 µm is achieved by direct excitation of the $^6H_{13/2}$ level of the Dy ion using 2.8 µm emission from an Er:ZBLAN fiber laser. Increase in fiber length results in a maximum emission wavelength of 3.26 µm.

10:00—10:30 • Coffee Break & Exhibits, *Banquet Hall*

NOTES

Ionic	Doric	Corinthian
NP	HILAS	MICS

Ionic — NP

10:30 -- 12:30
NM3A • Nonlinear Frequency Conversion
Presider: Nathalie Vermeulen; Vrije Universiteit Brussel, Belgium

NM3A.1 • 10:30 Invited
Frequency Combs In Quadratically Nonlinear Resonators, Miro J. Erkintalo[1], Tobias Hansson[2,4], Iolanda Ricciardi[3], Stephane Coen[1], Maurizio De Rosa[3], Stefan Wabnitz[4,3], Francois Leo[1]; [1]*Univ. of Auckland, New Zealand;* [2]*Chalmers Univ. of Technology, Sweden;* [3]*Italian National Inst. of Optics, Italy;* [4]*Universita degli Studi di Brescia, Italy.* We describe the physics and modelling of frequency combs and corresponding temporal patterns in coherently driven, quadratically nonlinear resonators.

NM3A.2 • 11:00
Tunable Wavelength Conversion of 40-Gbps Signals Using Cascade of Sum Frequency Mixing and Difference Frequency Mixing in a Periodically Poled Lithium Niobate, Yutaka Fukuchi[1], Kouji Hirata[1]; [1]*Tokyo Univ. of Science, Japan.* We realize tunable wavelength conversion of 40Gbps signals using a periodically poled lithium niobate. The conversion efficiency is –10dB. The device is attractive for channel-by-channel wavelength conversion in 100GHz-spaced 40Gbps DWDM networks.

NM3A.3 • 11:15
Advances in Ductile Mode Dicing of PPLN Devices, Lewis G. Carpenter[1], Samuel Berry[1], Corin B. Gawith[1]; [1]*Univ. of Southampton, UK.* We demonstrate ductile mode dicing in periodically poled lithium niobate (PPLN) with sub-nanometer surface roughness. This represents an order of magnitude improvement in roughness when compared to previously reported PPLN waveguide devices.

NM3A.4 • 11:30
Efficient pulsed Lyman-alpha radiation generation by resonant laser wave mixing in low-pressure Kr-Ar gas, Oleg A. Louchev[1], Norihito Saito[1], Yu Oishi[2], Koji Miyazaki[1], Kotaro Okamura[1], Jumpei Nakamura[2], Masahiko Iwasaki[1], Satoshi Wada[1]; [1]*RIKEN, Japan;* [2]*KEK-IMSS, Japan.* We report experimental demonstration and theoretical analysis revealing the way for high-efficiency generation of pulsed Lyman-alpha radiation by resonant non-linear wave mixing of 212.556 nm and 845.015 radiation pulses in phase-matched Kr-Ar gas.

NM3A.5 • 11:45
Towards compact coherent and broadband all-normal mid-infrared supercontinuum source, Bartlomiej Siwicki[1,2], Mariusz Klimczak[1], Grzegorz Sobon[3], Karol Krzempek[3], Krzysztof Abramski[3], Ryszard Buczynski[1,2]; [1]*Glass Dept., Inst. of Electronic Materials Technology, Poland;* [2]*Faculty of Physics, Univ. of Warsaw, Poland;* [3]*Laser & Fiber Electronics Group, Wroclaw Univ. of Technology, Poland.* We present compact and cost-efficient all-normal supercontinuum source. With use of highly nonlinear all-solid photonic crystal fiber, we obtain broadband supercontinuum with pump power requirement decreased by 88% in relation to OPA pumped systems.

Doric — HILAS

10:30 -- 12:30
BM3B • Gratings Applications
Presider: Tristan Kremp; OFS Fitel LLC, USA

BM3B.1 • 10:30 Invited
Fabrication and application of fiber Bragg gratings in astronomy, Sergio G. Leon-Saval[1]; [1]*Univ. of Sydney, Australia.* Photonic functions, such as FBGs, in multimode systems are an exciting avenue in modern astronomical instrumentation to filter unwanted background light. New technologies and systems have been developed to pursue this aim over recent years

BM3B.2 • 11:00
High Temperature Stable Fiber Bragg Gratings (FBGs) Inscribed Through Polyimide Coating of Optical Fibers Using a Phase Mask, Dan Grobnic[1], Stephen J. Mihailov[1], Rune Lausten[1], Cyril Hnatovsky[1]; [1]*SDT, NRC, Canada.* High temperature stable FBGs are observed after 800°C-annealing of Type I gratings that were written through the polyimide coating of H_2-loaded high Ge-doped silica fibers with a fs-IR laser and a phase mask.

BM3B.3 • 11:15
Ultrafast Laser Inscription of Waveguide Bragg Gratings (WBGs) in Yb:YAG Crystals, Martin Ams[1], Thomas Calmano[2], Benjamin F. Johnston[1], Peter Dekker[1], Christian Kränkel[2], Michael J. Withford[1]; [1]*Macquarie Univ., Australia;* [2]*Institut für Laser-Physik, Universität Hamburg, Germany.* We report, for the first time, the fabrication of waveguide Bragg gratings inside bulk Yb:YAG crystals. Polarized WBGs with > 90% reflectivity are demonstrated. Such WBGs may be used to realize integrated single longitudinal mode waveguide lasers.

BM3B.4 • 11:30
A New Family of Single Frequency Bragg Grating Fiber Lasers, Scott B. Foster[1]; [1]*Defence Science & Tech Organisation, Australia.* We describe a class of single mode Bragg grating fiber lasers intermediate between DFB and DBR cavities. They possess a number of interesting properties that could be exploited to optimise linewidth, stability and thermo-mechanical coupling in sensor applications.

BM3B.5 • 11:45
Tunable L-band Mode-Locked Bi-EDF Fiber Laser Based on Chirped Fiber Bragg Grating, Yaxi Yan[1,2], Jie Wang[1,2], A Ping Zhang[1], Yonghang Shen[2], Hwayaw Tam[1]; [1]*Photonics Research Center, Dept. of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong;* [2]*State Key Lab of Modern Optical Instrumentation, College of Optical Science and Engineering, Zhejiang Univ., China.* A tunable L-Band mode-locked fiber laser based on a short Bismuth-based Erbium-doped fiber is presented. The central wavelength can be tuned between 1599.1 and 1602.5 nm and the mode locking status keeps stable during the tuning process.

Corinthian — MICS

10:30 -- 12:30
AM3C • Advances in Guided Wave Physics
Presider: Stuart Jackson; Macquarie Univ., Australia

AM3C.1 • 10:30 Invited
Towards in-fiber silicon photonics, Anna C. Peacock[1], Noel Healy[1], John Ballato[2], Ursula Gibson[3]; [1]*Univ. of Southampton, UK;* [2]*Center for Optical Materials Science and Engineering Technologies, Clemson Univ., USA;* [3]*Norwegian Univ. of Science and Technology, Norway.* We review the recent advancements in the fabrication and application of silicon optical fibers. Particular focus is placed on novel materials and device designs for use in optical signal processing systems.

AM3C.2 • 11:00
Hollow-Core Optical Fibers Made by Glass Billet Extrusion as Sensors for Raman Spectroscopy, Georgios Tsiminis[1], Erik P. Schartner[1], Mustaf Bekteshi[1], Mark R. Hutchinson[1], Heike Ebendorff-Heidepriem[1]; [1]*Univ. of Adelaide, Australia.* In this work we investigate the performance of hollow core optical fibers made by glass billet extrusion as Raman sensors at different laser excitation wavelengths and we compare their performance against multimode optical fiber sensors.

AM3C.3 • 11:15
Benchtop Production of Polymeric Optical Fibers, Felix Tan[1], Joshua Kaufman[1], Ayman Abouraddy[1]; [1]*CREOL, The College of Optics & Photonics, Univ. of Central Florida, USA.* Novel devices were designed and fabricated for benchtop production of multimaterial fibers by ram extrusion and thermal drawing. The system was experimentally tested by fabricating a large-core polymeric optical fiber from raw materials.

AM3C.4 • 11:30
Linear-cavity Wavenumber-Linear Swept Laser based on AOTF, Nam Su Park[1], Ga-Hee Han[1], Soo Kyung Chun[1], Chang-Seok Kim[1]; [1]*Pusan National Univ., Korea.* The electro-optic swept laser provides high environmental stability and arbitrary drive function sweeping since mechanical tuning of the filter is eliminated in AOTF.

AM3C.5 • 11:45
Sensitivity comparison of LMR based fiber optic refractive index (RI) sensors coated with different materials: Theoretical study, Nidhi Paliwal[1], Joseph John[1]; [1]*Indian Inst. of Technology, Bombay, India.* Sensitivities of LMR based fiber optic RI sensors with various material claddings are compared. Theoretical studies provide appropriate selection of a material for designing an LMR sensor with specific sensitivity in a desired spectral range.

Ionic — NP

10:30 -- 12:30
NM3A • Nonlinear Frequency Conversion-Continued

NM3A.6 • 12:00 Invited
Ferroelectric domain engineering using infrared femtosecond laser and its application to optical frequency conversion, Xin Chen[1], Pawel Karpinski[1,2], Vladlen Shvedov[1], Cyril Hnatovsky[1], Andreas Boes[3], Arnan Mitchell[3], Wieslaw Krolikowski[1,4], Yan Sheng[1]; [1]*The Australian National Univ., Australia;* [2]*Wroclaw Univ. of Technology, Poland;* [3]*RMIT Univ., Australia;* [4]*Texas A&M Univ. at Qatar, Qatar.* All-optical ferroelectric domain inversion is realized by using tightly focused infrared femtosecond pulses. Quasi-phase matching structures are fabricated for efficient second harmonic generations in lithium niobate waveguide.

Doric — BGPP

10:30 -- 12:30
BM3B • Gratings Applications– Continued

BM3B.6 • 12:00
61 nm generation from a tilted fiber grating based all-fiber mode locked Erbium doped laser, Tianxing Wang[1], Chengbo Mou[1], Zhijun Yan[3], kaiming zhou[2], lin zhang[2], Tingyun Wang[1]; [1]*Key Lab of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China;* [2]*Aston Inst. of Photonic Technologies, Aston Universitty, UK;* [3]*State Key Lab of Transient Optics and Photonics, Xi'an Inst. of Optics and Precision Mechanics, CAS, China.* By incorporating a tilted fiber grating in a dispersion managed fiber laser cavity, we have achieved ultrashort pulse generation with a flat spectral width of 61 nm from an all-fiber mode locked Erbium doped laser.

BM3B.7 • 12:15
Tunable-wavelength high-speed pulsed-laser using active mode locking cavity, Sang Min Park[1], Gyeong Hun Kim[1], Chang-Seok Kim[1]; [1]*Pusan National Univ., Korea.* We present a tunable-wavelength nano-second pulsed Erbium-doped fiber (EDF) laser using active mode locking cavity. Its high-repetition rate of several hundred kHz is suitable for fast photo-acoustic imaging.

Corinthian — ACOFT

10:30 -- 12:30
AM3C • Advances in Guided Wave Physics– Continued

AM3C.6 • 12:00
Generation of non-uniformly polarized beams in an optical fiber interferometer, Ivan Popkov[1,2], Maksim Bolshakov[1,3], Anastasia Popkova[1,3], Natalia Kundikova[1,3]; [1]*South Ural State Univ. (National Research Univ.), Russia;* [2]*International Complex Systems Inst. (Australia), Russia;* [3]*Inst. of Electrophysics of the Ural Division of the Russian Academy of Sciences (IEP UD RAS), Russia.* The process of circularly polarized radiation propagation in a few modes optical fiber is described. The method of the generation of non-uniformly polarized beams in an optical fiber interferometer is presented.

12:30—14:00 • Lunch *(on your own)*

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Ionic

NP

14:00 -- 16:00
NM4A • Nonlinear Nanophotonics I
Presider: Dragomir Neshev; Australian National Univ., Australia

NM4A.1 • 14:00 Invited
Plasmonic Metamaterials for Nonlinear Nanophotonics, Anatoly Zayats[1]; *[1]King's College London, UK.* We overview second-harmonic generation and Kerr-type optical nonlinearities in ε-near-zero metamaterials. Metamaterials provide possibility to design nonlinear properties in a desired spectral range beyond nonlinear response of their constituents.

NM4A.2 • 14:30
Collective nonlinear effects in metal oligomers using matched cylindrical vector beams, Godofredo S. Bautista[1], Christoph Dreser[2,3], Xiaorun Zang[1], Jouni Mäkitalo[1], Dieter Kern[2,3], Monika Fleischer[2,3], Martti . Kauranen[1]; *[1]Dept. of Physics, Tampere Univ. of Technology, Finland; [2]Inst. for Applied Physics, Univ. of Tübingen, Germany; [3]Center for Light-Matter-Interaction, Sensors and Analytics LISA+, Univ. of Tübingen, Germany.* We prepare metal oligomers whose structure is matched to the local polarization of focused cylindrical vector beams. Significant collective second-harmonic signals prove the potential of such beams in engineering nonlinear effects on the nanoscale.

NM4A.3 • 14:45
Observation of Spontaneous Symmetry Breaking in Nanostructures, Mohsen Rahmani[1], Maxim Shcherbakov [2], Alexander Shorokhov[2], Andrey Miroshnichenko[1], Ben Hopkins[1], Rocio Camacho Morales[1], Andrey Fedyanin[2], Yuri Kivshar[1], Dragomir N. Neshev[1]; *[1]Nonlinear Physics Centre, Australian National Univ., Australia; [2]Faculty of Physics, Lomonosov Moscow State Univ. , Russia.* We observe the signature of spontaneous symmetry breaking in symmetric Au oligomers with *isotropic* far-field. Oligomers exhibit varied near-fields for various incident-polarizations, leading to symmetry breaking detected via 2nd harmonic generation.

NM4A.4 • 15:00
Generation of Photon-Plasmon Quantum Entanglement in Nonlinear Metamaterials, Alexander Poddubny[2,3], Ivan Iorsh[2], Andrey A. Sukhorukov[1]; *[1]Australian National Univ., Australia; [2]ITMO Univ., Russia; [3]Ioffe Physical-Technical Inst. of the Russian Academy of Science, Russia.* We predict high efficiency of paired photon-plasmon generation through spontaneous nonlinear wave mixing, rigorously accounting for dispersion and losses, and reveal broadband enhancement at the topological transition in hyperbolic metamaterials.

NM4A.5 • 15:15
Quantum Size Effects in the Intrinsic Nonlinearity of Metal Plasmonic Nanoparticles, Rodrigo Sato[1,2], Keiji Oyoshi[2], Masato Ohnuma[3], Yoshihiko Takeda[2,1]; *[1]Univ. of Tsukuba, Japan; [2]NIMS, Japan; [3]Hokkaido Univ., Japan.* We clarified the quantum size effects of the intrinsic nonlinearity in metal plasmonic nanoparticles. Understanding the underlying mechanisms in the nonlinear regime is a crucial step for controlling the light at nanoscale.

Doric

BGPP

14:00 -- 16:00
BM4B • From Lab to the Real World I
Presider: Paula Gouvea; Pontificia Univ Catolica Rio de Janeiro, Brazil

BM4B.1 • 14:00 Invited
Fiber Bragg grating sensors for biomedical applications, Alexis Mendez[1]; *[1]MCH Engineering, LLC, USA.* Fiberoptic sensors are seeing increased acceptance for bio-medical applications—from simple thermomethers to intra-aortic probes. This paper will review the benefits, needs and applications of fiber Bragg grating sensors in the biomedical field.

BM4B.2 • 14:30
Flow sensor based on heated-FBG by multiple pump lasers, Zhengyong Liu[1], Lin Htein[1], Hwa Yaw Tam[1]; *[1]The Hong Kong Polytechnic Univ., Hong Kong.* This paper presents the preliminary results of a novel flow sensor constructed by a FBG and six Cobalt-doped fibers. The grating can be heated up by the Co-doped fiber pumped with lasers.

BM4B.3 • 14:45
Simple Salinity Sensor Based on Cladding-Etched Fibre Bragg Gratings, Medya Namiq[1], Morten Ibsen[1]; *[1]Univ. of Southampton, UK.* We demonstrate water-salinity sensing based on the relative shifts of the higher-order Bragg-resonances in a cladding-etched fibre Bragg grating, and achieve sensitivities of 2.9nm/RIU(LP01) and 3.4nm/RIU(LP11) atλ=1560nm for the two sets of modes.

BM4B.4 • 15:00 Invited
Fibre Bragg Grating Sensors for Smart Railway Monitoring, Hwa Yaw Tam[1]; *[1]The Hong Kong Polytechnic Univ., Hong Kong.* A new approach for structural health and conditions monitoring of trains and railway tracks using fibre Bragg grating sensing networks will be described. Track-borne fibre Bragg grating sensing networks are used to monitor moving trains whereas fibre-Bragg grating sensing systems installed on passenger trains are used to monitor track condition as well as critical train components, including pantograph-catenary interactions. This approach minimizes capital investment to monitor extensive railway networks for safety and maintenance purposes.

Corinthian

ACOFT

14:00 -- 16:00
AM4C • Integrated Photonics and Applications
Presider: Simon Gross; Macquarie Univ., Australia

AM4C.1 • 14:00 Invited
Dirac Physics in a Planar Silicon Photonics Device, Matthew J. Collins[1], Jack Zhang[2], Richard Bojko[3], Lukas Chrostowki[2], Mikael Rechtsman[1]; *[1]Dept. of Physics, The Pennsylvania State Univ., USA; [2]Dept. of Electrical and Computer Engineering, The Univ. of British Columbia , Canada; [3]Dept. of Electrical Engineering, Univ. of Washington, USA.* We employ planar silicon photonic crystal "photonic boron nitride" to observe Dirac physics in guided optical modes, by breaking the inversion symmetry of a honeycomb lattice of air holes to open an observable optical bandgap.

AM4C.2 • 14:30
Highly Efficient Broadband Polarization Control With All-Dielectric Metasurfaces, Sergey S. Kruk[1], Ben Hopkins[1], Ivan Kravchenko[2], Andrey Miroshnichenko[1], Dragomir N. Neshev[1], Yuri Kivshar[1]; *[1]Australian National Univ., Australia; [2]Oak Ridge National Lab, USA.* We experimentally demonstrate broadband transparent all-dielectric Huygens' metasurfaces for polarization manipulation. They feature 99% polarization conversion efficiency, 90% transmission and bandwidth exceeding two (C+L) optical telecom bands.

AM4C.3 • 14:45
Integrated Optical Fiber: A novel optical platform, Christopher Holmes[1], Stephen Lynch[1], Alex Jantzen[1], Lewis G. Carpenter[1], Rex Bannerman[1], Sam A. Berry[1], James C. Gates[1], Peter Smith[1]; *[1]Univ. of Southampton, UK.* Integrated optical fiber is made through adapting a commercial flame hydrolysis deposition technique. Through it optical fiber is planarised upon a mechanically robust format. Direct optical interaction is demonstrated through tapered structuring.

AM4C.4 • 15:00
Tunable 3D waveguide circuits using ultrafast laser waveguide writing and subtractive laser machining, Zachary J. Chaboyer[1], Alex Stokes[1], Michael J. Steel[1], Michael J. Withford[1]; *[1]Macquarie Univ. , Australia.* We report the fabrication of reconfigurable photonic elements in glass using a combination of ultrafast waveguide inscription and subtractive laser machining. The phase response of the waveguide circuits is thoroughly characterised.

AM4C.5 • 15:15
Ultrafast laser waveguide inscription in Gallium Lanthanum Sulfide, Thomas Gretzinger[1,2], Simon Gross[1,2], Martin Ams[1,2], Alexander Arriola[1,2], Michael J. Withford[1,2]; *[1]MQ Photonics Research Centre, Macquarie Univ., Australia; [2]Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), Australia.* We report the fabrication of low-loss single-mode waveguides in the near- and mid-infrared in gallium lanthanum sulfide using femtosecond lasers. Three different techniques were explored: cumulative heating, slit-beam shaping and multiscan.

Ionic	Doric	Corinthian
NP	BGPP	ACOFT

14:00 -- 16:00
NM4A • Nonlinear Nanophotonics I— Continued

NM4A.6 • 15:30
Nonlinear Loss Engineering in a Silicon-Chalcogenide Hybrid Optical Waveguide, Atiyeh Zarifi[1], Alvaro Casas Bedoya[1], Blair Morrison [1], Yanbing Zhang[1], Guanghui Ren[2], Thach Nguyen[2], Stephen Madden[3], Khu Vu [3], Arnan Mitchell[2], Christian Wolff[4], David Marpaung [1], Benjamin J Eggleton [1]; [1]*Univ. of Sydney, Australia;* [2]*RMIT Univ. , Australia;* [3]*Australian National Univ. (ANU), Australia;* [4]*Univ. of Technology Sydney, Australia.* We fabricated a nonlinear loss engineered silicon-chalcogenide hybrid waveguide and experimentally demonstrated TPA reduction. Additionally, we showed a five-fold improvement in the figure of merit compared to standard silicon nanowire.

NM4A.7 • 15:45
How Useful Is Slow Light in Enhancing Nonlinear Interactions in Lossy Periodic Nanostructures?, Sina Saravi[1], Rafael Quintero-Bermudez[1,2], Frank Setzpfandt[1], N. Asger Mortensen[1,3], Thomas Pertsch[1]; [1]*Inst. of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Germany;* [2]*Dept. of Electrical and Computer Engineering, Univ. of Toronto, Canada;* [3]*Dept. of Photonics Engineering, DTU Fotonik, Technical Univ. of Denmark, Denmark.* We investigate analytically, and with nonlinear simulations, the extent of usefulness of slow light for enhancing the efficiency of second harmonic generation in lossy nanostructures, and find that the slower is not always the better.

14:00 -- 16:00
BM4B • From Lab to the Real World I—Continued

BM4B.5 • 15:30
Analysis of 25+ Meter Long Continuous Distributed Sensor Grating Arrays, Tristan Kremp[1], Ken S. Feder[1], Paul S. Westbrook[1]; [1]*OFS Labs, OFS Fitel LLC, USA.* An automated analysis of long arrays of distributed sensor gratings in twisted multicore fiber is presented. As an example, we analyze 7×744 quasi-continuous gratings from a single OFDR measurement written through UV transparent coating.

BM4B.6 • 15:45
Multi-Channel Dynamic Fiber Bragg-Grating Acousto-Ultrasound Condition Monitoring System, Edgar Mendoza[1], JP Prohaska[1], C Kempen[1], Y Esterkin[1], S Sunjian[1]; [1]*Redondo Optics , USA.* This paper describes progress towards the development of an adaptive and dynamic distributed fiber optic acousto-ultrasound sensor (FAULSense™) SHM system suitable for the unattended detection, localization, and classification of structural damage within large composite structures.

14:00 -- 16:00
AM4C • Integrated Photonics and Applications—Continued

AM4C.6 • 15:30
Actively Q-Switched integrated waveguide lasers, Christoph Wieschendorf[1], Josiah Firth[2], Simon Gross[1], François Ladouceur[2], Leonardo Silvestri[2], David Spence[1], Alexander Fuerbach[1]; [1]*Macquarie Univ., Australia;* [2]*Univ. of New South Wales, Australia.* Actively Q-Switched lasers typically require bulky optical components. By incorporating a novel liquid crystal cell into a waveguide laser cavity, an all integrated and monolithic short-pulsed laser can be realized.

AM4C.7 • 15:45
Study of Thermal Effect in Single Layer Graphene based Optical Modulators, Goran Kovacevic[1], Shinji Yamashita[1]; [1]*Research Center for Advanced Science and Technology, Univ. of Tokyo, Japan.* We estimate the thermal effect in single layer graphene and its potential use in thermally activated optical modulators. We show it to be significant in devices based on evanescent field coupling, while in normal-incidence regime it is negligible.

16:00—16:30 • Coffee Break & Exhibits, *Banquet Hall*

NOTES

Ionic	Doric	Corinthian
NP	BGPP	ACOFT

Ionic — NP

16:30 -- 18:30
NM5A • Cavity Solitons and Micro-resonators
Presider: Alejandro Giacomotti, CNRS UPR 20, France

Invited
NM5A.1 • 16:30
Temporal Cavity Solitons in Microresonators, Tobias J. Kippenberg[1]; [1]*Ecole Polytechnique Federale de Lausanne, Switzerland.* A broadband photonic microresonator chip based frequency comb is demonstrated using Soliton induced Cherenkov radiation. The spectral bandwidth is sufficient to achieve external broadening free self referencing.

NM5A.2 • 17:00
Breather Solitons in Microresonators, Mengjie Yu[1,2], Jae K. Jang[2], Yoshitomo Okawachi[2], Austin G. Griffith[1], Kevin Luke[1], Steven A. Miller[1], Xingchen Ji[1], Michal Lipson[2], Alexander L. Gaeta[2]; [1]*Cornell Univ., USA;* [2]*Columbia Univ., USA.* We present the first observations of breather solitons in microresonators. Our results provide key insight into the evolution towards stable soliton formation in microresonator-based frequency combs.

NM5A.3 • 17:15
Controlled Collisions of Dissipative Solitons, Jae Jang[2], Miro J. Erkintalo[2], Kathy Luo[2], Stuart G. Murdoch[2], Stephane Coen[2], Gian-Luca Oppo[1]; [1]*Univ. of Strathclyde, UK;* [2]*Physics, Univ. of Auckland, New Zealand.* Controlled merging and annihilation of dissipative solitons are compared via modelling and experiments in a nonlinear optical fibre resonator. The agreement is remarkable. These collisions fundamentally differ from those of conservative solitons.

NM5A.4 • 17:30
Silicon-Based Dual-Pumped Degenerate Kerr Oscillator, Yoshitomo Okawachi[1], Mengjie Yu[1,2], Kevin Luke[2], Daniel Carvalho[2,3], Alessandro Farsi[1], Sven Ramelow[2,4], Michal Lipson[1], Alexander L. Gaeta[1]; [1]*Columbia Univ., USA;* [2]*Cornell Univ., USA;* [3]*São Paulo State Univ. (UNESP), Brazil;* [4]*Univ. of Vienna, Austria.* We demonstrate frequency-degenerate optical parametric oscillation (OPO) via dual-pump four-wave mixing in a silicon-nitride microresonator. The system offers potential for realization of a network of coupled OPO's for coherent optical computing.

NM5A.5 • 17:45
Origin and stability of dark pulse Kerr frequency combs in normal dispersion microresonators, Pedro Parra-Rivas[3,4], Damia Gomila[4], Edgar Knobloch[5], Lendert Gelens[6,3], Stephane Coen[1,2]; [1]*Physics, The Univ. of Auckland, New Zealand;* [2]*Dodd-Walls Centre, New Zealand;* [3]*Applied Physics Research, Vrije Universiteit Brussel, Belgium;* [4]*IFISC Inst. (CSIC-UIB), Universitat de les Illes Balears, Spain;* [5]*Physics, Univ. of California, USA;* [6]*Cellular and Molecular Medicine, Univ. of Leuven, Belgium.* We theoretically analyze dark pulse Kerr frequency combs in normal dispersion microresonators. A wide range of dark pulses of different widths are found to coexist, and can be described as interlocked switching waves.

Doric — BGPP

16:30 -- 18:30
BM5B • From Lab to the Real World II
Presider: Edgar Mendoza, Redondo Optics, USA

Invited
BM5B.1 • 16:30
Applications of FBGs in Oil & Gas and in Aeronautics, Paula M. Gouvea[1]; [1]*Pontificia Univ Catolica Rio de Janeiro, Brazil.* This presentation will discuss some of the research lines developed in the Optical Fiber Sensors Lab at PUC-Rio related to Fiber Bragg Gratings (FBGs) in the Oil & Gas and in the Aeronautical industries.

BM5B.2 • 17:00
Monitoring of Pressure in Pipelines using Externally-Mounted Fiber Bragg Gratings, Cameron Meiring[1], Gary Allwood[1], Steven Hinckley[1], Graham Wild[2]; [1]*Edith Cowan Univ., Australia;* [2]*School of Engineering, RMIT Univ., Australia.* A non-intrusive helical fiber Bragg grating sensor design is proposed and tested for measuring a gas pipeline's pressure and temperature response. A dual-FBG sensor proved to be an effective burst-detection and temperature sensor.

BM5B.3 • 17:15
Chirped Fiber Bragg gratings for distributed detonation velocity measurements, Sylvain Magne[1], Guillaume Laffont[1], Pierre Ferdinand [1], Yohan Barbarin[2], Alexandre Lefrancois[2], Vincent Chuzeville[2], Jérôme Luc [2], Karol Woirin [3]; [1]*DM2I LCAE, CEA LIST, France;* [2]*CEA DAM, France;* [3]*Herakles SAFRAN-GROUP, France.* Accurate measurement of detonation velocity of high explosives enables to improve the manufacturing conditions and to qualify both vulnerability and aging. Chirped Fiber Bragg Gratings are investigated for *in situ* distributed velocity measurements.

Invited
BM5B.4 • 17:30
Reliability, Durability and Packaging of Fibre Bragg Gratings for use on Defence Platforms, Claire Davis[1]; [1]*DSTO, Australia.* This paper presents work by the Australian Defence Science and Technology group on the reliability, durability and packaging of FBGs together with selected highlights from platform based test programs in the aerospace and maritime domains.

Corinthian — ACOFT

16:30 -- 18:30
AM5C • Emerging Themes in Integrated Photonics
Presider: Sergio Leon-Saval; Univ. of Sydney, Australia

Invited
AM5C.1 • 16:30
Monolithic Multicore Fibre Mode-Multiplexer, Simon Gross[1], Nicolas N. Riesen[2], John D. Love[3], Yusuke Sasaki[4], Michael J. Withford[1]; [1]*MQ Photonics Research Centre, Dept. of Physics and Astronomy, Macquarie Univ., Australia;* [2]*Inst. for Photonics and Advanced Sensing (IPAS) and School of Physical Sciences, The Univ. of Adelaide, Australia;* [3]*Research School of Physics and Engineering (RSPE), The Australian National Univ., Australia;* [4]*Advanced Technology Lab, Fujikura Ltd., Japan.* We report the first monolithic mode-selective multicore fibre multiplexer for future ultrahigh bandwidth optical communication networks. The two-mode, four-core fibre multiplexer exhibits low insertion loss and excellent mode-purity.

AM5C.2 • 17:00
Rapid Prototyping of Arrayed Waveguide Gratings, Glen Douglass[1], Felix Dreisow[2], Simon Gross[1], Stefan Nolte[2], Michael J. Withford[1]; [1]*Macquarie Univ., Australia;* [2]*Fredrich-Schiller, Germany.* We demonstrate the first ultrafast laser inscribed arrayed waveguide grating (AWG). Prototypes have been developed with a central wavelength of 633nm with a free spectral range of 22.4nm, 1.35nm resolution and 11.47% throughput across 4 orders.

AM5C.3 • 17:15
Dynamic optical tuning of an on-chip RF photonic delay line, Yang Liu[1], Amol Choudhary[1], David Marpaung [1], Benjamin Eggleton[1]; [1]*Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), The Univ. of Sydney, Australia.* Dynamic optical tuning of a Si3N4 ring resonator RF photonic delay line is experimentally demonstrated. Tunable delay and advancement of microwave pulses were achieved solely by controlling the power of an additional out-of-phase optical signal.

AM5C.4 • 17:30
Removing Image Artefacts in Magnifying Hyperlenses, Md. Samiul Habib[1], Shaghik Atakaramians[1], Simon Fleming[1], Alexander Argyros[1], Boris Kuhlmey[1]; [1]*School of Physics, Univ. of Sydney, Bangladesh.* We propose a novel wire media (WM) based magnifying hyperlens that provides two-fold image magnification at the output, and introduce a unique recipe to remove imaging artefacts so that ultra-broad band imaging is achieved.

AM5C.5 • 17:45
Electrically-Controlled Periodic Segmented Waveguide With a Nematic Liquid Crystal Core, Mukesh Sharma[1], Mangalpady Rajaram Shenoy[1], Aloka Sinha[1]; [1]*Indian Inst. of Technology Delhi, India.* We report the first fabrication of electrically-controlled periodic segmented waveguides, of duty cycles 0.33 and 0.5, with a nematic liquid crystal core region, surrounded by AZ15nXT (negative photoresist) cladding, on ITO-coated glass substrates.

Ionic	Doric	Corinthian
NP	BGPP	ACOFT

16:30 -- 18:30
NM5A • Cavity Solitons and Micro-resonators—Continued

NM5A.6 • 18:00
Cherenkov-radiation-induced binding of temporal cavity solitons observed in a passive fiber ring resonator, Yadong Wang[1,2], Francois Leo[1,2], Julien Fatome[3], Miro J. Erkintalo[1,2], Stuart G. Murdoch[1,2], Stephane Coen[1,2]; [1]*Physics, The Univ. of Auckland, New Zealand;* [2]*Dodd-Walls Centre, New Zealand;* [3]*Universite de Bourgogne, France.* We resolve in real-time the dynamics of bound states of temporal cavity solitons in a low-dispersion passive driven nonlinear resonator. The solitons are found to be bound by Cherenkov-like dispersive waves.

NM5A.7 • 18:15
Frequency combs in nonlinear SNAP fiber resonators, Sergey V. Suchkov[1], Mikhail Sumetsky[2], Andrey A. Sukhorukov[1]; [1]*Australian National Univ., Australia;* [2]*Aston Inst. of Photonics Technology, Aston Univ., UK.* We suggest Surface Nanoscale Axial Photonic fiber resonators for frequency comb generation. We show that by appropriate variation of the fiber radius we can obtain a tiny spacing frequency comb.

16:30 -- 18:30
BM5B • From Lab to the Real World II— Continued

BM5B.5 • 18:00
Low Power, Light Weight, Small Size, Multi-Channel Optical Fiber Interrogation System (MOFIS™) for Structural Health Management of Rotor Blades, Edgar Mendoza[1], JP Prohaska[1], C Kempen[1], Y Esterkin[1], S Sunjian[1]; [1]*Redondo Optics, USA.* This paper describes progress towards the development and demonstration of a miniature, light weigh, and power efficient, multi-channel fiber Bragg grating sensor interrogation (MOFIS™) system suitable for the in-situ structural health monitoring of helicopter rotor blades.

BM5B.6 • 18:15
A Multicore Fiber Sensor for Monitoring Twists of Wind Turbine Parts, Martin Kristensen[1], Lars Nielsen[1], Lars Glavind[2]; [1]*Aarhus Universitet, Denmark;* [2]*Vestas Wind Systems, Denmark.* We investigate twist measurements on wind turbine blades by multicore fiber optics and demonstrate sensors specifically designed for wind turbine blades in terms of selectivity, sensitivity and possibilities for mounting in an extreme environment.

16:30 -- 18:30
AM5C • Emerging Themes in Integrated Photonics—Continued

AM5C.6 • 18:00
Negative to positive refractive index change in borosilicate BK7 glass through MHz femtosecond laser writing, Wen Qi Zhang[1], George Y. Chen[1], David G. Lancaster[1], Tanya Monro[1]; [1]*School of Engineering, Univ. of South Australia, Laser Physics and Photonic Devices Labs, Australia.* Transition of refractive index changes from negative to positive regime was observed for a range of different pulse energies and writing speeds. Optimal conditions for writing microstructured waveguides with suppressed index claddings were determined.

AM5C.7 • 18:15
Upconversion Nanocrystals Doped Glass: A New Paradigm for Integrated Optical Glass, Tim Zhao[1], Xianlin Zheng[3], Erik P. Schartner[1], Paul Ionescu[4], Run Zhang[3], Tich-Lam Nguyen[4], Dayong Jin[2], Heike Ebendorff-Heidepriem[1]; [1]*Univ. of Adelaide, USA;* [2]*Univ. of Technology Sydney, Australia;* [3]*Macquarie Univ., Australia;* [4]*Univ. of Melbourne, Australia.* A new versatile method of integrating upconversion nanocrystals in glass is presented which opens up exciting possibilities for new hybrid glass materials and multifunctional fiber devices with tailored nanoscale properties and high transparency.

18:30 -- 20:30

JM6A • Joint Poster Session I, *Banquet Hall*

JM6A.1 • MoS_2-Mode-Locked Fiber Laser Delivering Ultrashort Pulses with Three Types of Sidebands, Feifei Lu[1], Xueming Liu[1], Huiran Yang[1]; [1]*Xi'an Inst of Optics and Precision Mech, China.* We demonstrate an erbium-doped fiber laser passively mode-locked by a monolayer MoS_2 which is covered onto a fiber taper. Three types of sidebands, e.g. peak, peak-dip and dip spectral sidebands, are observed in the experiment.

JM6A.2 • Ultra-broadband and compact polarization splitter for sensing applications, Abdul Khaleque[1], Marcos A. R. Franco[2], Haroldo Hattori[1]; [1]*SEIT, UNSW Canberra, Australia;* [2]*Instituto de Estudos Avançados, Brazil.* A polarization splitter based on a gold filled photonic crystal fiber (PCF) is reported in this article: it can work from 1420 nm to 1980 nm with 254.6 µm length, covering communications and sensing applications.

JM6A.3 • A New Compact Design of 1310nm Discrete Raman Amplifier with Combined Raman Cavity, Kwong Shing Tsang[1], Mary Fung[1], Jack Cheung[1], Yanny Tsang[1], Victor Ho[1], Kevin L.F. Kevin[1], ray man[1]; [1]*Amonics Ltd, Hong Kong.* A new approach to construct a discrete 1310nm Raman amplifier is reported. The amplifier combines a multi-Stokes Raman fiber laser and a 1310nm Raman gain amplifier in the same cavity. A compact and higher efficiency design can be achieved.

JM6A.4 • Dual-Core Polymer Optical Fibre Refractive Index Sensor, Sreenesh Shashidharan[1]; [1]*Macquarie Univ., Australia.* We describe a novel dual-core polymer optical fiber (POF) made of PMMA-PC with an axial air-hole for fluid sensing. Numerical calculations show a sensitivity up to 229,200 %/RIU in the wavelength of 900nm.

JM6A.5 • Three-dimensional visualizing of ferroelectric domain growth and switching using čerenkov second-harmonic generation, Mousa Ayoub[1], Hannes Futterlieb[1], Joerg Imbrock[1], Cornelia Denz[1]; [1]*Inst. of Applied Physics, Germany.* We demonstrate for the first time to our knowledge a 3D monitoring of the evolution of the spontaneous polarization during electrical poling and temperature annealing in random strontium barium niobate using čerenkov-type second-harmonic generation.

JM6A.6 • Near-stoichiometric $LiTaO_3$ Optical Waveguides, Edwin Y. Pun[1], Delong Zhang[2], X.F. Yang[2]; [1]*City Univ. of Hong Kong, Hong Kong;* [2]*Tianjin Univ., China.* Near-stoichiometric titanium indiffused $LiTaO_3$ strip waveguides have been fabricated and characterized. The waveguides are polarization-insensitive, and the propagation losses are ~ 0.2 dB/cm and 0.3 dB/cm for TE and TM modes, respectively.

JM6A.7 • Investigation of Unsaturable Absorption and Excited State Absorption on Bi/ Er Co-doped Fibers, Zhao Qiancheng[1], Yanhua Luo[1], Shu'en wei[1], Gang-Ding Peng[1]; [1]*electrical and electronic communication, Univ. of New south wales, Australia.* The unsaturable absorption and excited state absorption (ESA) for bismuth/erbium codoped fibers have been investigated under 830 nm pumping. The ESA and unsaturable absorption at 1050 nm are found to increase with increasing BAC-Al absorption.

JM6A.8 • Response characteristics of annealed Pd film on hetero-core optical fiber structure, Daisuke Komatsu[1], Ai Hosoki[1], Michiko Nishiyama[1], Hirotaka Igawa[2], Kazuhiro Watanabe[1]; [1]*Faculty of Engineering, Soka Univ., Japan;* [2]*Aerospace research and development directorate, Japan Aerospace Exploration Agency, Japan.* We produced Pd nano-particles by annealing Pd film sputtered on hetero-core structured optical fibers, and discussed response characteristics of annealed and non-annealed sensor. Pd nano-particles improved time responses for 4% hydrogen.

JM6A.9 • Inter-Modal Nonlinearity Penalty Reduction in Two-Mode Fiber by Volterra-based Nonlinear Equalization, Elias Giacoumidis[1], Benjamin Eggleton[1]; [1]*CUDOS, Univ. of Sydney, Australia.* Inter-modal nonlinearity in two-mode fiber (TMF) is tackled by Volterra-based nonlinear equalization. For ~260-Gb/s dual-polarization coherent optical OFDM at 1040 km the TMF inter-modal nonlinearity penalty is reduced by up to ~4 dB.

JM6A.10 • Controlled Wake Fields in Interfering Propagating Surface Plasmons, Yehiam Prior[1], Roy Kaner[1], Basudeb Sain[1]; [1]*Weizmann Inst. of Science, Israel.* Plasmonic wakes are observed in a linear array of nanocavities in a gold film on glass substrate. The wakes are generated by the different propagation velocity of surface plasmons on the two sides of the film.

JM6A.11 • Continuous Wave Pumped Supercontinuum Generation Using a Weak Continuous Wave Trigger, Cai Wen[1], Qian Li[1]; [1]*School of Electronic and Computer Engineering, Peking Univ., China.* We numerically demonstrate enhancement of bandwidth and stability of continuous wave pumped supercontinuum generation by using weak continuous wave triggers.

JM6A.12
Withdrawn

JM6A.13 • Noise Correlation between Eigenvalues in Nonlinear Frequency Division Multiplexing, Wen Qi Zhang[1], Qun Zhang[2], Kashif Amir[1], Tao Gui[3], Xuebing Zhang[4], Alan Pak Tao Lau[3], Chao Lu[4], Terence Chan[2], Shahraam Afshar[1,5]; [1]*School of Engineering, Univ. of South Australia, Laser Physics and Photonic Devices Labs, Australia;* [2]*Univ. of South Australia, Inst. for Telecommunications Research, Australia;* [3]*Dept. of Electrical Engineering, The Hong Kong Polytechnic Univ., Photonics Research Centre, China;* [4]*Dept. of Electriconic and Information Engineering, The Hong Kong Polytechnic Univ., Photonics Research Center, China;* [5]*School of Physical Sciences, The Univ. of Adelaide, Insitute for Photonics and Advanced Sensing, Australia.* The noise effects on signals with multiple eigenvalues is studied numerically. Correlations between the noise of the eigenvalues are discovered for the first time, which allows a more compact pack of signal points.

JM6A.14 • Fibre Loss and Noise Characterisation in Nonlinear Spectral Domain, Terence Chan[1], Kashif Amir[1], Wenqi Zhang[1], Qun Zhang[1], Shahraam Afshar[1]; [1]*Univ. of South Australia, USA.* We propose an analytical model for the perturbation of eigenvalues when an N-soliton is transmitted across a lossy and noisy fibre. Our analytical model agrees with simulation results when noise and loss are moderate.

JM6A.15
Withdrawn

JM6A.16 • Nonlinear polarization attraction in optical fibers; steady state andtraveling wave solutions, Shahraam Afshar[1,2], Max A. Lohe[2]; [1]*School of Engineering, Univ. of South Australia, Australia;* [2]*School of Physical Sciences, The Univ. of Adelaide, Australia.* We find the exact steady state and traveling wave solutions of nonlinearpolarization attraction equations in a randomly birefringent optical fiber using a rotational and relativistic symmetry.

JM6A.17 • Observation of anti-dark solitons in fiber lasers, Dingyuan Tang[1], Jun Guo[1], yuanjiang xiang[1], Guodong Shao[1], Yufeng Song[1], luming zhao[2], deyuan shen[2]; [1]*Nanyang Technological Univ., Singapore;* [2]*Jiangsu Normal Univ., China.* We report on the numerical simulation and experimental observation of anti-dark solitons in fiber laser. The anti-dark solitons were experimentally obtained in a net normal near zero dispersion region where the third-order dispersion plays a role.

JM6A.18 • Nonlinear optical properties investigation of Ta_2O_5 channel waveguide, YuanYao Lin[1], Chung-Lun Wu[1], Yung-Jr Hung[1], Yi-Jen Chiu[1], Ann-Kuo Chu[1], Chao-Kuei Lee[1]; [1]*National Sun Yat-Sen Univ., Taiwan.* Nonlinear optical properties of high quality Ta_2O_5 film has been investigated by self-phase-modulation technique. The nonlinear refractive index n_2 of $2x10^{-14}cm^2/W$ at 800nm was obtained. Nearly analytical formula for modifying n_2 was discussed.

JM6A.19 • Unified description of dispersive wave emission in normal and anomalous dispersion regimes, David Castello-Lurbe[1], Nathalie Vermeulen[1], Enrique Silvestre[2]; [1]*Vrjie Universiteit Brussel, Belgium;* [2]*Departament d'Òptica, Universitat de València, Spain.* We present a novel theoretical framework where dispersive wave emission in normal and anomalous dispersion is interpreted based on four-wave mixing processes. It is a powerful tool for designing supercontinuum sources along analytical guidelines. While avoiding optical damage. We find that the optimal configuration depends on the waveguide length.

JM6A.20 • Performance Comparison of Kerr Nonlinear Plasmonic Waveguide Configurations, Guangyuan Li[1,2], C. Martijn de Sterke[1,2], Stefano Palomba[1]; [1]*Inst. of Photonics and Optical Science (IPOS), School of Physics, the Univ. of Sydney, Australia;* [2]*Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), the Univ. of Sydney, Australia.* We compare the Kerr nonlinear performance of plasmonic waveguide configurations using a Figure-of-Merit which balances nonlinear effect with loss, while avoiding optical damage. We find that the optimal configuration depends on the waveguide length.

JM6A.21 • Elastic modelling of electrostriction in dielectric composite materials, Michael J. Smith[1], C. Martijn de Sterke[1], Boris Kuhlmey[1], Christian Wolff[2], Mikhail Lapine[2], Chris Poulton[2]; [1]*The Univ. of Sydney, Australia;* [2]*Univ. of Technology Sydney, Australia.* The electrostriction of a composite material does not only depend on the electrostrictive properties of the constituents, but also includes an additional mechanical response term. We compare two different models to calculate this contribution.

JM6A.22 • Wideband Multimode Parametric Amplification in Optical Fibers, Massimiliano Guasoni[1]; [1]*Nonlinear Physics Center, Australian National Univ., Australia.* Modulational instability in multimode fibers is theoretically and numerically investigated. A phenomenon of collective mode amplification is put in evidence, where all fiber modes are simultaneously amplified in a broad frequency band.

JM6A.23 • Mode Analysis of Quantum Nonlinear Propagation of Ultrashort Laser Pulse in an Optical Fiber, Aruto Hosaka[1], Taiki Kawamori[1], Fumihiko Kannari[1]; [1]*Keio Univ., Japan.* We develop a quantum multimode theory of nonlinear propagation in optical fibers. Using the developed theory, we numerically study potential of parallelism of fiber-based squeezed state generation by soliton-like and zero-dispersion propagations.

JM6A.24 • Theory of Squeezed Quantum X-Waves Carrying Orbital Angular Momentum, Marco Ornigotti[1], Leone di Mauro Villari[2,3], Claudio Conti[2,3], Alexander Szameit[1]; [1]*Institut für Angewandte Physik, Friedrich Schiller Universität , Germany;* [2]*Dept. of Physics, Univ. Sapienza, Italy;* [3]*Inst. for Complex Systems, Italy.* We discuss the quantisation of X-waves carrying orbital angular momentum (OAM), with particular attention to the effect of OAM in the squeezing resulting from spontaneous parametric down conversion of photons in quadratic media.

18:30 -- 20:30
JM6A • Joint Poster Session I, *Banquet Hall*

JM6A.25 • Generation of Polarization Entangled Photon Pairs in a Slant - Strip -Type Periodically Poled Planar Waveguide, Divya Bharadwaj[1], K Thyagarajan[1]; *[1]Indian Inst. of Technology, Delhi, India.* We present design and analysis of generation of polarization-entangled photon pairs in a 2D slant strip type periodically poled planar waveguide and show the advantages of this vis a vis bulk and channel waveguide.

JM6A.26 • Solitons in non-positive definite nonlinearity, YuanYao Lin[1], Ray-Kuang Lee[2]; *[1]National Sun Yat-Sen Univ. , Taiwan; [2]Inst. of Photonics Technologies, National Tsing Hua Univ., Taiwan.* The concept of soliton formation in non-positive definite nonlinearity is proposed and the soliton property is investigated. The solitons are formed under the balance of the competing spectral components in the non-positive definite noninearity.

JM6A.27 • Adaptive Characterization of Fiber Bragg Grating Sensors using FBG-Transceiver™ Power-based Interrogators, Cristian Andres Triana[1], Edgar Mendoza[2], Daniel Pastor[3], Margarita Varón[1]; *[1]Universidad Nacional de Colombia, Colombia; [2]Redondo Optics, USA; [3]Universidad Politécnica de Valencia, Spain.* In this paper, we analyze an adaptive characterization method for fiber Bragg grating sensors using the commercial interrogators FBG-Transceiver™ from Redondo Optics. Results showed good fitting of the characteristic curve at different power levels.

JM6A.28 • Fibre Bragg Grating Sensing Technology for the Evaluation of Physical Properties of Dental Resin Composites, Ginu Rajan[1], Paul Shouha[2], Ayman Ellakwa[2], Jiangtao Xi[1], Gangadhara Prusty[3]; *[1]School of Electrical, Computer and Telecommunications Engineering, Univ. of Wollongong, Australia; [2]Faculty of Dentistry, Univ. of Sydney, Australia; [3]School of Mechanical and Manufacturing Engineering, Univ. of New South Wales, Australia.* This study demonstrates how optical fibre technology can provide simple and reliable methods of measuring the critical physical properties of dental composites such as linear polymerization shrinkage, thermal expansion and water sorption.

JM6A.29 • SHM with FBGs on a Full-scale Composite Aircraft Part, Leonardo P. Salvini[1], Daniel R. Louzada[1], Paula M. Gouvea[1], Paulo A. Silva[2], Fernando Dotta[2], Laudier J. Moraes[2], Luiz G. Valente[1], Arthur M. Braga[1]; *[1]Pontificia Univ Catolica Rio de Janeiro, Brazil; [2]Embraer S.A., Brazil.* An SHM test of a full-scale composite aircraft part using FBGs bonded to the surface of the aircraft part to monitor the part before and after localized damage was created.

JM6A.30 • Tunable Composite Gratings, Abdul Khaleque[1], Haroldo Hattori[1]; *[1]SEIT, UNSW Canberra, Australia.* A composite graphene-silica grating structure based upon a pseudo-noise function is proposed and analysed - it is shown that the properties of the compound grating can be tailored by applying an external voltage to graphene.

JM6A.31 • Refractive index sensing with long period grating in thin-core-fiber, Ying Wang[1], Cailing Fu[1], Changrui Liao[1], Yiping Wang[1]; *[1]Shenzhen Univ., China.* Asymmetric long period grating in thin core fiber is proposed to measure refractive index of liquid with an averaged sensitivity of 1047.3 nm/RIU within the range from 1.400 to 1.440.

JM6A.32 • Design of all-optical temporal differentiator based on phase-modulated fiber Bragg grating in transmission, An all-optical first-order temporal differentiator is demonstrated with transmissive phase-modulated fiber Bragg grating (PM-FBG) for the first time. A novel two-step nonlinear optimization method is proposed to design the transmissive PM-FBG.

JM6A.20 • Performance Comparison of Kerr Nonlinear Plasmonic Waveguide Configurations, Guangyuan Li[1,2], C. Martijn de Sterke[1,2], Stefano Palomba[1]; *[1]Inst. of Photonics and Optical Science (IPOS), School of Physics, the Univ. of Sydney, Australia; [2]Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), the Univ. of Sydney, Australia.* We compare the Kerr nonlinear performance of plasmonic waveguide configurations using a Figure-of-Merit which balances nonlinear effect with loss, while avoiding optical damage. We find that the optimal configuration depends on the waveguide length.

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JM6A.27 • Adaptive Characterization of Fiber Bragg Grating Sensors using FBG-Transceiver™ Power-based Interrogators, Cristian Andres Triana[1], Edgar Mendoza[2], Daniel Pastor[3], Margarita Varón[1]; *[1]Universidad Nacional de Colombia, Colombia; [2]Redondo Optics, USA; [3]Universidad Politécnica de Valencia, Spain.* In this paper, we analyze an adaptive characterization method for fiber Bragg grating sensors using the commercial interrogators FBG-Transceiver™ from Redondo Optics. Results showed good fitting of the characteristic curve at different power levels.

JM6A.28 • Fibre Bragg Grating Sensing Technology for the Evaluation of Physical Properties of Dental Resin Composites, Ginu Rajan[1], Paul Shouha[2], Ayman Ellakwa[2], Jiangtao Xi[1], Gangadhara Prusty[3]; *[1]School of Electrical, Computer and Telecommunications Engineering, Univ. of Wollongong, Australia; [2]Faculty of Dentistry, Univ. of Sydney, Australia; [3]School of Mechanical and Manufacturing Engineering, Univ. of New South Wales, Australia.* This study demonstrates how optical fibre technology can provide simple and reliable methods of measuring the critical physical properties of dental composites such as linear polymerization shrinkage, thermal expansion and water sorption.

JM6A.29 • SHM with FBGs on a Full-scale Composite Aircraft Part, Leonardo P. Salvini[1], Daniel R. Louzada[1], Paula M. Gouvea[1], Paulo A. Silva[2], Fernando Dotta[2], Laudier J. Moraes[2], Luiz G. Valente[1], Arthur M. Braga[1]; *[1]Pontificia Univ Catolica Rio de Janeiro, Brazil; [2]Embraer S.A., Brazil.* An SHM test of a full-scale composite aircraft part using FBGs bonded to the surface of the aircraft part to monitor the part before and after localized damage was created.

JM6A.30 • Tunable Composite Gratings, Abdul Khaleque[1], Haroldo Hattori[1]; *[1]SEIT, UNSW Canberra, Australia.* A composite graphene-silica grating structure based upon a pseudo-noise function is proposed and analysed - it is shown that the properties of the compound grating can be tailored by applying an external voltage to graphene.

JM6A.31 • Refractive index sensing with long period grating in thin-core-fiber, Ying Wang[1], Cailing Fu[1], Changrui Liao[1], Yiping Wang[1]; *[1]Shenzhen Univ., China.* Asymmetric long period grating in thin core fiber is proposed to measure refractive index of liquid with an averaged sensitivity of 1047.3 nm/RIU within the range from 1.400 to 1.440.

JM6A.32• Design of all-optical temporal differentiator based on phase-modulated fiber Bragg grating in transmission, Xin Liu[1], Xuewen Shu[1], Adenowo Gbadebo[2]; *[1]Huazhong Univ. of Sci and Tech, USA; [2]Aston Univ., UK.* An all-optical first-order temporal differentiator is demonstrated with transmissive phase-modulated fiber Bragg grating (PM-FBG) for the first time. A novel two-step nonlinear optimization method is proposed to design the transmissive PM-FBG.

07:30—17:30 • Registration, *Ground Foyer*

Banquet Hall

Plenary Session

JT1A.1 • 08:30 Plenary

Photonic Integration: Building the Ecosystem, Thomas L. Koch[1]; [1]*Univ. of Arizona, USA.* This talk will discuss advances in electronic/photonic integration, as well as new approaches to packaging, assembly and test in manufacture, that are being targeted in the recently launched American Institute for Manufacturing Integrated Photonics (AIM Photonics).

Ionic — NP

09:15 -- 10:00
NT2A • Topological solitons and exciton-polaritons
Presider: Stuart Murdoch; Univ. of Auckland, New Zealand

NT2A.1 • 09:15
Topological solitons in partially-PT-symmetric potential, Yaroslav V. Kartashov[1,3], Lluis Torner[1], Vladimir Konotop[2]; [1]*ICFO -The Inst. of Photonic Sciences, Spain;* [2]*Universidade de Lisboa, Portugal;* [3]*Inst. of Spectroscopy, Russia.* We introduce partially-PT-symmetric potentials build from PT-symmetric cells located on a ring, where azimuthal directions are *nonequivalent*. Such structures support *stable* vortex solitons, whose properties depend on the *sign* of topological charge.

NT2A.2 • 09:30
Four-Wave Mixing of Spontaneously Created Exciton-Polariton Condensates, Eliezer Estrecho[1], Tingge Gao[1], Michael Fraser[2], Daniel Comber-Todd[1], Christian Schneider [3], hoefling sven[3,4], Loren Pfeiffer[5], Ken West[5], Mark Steger[6], David Snoke[6], Elena Ostrovskaya[1], Andrew Truscott[1]; [1]*Research School of Physics and Engineering, Australian National Univ., Australia;* [2]*Quantum Functional System Research Group, RIKEN Center for Emergent Matter Science, Japan;* [3]*Technische Physik, Wilhelm-Conrad-Röntgen Research Center for Complex Material Systems, Universität Würzburg, Germany;* [4]*SUPA, School of Physics and Astronomy, Univ. of St Andrews, UK;* [5]*Dept. of Electrical Engineering, Princeton Univ., USA;* [6]*Dept. of Physics and Astronomy, Univ. of Pittsburgh, USA.* We observe degenerate four-wave mixing of exciton-polariton condensates in a semiconductor microcavity in the pulsed non-resonant excitation regime by colliding two counter propagating condensates, which forms an anisotropic halo in k-space.

NT2A.3 • 09:45
Talbot effect for exciton polaritons, Tingge Gao[1], Eliezer Estrecho[1], guangyao Li[1], O. A Egorov[2], X Ma[2], Karol Winkler[3], Martin Kamp[3], Christian Schneider [3], hoefling sven[3], Andrew Truscott[1], Elena Ostrovskaya[1]; [1]*Research School of Physics and Engineering, The Australian National Univ., Australia;* [2]*Inst. of Condensed Matter Theory and Solid State Optics, Abbe Center of Photonics, Friedrich-Schiller-Universit at Jena,, Germany;* [3]*Technische Physik, Wilhelm-Conrad-R ontgen-Research Center for Complex Material Systems, Universit at W urzburg,, Germany.* We observe the Talbot effect for quantum light-matter waves by loading the exciton polariton condensate into a 1D periodic array of mesa traps, which acts as both an amplitude and phase grating.

Doric — BGPP

09:15 -- 10:00
BT2B • Properties: Gratings II
Presider: Manfred Rothhardt; IPHT, Germany

BT2B.1 • 09:15
FBG-based Tunable Waveplate, Dmitrii Stepanov[1]; [1]*Defence Science Technology Group, Australia.* A pair of wavelength-matched Bragg gratings in a polarization maintaining fiber comprises a reflective tunable waveplate. Polarization of the reflected laser light is continuously tuned by tuning the laser wavelength or by straining the device.

BT2B.2 • 09:30
Tilted Bragg Gratings in Integrated Optical Fiber, Alex Jantzen[1], Christopher Holmes[1], Stephen Lynch[1], Matthew T. Posner[1], Rex Bannerman[1], Peter Smith[1]; [1]*Univ. of Southampton, UK.* In this paper, the first successful case of a short period tilted Bragg grating in integrated optical fibre is reported through the observation of resonance features in the reflection spectrum from a 4.98° tilted grating.

BT2B.3 • 09:45
Bragg Gratings in a Bioresorbable Phosphate Glass Optical Fiber, Maria Konstantaki[1], Stavros Pissadakis[1], Diego Pugliese[2], Edoardo Ceci-Ginistrelli[2], Nadia Boetti[3], Daniel Milanese[2]; [1]*FORTH-IESL, Greece;* [2]*Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, Italy;* [3]*Istituto Superiore Mario Boella, Italy.* The inscription of Bragg gratings in a bioresorbable phosphate optical fiber using 193 nm excimer laser radiation is reported. The dissolution of the fiber immersed in aqueous solution is monitored through the cladding modes spectra.

Corinthian — ACOFT

09:15 -- 10:00
AT2C • Mid-infrared Fibre Sources III
Presider: Adrian Carter; Nufern, Australia

AT2C.1 • 09:15 Invited
Pulsed Thulium and Holmium Fibre Lasers, Nikita Simakov[1], Alexander Hemming[1], Keiron Boyd[1], Jae M. Daniel[1], Neil Carmody[1], Alan Davidson[1], Kevin Farley[2], Adrian Carter[2], John Haub[1]; [1]*Defence Science and Technology Group, Australia;* [2]*Nufern Inc, USA.* We will review recent progress in the area of average power and peak power scaling of sources based around thulium and holmium doped fibre lasers.

AT2C.2 • 09:45
Multi-octave mid-infrared supercontinuum generation in robust chalcogenide nanowires using a thulium fiber laser, Soroush Shabahang[1], Andrew Sims[2], Guangming Tao[1], Lawrence Shah[1], Martin Richardson[1], Ayman Abouraddy[1]; [1]*Univ. of Central Florida, CREOL, USA;* [2]*Lockheed Martin Coherent Technologies, USA.* A mid-IR supercontinuum spanning over 1-3.2 μm is generated through pumping highly nonlinear robust chalcogenide glass nanotapers with femtosecond pulses at 2 μm. Nanotapers are produced from a multimaterial high-index-contrast step-index fiber.

10:00—10:30 • Coffee Break & Exhibits, *Banquet Hall*

Ionic

NP

10:30 -- 12:30
NT3A • Nonlinear Nanophotonics II
Presider: Anatoly Zayats; King's College London, UK

NT3A.1 • 10:30 Invited
Mode-Matching In Multiresonant Nanoantennas For Enhanced Nonlinear Emission, Michele Celebrano[1], Lavinia Ghirardini[1], Xiaofei Wu[2], Swen Grossmann[3], Paolo Biagioni[1], Giovanni Pellegrini[1], Milena Baselli[1], Andrea Locatelli[4], Costantino . De Angelis[4], Giulio Cerullo[1,5], Roberto Osellame[5], Bert Hecht[3], Lamberto Duò[1], Marco Finazzi[1], Franco Ciccacci[1]; *[1]Dept. of Physics, Politecnico di Milano, Italy; [2]Dept. of Physics, Univ. of Bayreuth, Germany; [3]Dept. of Physics - Experimental Physics 5, Univ. of Wuerzburg, Germany; [4]Dept. of Electronic Engineering, Univ. of Brescia, Italy; [5]Dept. of Physics, IFN-CNR, Italy.* We developed a paradigm to optimize the second-order nonlinear response of plasmonic nanoantennas. Multiresonant nanostructures featuring a broken symmetry and spatial overlap between the involved modes show a nonlinear peak coefficient of 5×10^{-10}.

NT3A.2 • 11:00
Nonlinear emission from dark anapole modes and route to all-dielectric metamaterial near-field lasers, Juan Sebastian Totero Gongora[1], Andrey E. Miroshnichenko[2], Yuri S. Kivshar[2], Andrea Fratalocchi[1]; *[1]PRIMALIGHT, King Abdullah Univ. of Science and Technology, Saudi Arabia; [2]Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National Univ., Australia.* By employing ab-initio simulations of Maxwell-Bloch equations with a source of quantum noise, we study a new laser concept based on photonic dark-matter nanostructures that emit only in the near-field, with no far-field radiation pattern.

NT3A.3 • 11:15
Second-harmonic generation in AlGaAs nanoantennas, Valerio F. Gili[1], Luca Carletti[2], Davide Rocco[2], Andrea Locatelli[2], Lavinia Ghirardini[3], Ivan Favero[1], Carmen Gomez[4], Aristide Lemaître[4], Marco Finazzi[3], Michele Celebrano[3], Costantino De Angelis[2], Giuseppe Leo[1]; *[1]Universite Paris-Diderot Paris VII, France; [2]Università degli Studi di Brescia, Italy; [3]Politecnico di Milano, Italy; [4]LPN-CNRS, France.* We demonstrate second harmonic generation from a 1554-nm pump beam in monolithic aluminum gallium arsenide nanoantennas on an aluminum oxide substrate, with a peak conversion efficiency exceeding 10^{-5}.

NT3A.4 • 11:30
Quantum-classical correspondence for photon-pair generation in nonlinear dielectric nano-resonators, Alexander Solntsev[1], Luca Carletti[2], Lei Xu[1], Alexander Poddubny[3,4], Costantino . De Angelis[2], Giuseppe Leo[5], Yuri Kivshar[1], Dragomir N. Neshev[1], Andrey A. Sukhorukov[1]; *[1]NPC, Australian National Univ., Australia; [2]Dept. of Information Engineering, Univ. of Brescia, Italy; [3]ITMO Univ., Russia; [4]Ioffe Physical-Technical Inst. of the Russian Academy of Science, Russia; [5]MPQ, Universite Paris Diderot-CNRS, France.* We predict highly efficient sum-frequency conversion in quadratic nonlinear dielectric nano-resonators made of AlGaAs, and formulate a general quantum-classical correspondence with spontaneous parametric down-conversion.

Doric

BGPP

10:30 -- 12:30
BT3B • Fundamentals: Femtosecond Photosensitivity
Presider: Yasuhiko Shimotsuma; Kyoto Univ., Japan

BT3B.1 • 10:30 Invited
Laser induced self-organisation: from plasma to nanostructures, Martynas Beresna[1]; *[1]Univ. of Southampton, UK.* Ability of short light pulses to induced self-assembled nanostructures in the bulk of silica was observed more than a decade ago. Here recent progress in understanding of this phenomena will be reviewed.

BT3B.2 • 11:00
Orientation instabilities of nanogratings recorded by femtosecond laser pulses in silica, Valdemar Stankevič[1,2], Gediminas Račiukaitis[1], Francesca Bragheri[3], Xuewen Wang[4], Eugene G. Gamaly[5], Roberto Osellame[3], Saulius Juodkazis[4]; *[1]Center for Physical Sciences and Technology, Lithuania; [2]ELAS, Ltd, Lithuania; [3]Instituto di Ftonica e Nanotecnologie – CNR, Italy; [4]Center for Micro-Photonics, Faculty of Science, Engineering and Technology, Swinburne Univ. of Technology, Australia; [5]Laser Physics Centre, Research School of Physics & Engineering, The Australian National Univ., Australia.* Tilt between the orientation of the scan direction and nanogratings formed by linearly polarized ultra-short laser pulses was systematically studied in fused silica. The dependence of period of nanogratings on the scanning direction is also observed.

BT3B.3 • 11:15
Anisotropic circular optical properties photo-induced by femtosecond laser irradiation in silica glass, Rudy Desmarchelier[1], Matthieu Lancry[1], Jing Tian[1], Bertrand Poumellec[1]; *[1]ICMMO, Université Paris Saclay, France.* We report the creation of circular optical properties by femtosecond laser in silica glass. We suggest an interpretation based on involves light induced torque created by nonlinear effect between the DC electric field and the stress field.

BT3B.4 • 11:30
Ultrafast laser-induced microexplosion: material modification tool, Ludovic Rapp[3,2], Eugene G. Gamaly[2], Remo Guist Guist[3], Luca Furfaro[3], Pierre-Ambroise Lacourt[3], John M. Dudley[3], Saulius Juodkazis[1], Francois Courvoisier[3], Andrei Rode[2]; *[1]Swinburne Univ. of Technology, Australia; [2]Laser Physics Centre, Research School of Physics and Engineering, ANU, Australia; [3]Institut FEMTO-ST, UMR 6174 CNRS Université de Bourgogne Franche-Comté, France.* Femtosecond Bessel pulses with a needle-like intensity distribution were focused inside sapphire crystal to create voids and the shock-wave affected volume which is by two orders of magnitude larger as compared with Gaussian pulse.

Corinthian

ACOFT

10:30 -- 12:30
AT3C • Biosensing and Chemical Sensing
Presider: Steven Hinckley; Edith Cowan Univ., Australia

AT3C.1 • 10:30 Invited
Coupling Dye Molecules to a Silicon Nitride Waveguide, Claudio Polisseni[1], Kyle Major[1], Samuele Grandi[1], Sebastien Boissier[1], Alexander Clark[1], Edward Hinds[1]; *[1]Imperial College London, USA.* A dibenzoterrylene (DBT) molecule can emit single-photons into a waveguide. We have grown and characterised thin, DBT-doped anthracene crystals on photonic structures, including a silicon nitride ridge waveguide from which we detect single-photons.

AT3C.2 • 11:00
Ultra-sensitive Biosensing with Dielectric Nanoantennas, Nicolò Bontempi[1,2], Katie Chong[1], Henry Orton[1], Isabelle Staude[3], Duk-Yong Choi[1], Ivano Alessandri[2], Yuri Kivshar[1], Dragomir N. Neshev[1]; *[1]Australian National Univ., Australia; [2]Mechanical and Industrial Engineering Dept., Univ. of Brescia, Italy; [3]Friedrich Schiller Univ. Jena, Germany.* We demonstrate new direction in biosensing based on biocompatible, non-toxic, low-loss dielectric nanoantennas. Using biotin-coated Si nanodisks with optically-induced magnetic resonances we detect streptavidin of concentration as low as 10^{-10} mol/L.

AT3C.3 • 11:15
Hand-held Optical Fiber Smartphone Spectrometer for Classification of Vegetable Oils, Md. Arafat Hossain[1], John . Canning[2], Kevin Cook[2], Abbas Jamalipour[1]; *[1]School of Electrical and Information Engineering, The Univ. of Sydney, Australia; [2]School of Chemistry, The Univ. of Sydney, Australia.* An optical-fiber-based low-cost, hand-held smartphone spectrometer is demonstrated for differentiating vegetable oils.The visible fluorescence spectrum of extra virgin olive oil is found to be significantly different from other oils.

AT3C.4 • 11:30
LMR Based Hydrogen Peroxide Sensor Using ZnO/Ag Nanostructures, Sruthi P. Usha[1], Anand M. Shrivastav[1], Banshi D. Gupta[1]; *[1]Indian Inst. of Technology, Delhi, India.* Fabrication and characterization of a lossy mode resonance based fiber optic H_2O_2 sensor using ZnO/Ag nanostructures are reported for normal to toxic concentration range. The sensor possesses a limit of detection of 0.13 μM.

Ionic — NP

10:30 -- 12:30
NT3A • Nonlinear Nanophotonics II– Continued

NT3A.5 • 11:45
Shaping the second harmonic radiation pattern from AlGaAs dielectric nanoantennas, Luca Carletti[1], Andrea Locatelli[1], Dragomir N. Neshev[2], Costantino . De Angelis[1]; [1]*Universita' degli Studi di Brescia, Italy;* [2]*The Australian National Univ., Australia.* We study the radiation-pattern of second-harmonic-generation (SHG) from AlGaAs all-dielectric nanoantennas. We show the importance of the interference of different higher-order electric and magnetic multipoles for shaping the SHG radiation-pattern.

NT3A.6 • 12:00
Dynamical Centrosymmetry Breaking and Second-Harmonic Generation in Graphene, David Carvalho[1], Fabio Biancalana[1]; [1]*Heriot-Watt Univ., UK.* A set of equations is proposed as a model for nonlinear light-matter interactions in monolayer graphene with pulsed light. At normal incidence, these equations predict SHG by encapsulating a new mechanism of centrosymmetry breaking.

NT3A.7 • 12:15
Coherent Nonlinear Optics with a Single Molecules, Benjamin Gmeiner[1], Andreas Maser[1,2], Tobias Utikal[1], Stephan Götzinger[2,1], Vahid Sandoghdar[1,2]; [1]*Max Planck Inst. for the Science of Light, Germany;* [2]*Friedrich Alexander Univ., Germany.* We report on coherent nonlinear effects with a single organic molecule placed at the tight focus of two near-resonant laser beams. Efficient photon-molecule coupling allows switching a laser beam by a handful of photons.

Doric — BGPP

10:30 -- 12:30
BT3B • Fundamentals: Femtosecond Photosensitivity—Continued

BT3B.5 • 11:45
3D Photonics in the Mid-infrared: Parametric study of ultrafast laser inscribed waveguides for stellar interferometry, Alexander Arriola[1,2], Simon Gross[1,2], Martin Ams[1,2], Thomas Gretzinger[1,2], David Le Coq[3], Rongping Wang[4], Heike Ebendorff-Heidepriem[5], Jasbinder Sanghera[6], Shyam Bayya[6], Brandon Shaw[6], Michael Ireland[7], Peter Tuthill[8], Michael J. Withford[1,2]; [1]*MQ Photonics, Physics and Astronomy, Macquarie Univ., Australia;* [2]*CUDOS - Centre for Ultrahigh Bandwidth Devices for Optical Systems, Australia;* [3]*Institut des Sciences Chimiques de Rennes, Univ. of Rennes, France;* [4]*Laser Physics Centre, Research School of Physics and Engineering, Australian National Univ., Australia;* [5]*Univ. of Adelaide, School of Chemistry and Physics, Australia;* [6]*US Naval Research Lab, USA;* [7]*Research School of Astronomy & Astrophysics, Australian National Univ., Australia;* [8]*Sydney Inst. for Astronomy (SIfA), School of Physics, Univ. of Sydney, Australia.* We present a study on glass materials that are potentially suitable for the fabrication of low-loss waveguides in the mid-infrared, more specifically in the region 3 - 5 µm.

BT3B.6 • 12:00
Impact of H_2 Loading on The Refractive Index Change in Waveguides Written by Femtosecond Laser Pulses in Pure Silica Glasses, Maxime Royon[1], Emmanuel Marin[1], Sylvain Girard[1], Aziz Boukenter[1], Youcef Ouerdane[1], Razvan Stoian[1]; [1]*Laboratoire Hubert Curien, France.* We investigate the influence of H_2 loading on the fs-laser induced refractive index change (Δn) in pure fused silica. Δn obtained with the far-field characterization of inscribed waveguides shows that it can be increased with H_2 loading.

Corinthian — ACOFT

10:30 -- 12:30
AT3C • Biosensing and Chemical Sensing–Continued

AT3C.5 • 11:45
Fiber-optical coupling in agricultural and environmental sensing, based on open-path cavity ringdown spectroscopy, Brian J. Orr[1], Yabai He[1], Julian Hill[2], Ian Jamie[1]; [1]*Macquarie Univ., Australia;* [2]*Ternes Agricultural Consulting Pty Ltd, Australia.* Single-mode optical fibers can be used to couple remotely located open-path ringdown cavities to a single central control module. This enables laser-spectroscopic sensing of atmospheric species at trace levels in agricultural and environmental media.

AT3C.6 • 12:00
SPR and Molecular Imprinting based Fiber Optic Sensor for Copper Ion Detection, Anand M. Shrivastav[1], Sruthi P. Usha[1], Banshi D. Gupta[1]; [1]*Indian Inst. of Technology, Delhi, India.* A fiber optic copper ion sensor based on SPR and molecular imprinting techniques has been reported for 0 to 20 µM concentration range. Its sensitivity and detection limit are 26.6 nm/µM and 1.25×10^{-8} M respectively.

AT3C.7 • 12:15
SPR Based Fiber Optic Sensor for Detection of Cholesterol Using Gel Entrapment, Vivek Semwal[1], Anand M. Shrivastav[1], Banshi D. Gupta[1]; [1]*Indian Inst. of Technology, Delhi, India.* In this study we report the fabrication and characterization of a surface plasmon resonance (SPR) based fiber-optic sensor for the detection of cholesterol in 0 to 10 mM concentration range.

12:30—14:00 • Lunch *(on your own)*

13:00—14:00 • A Love of Photonics: Tribute Session for John Love, *Ionic*

A special session has been scheduled to pay tribute to Professor John Love. The session will include short talks from some of John's colleagues celebrating his key contributions to Australian Photonics. Sandwiches will be provided. RSVP required, please see registration.

14:00 -- 16:00
JT4A • Joint Poster Session II, *Banquet Hall*

JT4A.1 • Generation of forward Brillouin scattering in phononic-photonic waveguides, Ruiwen Zhang[1], Junqiang . Sun[1], Guodong Chen[1]; [1]*Wuhan National Lab for Optoelectronics, China.* We present the forward Brillouin scattering in two phononic-photonic waveguides which support the highly confined optical and acoustic modes for the enhanced acousto-optic interaction. The measured Brillouin frequency shift is 50 MHz and 2.425 GHz.

JT4A.2 • Optically induced charge transfer as the foundation for nanobot technology, John . Canning[2,1]; [1]*Univ. of Sydney, Australia;* [2]*Federal Univ. of Technology , Brazil.* A new approach to fabricating nanobot technology based on charge transfer with optical excitation is proposed.

JT4A.3 • Identification of threshold in a mesoscale laser, Tao Wang[1,2], GianPiero Puccioni[3], Gian Luca Lippi[1,2]; [1]*Insitut Non Lineaire de Nice, France;* [2]*Université de Nice-Sophia Antipolis, France;* [3]*Istituto dei Sistemi Complessi -- CNR, Italy.* Nanolaser thresholds have been long debated. We propose a definition based on the dynamics of the laser output and a technique for its experimental detection in a mesoscale device. Modelling similarities forecast its useful extension to nanolasers.

JT4A.4 • Characterization of the Nonlinear Response of Class B Microlasers in the Threshold Region, Djeylan Aktas[1], Tao Wang[2], Olivier Alibart[1], Gian Luca Lippi[2], Eric Picholle[1], Sébastien Tanzilli[1]; [1]*Laboratoire de Physique de la Matière Condensée, CNRS UMR 7336, Universite de Nice Sophia Antipolis, France;* [2]*Institut Non Linéaire de Nice, CNRS UMR 7335, Université de Nice Sophia Antipolis, France.* The nonlinear response of a Class-B semiconductor microlaser in the sub-threshold region is characterized through photon coincidence. Correlation values $g^{(2)}(0) > 3$ confirm the key role of spatio-temporal dynamics in the photon statistics.

JT4A.5 • Delay amplification in a broadband Brillouin -based microwave photonic delay line, Yang Liu[1], Amol Choudhary[1], David Marpaung [1], Benjamin Eggleton[1]; [1]*Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), The Univ. of Sydney, Australia.* A technique for improving the performance of a microwave photonic delay line based on stimulated Brillouin scattering (SBS) is experimentally demonstrated. The RF delay can be tuned and amplified without changing the SBS pump power.

JT4A.6 • Pulse Instabilities in passively mode locked fibre lasers: a numerical investigation, Neil Broderick[1]; [1]*Univ. of Auckland, New Zealand.* Using a lumped model I investigate the stability of pulses in passively mode-locked fibre lasers. It is found that the stability depends critically on the filter width.

JT4A.7 • Spectral filtering induced multi-pulsing in mode-locked soliton lasers, Xianting Zhang[1], Feng Li[1,2], Zhe Kang[1], Jinhui Yuan[1], Ping Kong A. Wai[1,2]; [1]*Departmenf of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., Hong Kong;* [2]*The Hong Kong Polytechnic Univ. Shenzhen Research Inst., China.* A spectral filter in a mode-locked soliton laser will introduce an energy dependent loss to the soliton pulses. We demonstrated with a geometrical model that such filtering loss will lead to multi-pulsing in the laser.

JT4A.8 • White Light Induced Mode Switching in a Graphene Flake Mixed ZnO Random Laser, Ryo Niyuki[1], Hideki Fujiwara[1], Keiji Sasaki[1]; [1]*Hokkaido Univ., Japan.* We observed lasing mode switching within a graphene flake mixed ZnO random structure induced by white light irradiation. The present study would provide a method for tuning of lasing modes in random structures.

JT4A.9 • Realization of Low Threshold ZnO Nanorod Array Random Lasers Using a Laser-Induced Hydrothermal Synthesis, Hideki Fujiwara[1], Takemasa Suzuki[1], Ryo Niyuki[1], Keiji Sasaki[1]; [1]*Hokkaido Univ., Japan.* We demonstrate low threshold random lasing in a ZnO nanorod array structure fabricated by a laser -induced hydrothermal synthesis, which enables us to control structural parameters by adjusting the laser irradiation time and intensity.

JT4A.10 • Soliton Formation with Controllable Frequency Line Spacing Using Dual-pump in Microresonator, Zitong Xiong[1], Bolin Wang[1], Jian Ruan[1], Guangqiang He[1,2]; [1]*State Key Lab of Advanced Optical Communication Systems and Networks, Electronic Engineering Dept., Shanghai Jiao Tong Univ., China;* [2]*State Key Lab of precision spectroscopy, East China Normal Univ., China.* We propose a method for controllable frequency line spacing soliton formation in microresonator using two continuous wave (CW) pumps with multi free spectral range (FSR) spacing.

JT4A.11 • Theoretical and Experimental Study of Signal Gain in Er-doped fiber, Irina Yarutkina[1,2], Alexey Ivanenko[1,3], Olga V. Shtyrina[1,2], Anna Kemmer[1,3], Igor Chekhovskoy[1,2], Anton S. Skidin[1,2], Mikhail P. Fedoruk[1,2]; [1]*Novosibirsk State Univ., Russia;* [2]*Inst. of Computational Technologies, Russia;* [3]*Tekhnoscan-Lab Ltd., Russia.* We propose the analytical method to estimate the saturation power and small signal gain of Er-doped fiber from the simple experimental measurements. The results may be useful for numerical simulation of fiber laser systems.

JT4A.12 • On Saturable Absorbtion in Ultra-Long Mode-Locked Fiber Lasers, Anton S. Skidin[2,1], Olga V. Shtyrina[2,1], Irina Yarutkina[2,1], Mikhail P. Fedoruk[2,1]; [1]*Inst. of Computational Technologies, Russia;* [2]*Novosibirsk State Univ., Russia.* We propose a method to estimate analytically the saturable absorber output energy as a series of powers of the recovery time in order to improve the estimation of the output energy in ultra-long fiber lasers.

JT4A.13 • Solitons with Tuneable Dynamical Properties: The Dispersion Relation of Atomic Josephson Vortices, Sophie S. Shamailov[1,2], Joachim Brand[1,2]; [1]*Massey Univ., New Zealand;* [2]*Dodd Walls Centre for Photonics and Quantum Technology, New Zealand.* Linearly coupled nonlinear Schrödinger equations support soliton-like excitations with vorticity. Here we report the dispersion relation of such atomic Josephson vortices and discuss their relevance for experiments.

JT4A.14 • Compactons of Binary Bose Gases in Optical Lattices with Inter-species Scattering Length Management, Fatkhulla Abdullaev[1], Muhammad S. Hadi[1], Mario Salerno[2], Bakhram Umarov[1]; [1]*International Islamic Univ Malaysia, Malaysia;* [2]*Physics Dept., Univ. of Salerno, Italy.* Binary mixtures of Bose-Einstein condensates in deep optical lattices under periodic rapid modulations of the interspecies scattering length are investigated. The existence of binary compactons and threshold on scattering length is demonstrated.

JT4A.15 • Analytical Solutions for Power Evolution in the Effective Two-level Medium Laser Models, Olga Shtyrina[2,1], Semen Efremov[2,1], Irina Yarutkina[2,1], Anton S. Skidin[2,1], Sergei K. Turitsyn[2,3], Mikhail P. Fedoruk[2,1]; [1]*Inst. for Computational Technologies, Russia;* [2]*Novosibirsk State Univ., Russia;* [3]*Aston Univ., UK.* We present analytical solution describing power evolution in the general two-level active medium and the generated output power in the Fabry-Perot and ring fiber laser configurations.

JT4A.16 • Counter-propagating cross-polarized pumps for efficient conjugate generation using FWM in SOA, Aneesh S[1], Krithika V R[1], Deepa Venkitesh[1]; [1]*Indian Inst. of Technology, Madras, India.* We experimentally propose and demonstrate a cross-polarized and counter-propagating partially degenerate scheme for efficient conjugate generation. The efficiency in this scheme is found to be better at the input port, thus making this scheme unique.

JT4A.17 • Bandwidth Limitation of Tunable Wavelength Conversion Using the Cascaded Second -Order Nonlinear Effect in a Quasi-Phase Matched Lithium Niobate Waveguide, Yutaka Fukuchi[1]; [1]*Tokyo Univ. of Science, Japan.* We show that 8ps pulses are arbitrarily wavelength-converted with efficiency of –6dB by using a 50mm-long quasi-phase matched lithium niobate. The result suggests possibility of selective and tunable wavelength conversion of 40-Gbps WDM signals.

JT4A.18 • Using Machine Learning to Explore the Dynamics of Complex Laser Systems, Joshua Toomey[1], Alistair Reid[2], Lachlan McCalman[2], Tushar Malica[1], Deborah M. Kane[1]; [1]*Macquarie Univ., Australia;* [2]*NICTA, Australia.* Proof of principle study using a machine learning algorithm to actively sample the operating parameter space of a complex laser system, in real-time, to find the boundaries between differentiated dynamical regions efficiently.

JT4A.19 • Quasiperiodic Dynamics in a Micropillar Laser with Saturable Absorber and Delayed Optical Feedback, Bernd Krauskopf[1,2], Soizic Terrien[1,2], Neil Broderick[1,2], Sylvain Barbay[3]; [1]*The Univ. of Auckland, New Zealand;* [2]*The Dodd-Walls Center for Photonic and Quantum Technologies, New Zealand;* [3]*CNRS - Laboratoire de Photonique et Nanostructures, France.* By considering a simple delay differential equation model, we show that modulated pulse trains measured in a micropillar semiconductor laser with saturable absorber and optical feedback can be interpreted as quasiperiodic oscillations on a torus.

JT4A.20 • Modulation-instability biosensing using an As_2S_3 chalcogenide tapered fiber, Christos Markos[1], Ole Bang[1]; [1]*Danmarks Tekniske Universitet, Denmark.* We demonstrate an experimentally feasible biosensor design based on As_2S_3 chalcogenide tapered fiber. Pumping the fiber close to 1064 nm, a record sensitivity up to ~18 nm/nm was predicted.

JT4A.21 • Multistable dynamics in a micropillar laser with saturable absorber and delayed optical feedback, Soizic Terrien[1,2], Bernd Krauskopf[1,2], Neil Broderick[1,2], Sylvain Barbay[3]; [1]*The Univ. of Auckland, New Zealand;* [2]*The Dodd-Walls Center for Photonic and Quantum Technologies, New Zealand;* [3]*CNRS - Laboratoire de Photonique et Nanostructures, France.* Multistability between several pulsing solutions in a model of laser with saturable absorber and optical feedback is studied. High sensitivity to small perturbations is discussed and emerges as an interpretation of experimentally-observed dynamics.

JT4A.22 • Thermal Effect in SHG of High-Power CW Lasers in Periodically Poled $LiNbO_3$-type crystals, susumu kato[1], sunao kurimura[2], norikatsu mio[3]; [1]*AIST, Japan;* [2]*NIMS, Japan;* [3]*Univ. of Tokyo, Japan.* A model which consists of the propagation of fundamental and second harmonic waves, light-induced heating, and the heat transports is proposed to investigate the achieved output power of second-harmonic continuous-wave generation without breakdown.

JT4A.23 • Light and heavy hole exciton polariton Faraday rotation in a single GaAs microcavity, Franklin M. Matinaga[1]; [1]*Universidade Federal de Minas Gerais, Brazil.* Faraday rotation has been investigated in nonlinear materials and systems like GaAs microcavity lasers. We present in this work heavy and light hole polaritons effect on the Faraday rotation without external magnetic field.

JT4A.24 • Third Harmonic Generation in Birefringent WGM Resonators: A Survey of Possible Geometries, Christian Peuntinger[2], Luke Trainor[2], Florian Sedlmeir[2], Martin Hauer[1], Dmitry Strekalov[1], Harald G. Schwefel[2]; [1]*Max Planck Inst. for the Science of Light, Germany;* [2]*Dept. of Physics, Univ. of Otago, New Zealand.* Third harmonic and its reverse process of photon triplet generation are of particular interest for quantum communication and computing tasks. We present crystal classes and their necessary geometries to generate such triplets in WGM resonators.

JT4A.25 • Radiation-hardened fiber Bragg gratings for space missions, Adriana Morana[1], Sylvain Girard[1], Emmanuel Marin[1], Mike Trinczek[2], Conny Hoehr[2], Ewart Blackmore[2], Jocelyn Périsse[3], Philippe Paillet[4], Claude Marcandella[4], Olivier Duhamel[4], Laurent Lablonde[5], Jean-Reynald Macé[6], Aziz Boukenter[1], Youcef Ouerdane[1]; [1]*Laboratoire Hubert Curien, CNRS UMR5516, Université de Lyon, France;* [2]*TRIUMF, Canada;* [3]*AREVA NP, France;* [4]*CEA, DAM, DIF, France;* [5]*iXBlue, France;* [6]*AREVA, France.* We developed fs-fiber Bragg gratings resistant to ionizing radiations (X or γ-rays). We demonstrated here the robustness of this sensor technology to proton fluences representative of the most challenging space missions.

JT4A.26 • Investigation of radiation resistance of Er^{3+} doped germano-silica fibers by means of SiO_2 and Al_2O_3 nanoparticles, Babu Hari Babu[2], Nadége Ollier[2], Inna Savelii[3], Hicham El Hamzaoui[3], Alain Pastouret[4], Bertrand Poumellec[1], Mohamed Bouazaoui[3], Laurent Bigot[3], Matthieu Lancry[1]; [1]*Universite de Paris Sud, France;* [2]*LSI, Université Paris Saclay, France;* [3]*PhLAM, Université Lille 1, France;* [4]*Draka-Prysmian, France.* The impact of Er-SiO_2 and Er-Al_2O_3 nanoparticles doping on the radiation induced defects and radiation induced attenuation is investigated in germano-silica optical fibers with various Al/Ge ratios ranging over 0.1-150.

JT4A.27 • Investigation of structural glass relaxation in regenerated fiber Bragg gratings, Matthieu Lancry[1], Kevin Cook[2], Bertrand Poumellec[1], John . Canning[2]; [1]*ICMMO, Universite Paris Saclay, France;* [2]*iPL, The Univ. of Sydney, Australia.* Using Raman and phase shift interferometry we reveal that the seed structure of regenerated FBG has changed the thermal history of the glass so that whilst the annealing is identical in all areas, the local glass relaxation is different and enhanced.

JT4A.28 • Temperature-dependent Raman spectroscopy studies of fibers, Binod Bastola[1], David Barba[1], Mert Celikin[1], Kamel Tagziria[2], Emile Haddad[2], Federico Rosei[1], Andreas Ruediger[1]; [1]*INRS-EMT, Canada;* [2]*MPB Communications, Canada.* We report a systematic study of Raman microstructural change within H_2-free and H_2-loaded telecom fibers between ambient and 1000°C and, highlight the temperature dependent Raman bands that are responsible for indoor core–cladding structural change.

JT4A.29 • Secondary-type In Bragg grating formed in small core photosensitive fiber, Fu-Rong Feng[1], Yang Ran[1], Bai-Ou Guan[1]; [1]*Jinan Univ., China.* An abnormal phenomenon of secondary dip existing in type In Bragg grating formation, which is highly dependent on the diameter and photosensitivity of the fiber core, is discovered and investigated.

JT4A.30 • Etched Polymer Fibre Bragg Gratings, Kishore Bhowmik[1], Gang-Ding Peng[1], Yanhua Luo[1], Eliathamby Ambikairajah[1], Ginu Rajan[2]; [1]*Univ. of New South Wales, Australia;* [2]*Univ. of Wollongong, Australia.* Recently we initiated a new research direction for high-sensitivity and high-reflectivity Bragg grating fabrication based on etched polymer optical fibre, here we report the recent research developments on etched polymer fibre Bragg gratings.

JT4A.31 • Offset-Launch Measurement for Long-Period Fiber Gratings in the Few-Mode Region, Toru Mizunami[1], Mamoru Minami[1]; [1]*Electrical Engineering and Electronics, Kyushu Inst. of Technology, Japan.* Offset launch for higher-order mode excitation was performed for spectral measurement of long-period fiber gratings in the few-mode region. Attenuation peaks by coupling from LP_{11} mode to cladding modes were observed and compared with simulation.

JT4A.32
Withdrawn

JT4A.33 • The Nonlinear Optics of Self-assembled Supramolecular Systems, Jialiang Xu[1,2]; [1]*Inst. for Molecules and Materials, Radboud Univ. , Netherlands;* [2]*School of Chemical Engineering and Technology, Tianjin Univ., China.* We pursue a supramolecular approach to the NLO micro-/nano-materials in both the weak and strong coupling regimes. The clear structure-property correlation provides first principle design parameters for next generation multifunctional NLO materials.

Ionic — NP

16:00 -- 18:00
NT5A • George Stegeman Memorial Session
Presider: Gian-Luca Oppo; University of Strathclyde, UK

NT5A.1 • 16:00 **Invited**
Non-Hermitian photonics: Parity-time and other symmetries in optics, Demetrios N. Christodoulides[1]; [1]*CREOL, USA.* By harnessing ideas stemming from non-Hermiticity and parity-time (PT) symmetry, novel classes of synthetic structures and devices with counter-intuitive properties can be realized. This could potentially enable new possibilities in the field of optics and integrated photonics.

NT5A.2 • 16:30 **Invited**
Thirty Years Of All-Optical Signal Processing: Materials And Device Challenges, Barry Luther-Davies[1]; [1]*Australian National Univ., Australia.* In the 1980s all-optical technology was believed essential to overcome the “electronic bottleneck” that limited the speed of data on fiber networks. This talk reflects on the lessons from that era that still impact all-optical processing.

Doric — BGPP

16:00 -- 17:15
BT5B • Fundamentals: Poling
Presider: Martin Kristensen; Aarhus Universitet, Denmark

BT5B.1 • 16:00 **Invited**
Second-Order Nonlinearity In Optical Fibers: Achievements And Perspectives, Alexey Gladyshev[1]; [1]*FORC RAS, Russia.* Recent progress in thermal poling of silica fibers is reviewed. It is demonstrated that poled fibers can be used in a number of practical applications. Challenges for further development of poled fibers are discussed and possible solutions proposed.

BT5B.2 • 16:30
Cation Migration during Electrical Poling of Multicomponent Glass, Junji Nishii[1]; [1]*Hokkaido Univ., Japan.* This paper reports the relationship between the cation diffusion characteristics and the grating formation by the DC voltage application using a contact electrode with periodic fine pattern.

Corinthian — ACOFT

16:00 -- 18:00
AT5C • Optical Sensors I
Presider: Frederique Vanholsbeeck; Univ. of Auckland, New Zealand

AT5C.1 • 16:00 **Invited**
Focusing and scanning of femtosecond pulses through a multimode fiber: applications in two-photon imaging and polymerization, Edgar Morales[1], Demetri Psaltis[1], Christophe Moser[1]; [1]*Ecole Polytechnique Federale de Lausanne, Switzerland.* We demonstrate a method for transmission and scanning of focused femtosecond pulses through multimode fibers. We show two-photon imaging of biological tissue and explore the application of our method in 3D printing through multimode fibers.

AT5C.2 • 16:30
Long-Distance Fiber-Optical Transfer of a Radio-Frequency Control Signal for Radio-Astronomy and Sensing Applications, Kenneth G. Baldwin[1], Yabai He[3], Brian J. Orr[2], Bruce Warrington[3], Andre Luiten[4], Peter Mirtschin[5], Tasso Tzioumis[5], Chris Phillips[5], Guido Aben[6], Thomas Newlands[6], Tim Rayner[6]; [1]*Australian National Univ., Australia;* [2]*Macquarie Univ., Australia;* [3]*National Measurement Inst., Australia;* [4]*Univ. of Adelaide, Australia;* [5]*CSIRO, Australia;* [6]*AarNet, Australia.* Passive phase-conjugation enables precise fiber-optical transfer of radio-frequency reference signals over long distances, yielding high long-term stability for radio-astronomy and remote-sensing applications without active path-length stabilization.

Ionic — NP

16:00 -- 18:00
NT5A • George Stegeman Memorial Session — Continued

NT5A.3 • 17:00 Invited
Inviscid Burgers' Equation and Riemann Waves in Optics, Roberto Morandotti[1], Benjamin Wetzel[1], Domenico Bongiovanni[1], Michael Kues[1], Yi Hu[2], Zhigang Chen[2], Stefano Trillo[3], John M. Dudley[4], Stefan Wabnitz[5]; [1]*INRS-Energie Mat & Tele Site Varennes, Canada;* [2]*TEDA Applied Physics Inst. and School of Physics, Nankai Univ., China;* [3]*Dipartimento Di Ingegneria, Universita Di Derrara, Italy;* [4]*Institut FEMTO-ST, UMR 6174 CNRS-Universite de Franche-Comte, France;* [5]*Dipartmento di Ingeneria dell'Informazione, Uiversita degli Studi di Brescia, and INO-CNR, Italy.* We report on the experimental observation of inviscid Burgers' equation dynamics and Riemann wave formation in a nonlinear fiber. Experimental results clearly show controllable pulse front steepening and shock formation.

NT5A.4 • 17:30 Invited
Nonlinear Dynamics in Photonic Mesh Lattices, Ulf Peschel[1], Martin Wimmer[2], Mohammad-Ali Miri[3], Alois Regensburger[4], Demetrios N. Christodoulides[3]; [1]*Physics, Friedrich-Schiller Univ. Jena, Germany;* [3]*College of Optics and Photonics, Univ. of Central Florida, USA;* [4]*Physics, Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany.* Photonic mesh lattices are easily realized in the temporal domain using standard telecom equipment. This allows for the experimental demonstration of quantum walks and of various effects of linear and nonlinear dynamics in discrete systems.

Doric — BGPP

16:00 -- 17:15
BT5B • Fundamentals: Poling— Continued

BT5B.3 • 16:45
Formation of a Narrow Nonlinear Layer in Thermally Poled Optical Fibers, Lin Huang[1,2], Honglin An[1], Simon C. Fleming[1], Guobin Ren[2]; [1]*Inst. of Photonics and Optical Science, School of Physics, The Univ. of Sydney, Australia;* [2]*Key Lab of All Optical Network & Advanced Telecommunication Network of EMC, Beijing Jiaotong Univ., China.* A mechanism is proposed for the formation of a narrow nonlinear layer deep under the anode in thermally poled fibers, based on a two-rate H^+ migration mechanism. Simulations agree second harmonic microscopy measurements.

BT5B.4 • 17:00
Spatial and geometry control of second order optical properties in inorganic amorphous materials, Marc Dussauze[1], Vincent Rodriguez[1], Frederic Adamietz[1], Flavie Bondu[1], Antoine Lepicard[1], Thierry Cardinal[2], Evelyne Fargin[2]; [1]*ISM CNRS Univ. of Bordeaux, France;* [2]*ICMCB CNRS, France.* We report on the ability of a thermal poling treatment to be considered as an imprinting process modifying both linear and nonlinear optical properties as well as surface morphology of glassy materials.

Corinthian — ACOFT

16:00 -- 18:00
AT5C • Optical Sensors I— Continued

AT5C.3 • 16:45
Single-shot measurement of stimulated Brillouin spectrum by using OFDM probe and coherent detection, Jian Fang[1], Pengbai Xu[2], William Shieh[1]; [1]*The Univ. of Melbourne, Australia;* [2]*Harbin Inst. of Technology, China.* A single-shot BOTDA technique is demonstrated to measure distributed stimulated Brillouin spectrum by using dual-polarized OFDM probe and coherent detection, without frequency scanning, averaging or polarization scrambling.

AT5C.4 • 17:00
High Temperature Sensing with Suspended Core Fibers, Heike Ebendorff-Heidepriem[1], Stephen C. Warren-Smith[2], Linh V. Nguyen[1], Tanya Monro[3,1]; [1]*Univ. of Adelaide, Australia;* [2]*Leibniz Inst. of Photonic Technology Jena, Germany;* [3]*Univ. of South Australia, Australia.* We report interferometric and ablation grating based approaches of high temperature sensing using suspended core fibers. The use of undoped silica as the single fiber material allows sensing up to the deformation temperature (~1300°C) of silica.

AT5C.5 • 17:15
Wideband Instantaneous Frequency Measurement using Stimulated Brillouin Scattering, Siva Shakthi A[1], Akhil Suresh Suresh Kumar[1], Vahini Reddy Nareddy[1], Akhileshwar Mishra[1], Ravi Pant[1]; [1]*Indian Inst. of Science Education an, India.* We present a high resolution (50 MHz), wideband (25 GHz) microwave photonic instantaneous frequency measurement system exploiting the wavelength dependence of Brillouin shift to obtain an amplitude comparison function.

AT5C.6 • 17:30
Comparison of the Fluorescence Sensing Performance of Microstructured Optical Fibres and Multi-mode Fibre Tips, Erik P. Schartner[1], Georgios Tsiminis[1], Matthew Henderson[2], Stephen C. Warren-Smith[3], Tanya M. Monro[1,4]; [1]*Centre for Nanoscale BioPhotonics, IPAS & School of Physical Sciences, Univ. of Adelaide, Australia;* [2]*IPAS & School of Physical Sciences, Univ. of Adelaide, Australia;* [3]*Leibniz Inst. of Photonic Technology (IPHT Jena), Germany;* [4]*Univ. of South Australia, Australia.* We examine the fluorescence sensing efficiency of suspended-core fibres (SCFs), and multi-mode fibres (MMFs). Theoretical and experimental results show that the SCFs display a consistently higher signal than MMFs with equivalent conditions.

AT5C.7 • 17:45
Fiber Optic SPR Sensor for Detection of Triclosan Using Molecular Imprinted Polymeric Layer, Anand M. Shrivastav[1], Sruthi P. Usha[1], Banshi D. Gupta[1]; [1]*Indian Inst. of Technology, Delhi, India.* We report sensing of triclosan using optical fiber configuration with SPR and molecular imprinting techniques. The sensor possesses high sensitivity and selectivity and operates from concentration 0.0001 to 0.1 µg/L of triclosan.

18:00—21:00 • Conference Banquet, *Waterfront on The Rocks*

***Separate registration required ***

08:00—17:30 • **Registration**, *Ground Foyer*

Grand Lodge

Opening Remarks and Plenary Session

JW1A.1 • 08:30 Plenary

Nonlinear World of Commercial Photonic Systems, Sergei K. Turitsyn[1]; [1]*Aston Univ., UK.* Many nonlinear photonic technologies are already weaved into the operation of commercial systems. Nonlinearity is an essential component in the design of numerous photonic devices, but it is often shunned by engineers in view of its practical intractability and greatly increased difficulty of comprehension of system behavior. The understanding and mastering of nonlinear effects can translate into improving performance of the existing devices and enabling a new generation of engineering concepts. Our recent work on nonlinear science of fibre lasers and optical communications systems will be reviewed.

Ionic

NP

09:15 -- 10:00
NW2A • Novel Phenomena
Presider: Ulf Peschel; Friedrich-Schiller-Universität Jena, Germany

NW2A.1 • 09:15
Giant collective incoherent shock waves in strong turbulence, Gang Xu[1], Massimiliano Guasoni[1], David Vocke[2], Daniele Faccio[2], Josselin Garnier[3], Thomas Roger[2], Stefano Trillo[4], Antonio Picozzi[1]; [1]*Laboratoire Interdisciplinaire Carnot de Bourgogne, France;* [2]*Dept. of Engineering, Heriot-Watt Univ., UK;* [3]*Université Paris Diderot, France;* [4]*Univ. of Ferrara, Italy.* Contrary to conventional coherent shocks, we show theoretically and experimentally that nonlocal turbulent flows lead to the emergence of large-scale incoherent shock waves, which constitute a collective phenomenon of the incoherent field as a whole.

NW2A.2 • 09:30
Caustic diffraction catastrophes: Optical swallowtail and butterfly beams, Alessandro Zannotti[1], Falko Diebel[1], Martin Boguslawski[1], Cornelia Denz[1]; [1]*Inst. of Applied Physics, Germany.* We transfer higher order caustic catastrophes to optics, thus extending Airy and Pearcey by paraxial swallowtail and butterfly beams. Their caustics provide outstanding light trajectories for optical induction of refractive index structures.

NW2A.3 • 09:45
Ultrafast nonlinear Kerr effect in type-II superconductors, Charles Robson[1], Fabio Biancalana[1]; [1]*Heriot-Watt Univ., UK.* We study the ultrafast nonlinear Kerr effect and high-harmonic generation in type-II superconductors. Superconductors exhibit ultra-high $\chi^{(3)}$ due to progressive Cooper pairs destruction.

Corinthian

ACOFT

09:15 -- 10:00
AW2B • Mid-infrared Fibre Sources IV
Presider: David Lancaster; Univ. of South Australia, Australia

AW2B.1 • 09:15 Invited
Intense Mid-Infrared Few-Cycle Soliton Generation Covering 2-4.3 µm in Fluoride Fiber, Yuxing Tang[1], Logan Wright[1], Kriti Charan[1], Tianyu Wang[1], Chris Xu[1], Frank W. Wise[1]; [1]*Cornell Univ., USA.* We demonstrate a fiber-based system delivering femtosecond pulses with 5 nJ energies, continuously tunable over 2-4.3 µm through soliton self-frequency shift in fluoride fibers. Pulses with 138-fs duration and 40-kW peak power are obtained at 4.3 µm.

AW2B.2 • 09:45
Second Harmonic Generation Using a Monolithic, Linearly Polarized Thulium Doped Fiber Laser, Miftar Ganija[2], Nikita Simakov[1], Alexander Hemming[1], Cameron Pain[2], Jamie Mcinnes[2], John Haub[1], Peter Veitch[2], Jesper Munch[2]; [1]*Defence Science and Technology Group, Australia;* [2]*Dept. of Physics and IPAS, The Univ. of Adelaide, Australia.* We investigate the potential for power scaling of 975 nm cw radiation from frequency doubling a monolithic, polarized thulium fiber laser in a periodically poled non-linear material.

10:00—10:30 • **Coffee Break & Exhibits**, *Banquet Hall*

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Ionic — NP

10:30 -- 12:30
NW3A • Nonlinear Nanophotonics III
Presider: Costantino De Angelis; Universita' degli Studi di Brescia, Italy

NW3A.1 • 10:30 Invited
Three-Dimensional Metamaterials for Nonlinear Holography, Yehiam Prior[1], Ora Bitton[1], Euclides Almeida[1]; *[1]Weizmann Inst. of Science, Israel.* We demonstrate control of the nonlinear phase in 3D multilayer metamaterials. Functional nonlinear optical elements were fabricated, demonstrating capabilities to generate and shape light beams and computer generated nonlinear holography.

NW3A.2 • 11:00
Nonlinear Beam Shaping with Si Nanodisks, Lei Wang[1], Sergey S. Kruk[1], Mohsen Rahmani[1], Yuri Kivshar[1], Dragomir N. Neshev[1]; *[1]Australian National Univ., Australia.* We demonstrate experimentally the directionality control of the third-harmonic generation from resonant Si disk nano-dimers. Nonlinear beam steering is achieved by varying the polarization of pump and its spatial position relative to nanoparticles.

NW3A.3 • 11:15
Design of All-Dielectric Photonic Crystals for Surface-Enhanced Raman Scattering, Massimiliano Guasoni[1], Nicolo' Bontempi[1,2], Dragomir N. Neshev[1], Luca Carletti[3], Davide Rocco[3], Ivano Alessandri[2], Costantino . De Angelis[3]; *[1]Nonlinear Physics Center, Australian National Univ., Australia; [2]INSTM and Chemistry for Technologies Lab, Mechanical and Industrial Engineering Dept., Univ. of Brescia, Italy; [3]Dept. of Information Engineering, Univ. of Brescia, Italy.* We present the design and optimization of all-dielectric photonic crystal devices for surface-enhanced Raman scattering based applications.

NW3A.4 • 11:30
Multipolar Analysis of the Third Harmonic Radiation Pattern from Fishnet Metamaterials, Lei Wang[1], Alexander Shorokhov[2], Pavel Melentiev[3], Sergey S. Kruk[1], Manuel Decker[1], Christian Helgert[1,4], Frank Setzpfandt[1,4], Andrey Fedyanin[2], Yuri Kivshar[1], Dragomir N. Neshev[1]; *[1]Australian National Univ., Australia; [2]Faculty of Physics, Lomonosov Moscow State Univ., Russia; [3]Inst. for Spectroscopy, Russia; [4]Inst. of Applied Physics, Abbe Center of Photonics, Friedrich Schiller Univ. Jena, Germany.* We showed experimentally the higher-order multipolar contributions in the nonlinear response of fishnet metamaterials. The third-harmonic radiation pattern shows direct evidence of interference of magneto-electric contributions.

NW3A.5 • 11:45
Opto-Mechanical Interactions in Nanoparticles with Magnetic Light, Yue Sun[1], Sergey V. Suchkov[1], Andrey Miroshnichenko[1], Andrey A. Sukhorukov[1]; *[1]Australian National Univ., Australia.* We show that gold and silicon nanoparticles with a cut support highly co-localised optical magnetic dipole and mechanical modes, enabling strong opto-mechanical interactions providing up to 10% optical scattering modulation by mechanical vibrations.

Doric — NP

10:30 -- 12:30
NW3B • Solitons, resonators and rogue waves
Presider: Stephane Coen; University of Auckland, Australia

NW3B.1 • 10:30 Invited
Coexistence of Distinct Cavity Solitons States in a Tristable Passive Kerr Resonator, Miles Anderson[1], Yadong Wang[1], Francois Leo[1], Miro J. Erkintalo[1], Stephane Coen[1], Stuart G. Murdoch[1]; *[1]Univ. of Auckland, New Zealand.* We experimentally demonstrate the simultaneous coexistence of two distinct cavity soliton states in a tri-stable Kerr resonator. We also present the first measurement of a far-detuned 'super' cavity soliton.

NW3B.2 • 11:00
Topological solitons as addressable phase bits in a driven laser, Bruno Garbin[1], Julien Javaloyes[2], Stephane Barland[1], Giovanna Tissoni[1]; *[1]Institut Non Lineaire de Nice, USA; [2]Universitat de les Illes Baleares, Spain.* We use an experiment of laser with an optical injection and feedback to create topological solitons. Independence and interactions of such structures are analysed revealing, under certain conditions, non-monotoneous long-range interactions.

NW3B.3 • 11:15
Two-dimensional Rogue Waves Induced by Nonlinear Optical Vortices, Christopher Gibson[1], Alison M. Yao[1], Gian-Luca Oppo[1]; *[1]Univ. of Strathclyde, UK.* A novel mechanism for the generation of 2D spatio-temporal optical rogue waves in the presence of turbulence with interacting optical vortices is described. Applications are in lasers, optical parametric oscillators and polaritons in microcavities.

NW3B.4 • 11:30
Stability and chiral charge of phase solitons, françois gustave[1], Lorenzo Columbo[2], Giovanna Tissoni[1], massimo brambilla[2], Franco Prati[3], Stephane Barland[1]; *[1]Universite de Nice Sophia Antipolis, USA; [2]Dipartimento Interateneo di Fisica, Università degli Studi e Politecnico di Bari, Italy; [3]Dipartimento di Scienza e Alta Tecnologia, Università dell'Insubria, Italy.* We study experimentally and numerically the stability of dissipative phase solitons propagating in a forced ring semiconductor laser. Non-instantaneous medium dynamics appears to be crucial for the selection of their chiral charge.

NW3B.5 • 11:45
Spatio-temporal Extreme Events in a Laser with a Saturable Absorber, Cristina Rimoldi[1], Franco Prati[2], Stephane Barland[1], Giovanna . Tissoni[1]; *[1]Institut Non Linéaire de Nice, France; [2]Scienza e Alta Tecnologia, Università degli studi dell'Insubria, Italy.* We numerically study extreme events in a broad-area semiconductor laser with saturable absorber. We detect the spatio-temporal maxima of intensity, whose distribution can be meaningfully compared with heavy-tail distributions of extreme value theory.

Corinthian — ACOFT

10:30 -- 12:30
AW3C • Optical Sensors II
Presider: Adrian Carter; Nufern, Australia

AW3C.1 • 10:30 Invited
Material structure studies in strain tuneable whispering gallery mode polymeric resonators, Karolina Milenko[1], Stavros Pissadakis[1], Alina Aluculesei[1,2], George Fytas[2,1]; *[1]FORTH-IESL, Greece; [2]Max Planck Inst. for Polymer Research, Germany.* Strain tuneable, polystyrene whispering gallery mode resonators suspended on thin optical fibre tapers are used for measuring and monitoring structural properties of soft matter cavities.

AW3C.2 • 11:00
Scalable Production of Digitally Designed Multifunctional Polymeric Particles by In-Fiber Fluid Instabilities, Joshua Kaufman[1], Felix Tan[1], Richard Ottman[1], Ratna Chakrabarti[1], Ayman Abouraddy[1]; *[1]Univ. of Central Florida, USA.* By exploiting fluid instabilities in multimaterial fibers, we present a fabrication methodology for producing multifunctional particles. Particles are produced with optical and magnetic dopants confined to specific compartments within the particle.

AW3C.3 • 11:15
Diffusive Scattering from a Single Composite Microsphere Fabricated by an In-Fiber Fluid Instability, Felix Tan[1], Roxana Rezvani Naraghi[1,2], Sergey Sukhov[1], Aristide Dogariu[1], Ayman Abouraddy[1]; *[1]CREOL, The College of Optics & Photonics, Univ. of Central Florida, USA; [2]Dept. of Physics, Univ. of Central Florida, USA.* We confirm diffusive scattering in the forward and backward directions from composite microspheres fabricated by a thermally induced in-fiber instability and containing a random distribution of well-dispersed nanoparticles with high refractive index.

AW3C.4 • 11:30
Zeonex Microstructured Polymer Optical Fibre Bragg Grating Sensor, Getinet Woyessa[1], Andrea Fasano[1], Christos Markos[1], Henrik K. Rasmussen[1], Ole Bang[1]; *[1]Danmarks Tekniske Universitet, Denmark.* We fabricated an endlessly single mode and humidity insensitive Zeonex microstructured polymer optical fibre (mPOF) for fibre Bragg grating (FBG) temperature and strain sensors. We inscribed and characterise FBGs in Zeonex mPOF for the first time.

AW3C.5 • 11:45
Angle-Resolved Skew Rays for Microscopic Fault Detection in Optical Fiber Coatings, George Y. Chen[1], David G. Lancaster[1]; *[1]School of Engineering, Univ. of South Australia, Australia.* We demonstrate an extremely sensitive interrogation technique based on skew rays excitation and angle-resolved analysis that can easily identify coating faults along optical fibers.

Ionic — NP

10:30 -- 12:30
NW3A • Nonlinear Nanophotonics III— Continued

NW3A.6 • 12:00
Opto-electronic oscillator employing photonic-chip based stimulated Brillouin scattering, Moritz Merklein[1], Birgit Stiller[1], Irina Kabakova[2], Udara Mutugala[3], Khu Vu [4], Stephen Madden[4], Benjamin Eggleton[1], Radan Slavik[3]; *[1]Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), Univ. of Sydney, Australia; [2]Blacket Lab, Imperial College London, UK; [3]Optical Research Centre (ORC), Univ. of Southampton, UK; [4]CUDOS, Australian National Univ., Australia.* We demonstrate an optoelectronic oscillator based on stimulated Brillouin scattering as an active filter on a photonic chip. An ultrahigh Brillouin gain chalcogenide rib waveguide is used to generate low-noise single-mode 10 GHz RF signals.

NW3A.7 • 12:15
Coherent Optomechanical Coupling between a Surface Acoustic Wave and a Nitrogen Vacancy Center in Diamond, Hailin Wang[1], Andrew Golter[1], Thein Oo[1], Mayra Amezcua[1]; *[1]Univ. of Oregon, USA.* We demonstrate coherent coupling between a surface -acoustic-wave and a nitrogen vacancy center in the resolved-sideband regime. Rabi oscillations and coherent population trapping have been demonstrated via phonon-assisted sideband transitions.

Doric — NP

10:30 -- 12:30
NW3B • Solitons, resonators and rogue waves— Continued

NW3B.6 • 12:00
Polarization domain-wall cavity solitons in isotropic fiber ring resonators, Julien Fatome[1], Francois Leo[2], Massimiliano Guasoni[3], Bertrand kibler[1], Miro J. Erkintalo[2], Stephane Coen[2]; *[1]Universite de Bourgogne, France; [2]Univ. of Auckland, New Zealand; [3]Australian National Univ., Australia.* We investigate the existence of polarization domain-wall cavity solitons in an isotropic fiber ring resonator. We show that these topological polarization knots can be addressed individually and used as bit-entities for optical data storage.

NW3B.7 • 12:15
Extreme events and phase dynamics in a forced semiconductor ring laser, Francois Gustave[3,1], Lorenzo Columbo[4], massimo brambilla[4], Franco Prati[2], Cristina Rimoldi[1], Giovanna Tissoni[1], Stephane Barland[1]; *[1]Institut Nonlineaire de Nice, Universite de Nice, France; [2]Università dell'Insubria, Italy; [3]Laboratoire de Physique des Lasers, Atomes et Molecules, Université de Lille, France; [4]Dipartimento Interateneo di Fisica, Università degli Studi e Politecnico di Bari, Italy.* We experimentally analyze extreme events in a fast (nanosecond) spatially extended oscillatory medium with coherent forcing. We focus on individual events and their emergence in the (spatio-temporally resolved) optical phase dynamics.

Corinthian — ACOFT

10:30 -- 12:30
AW3C • Optical Sensors II— Continued

AW3C.6 • 12:00
Rapid evaluation of bacterial viability using the optrode – a near real time portable fluorimeter, Fang Ou[1], Cushla McGoverin[1], Simon Swift[2], Frederique Vanholsbeeck[1]; *[1]The Dodds-Walls Centre for Photonic and Quantum Technologies, Dept. of Physics, Univ. of Auckland, New Zealand; [2]School of Medical Sciences, Univ. of Auckland, New Zealand.* We describe a method for identifying live vs. dead bacteria that takes advantage of an inexpensive and portable fibre based fluorimeter, the optrode, which can measure fluorescence intensity in bacterial solutions in any working environment.

AW3C.7 • 12:15
Quasi-Distributed active mode locking laser sensor using fiber partial reflectors, Chang Hyun Park[1], Chang-Seok Kim[1], Gyeong Hun Kim[1]; *[1]Pusan national Univ., Korea.* We propose a new type of a quasi-distributed optical laser sensor based on an active mode locking fiber cavity. The change of mode locking frequency of lasing peak is experimentally proportional to the fine displacement change.

12:30—14:00 • Lunch *(on your own)*

NOTES

Ionic

NP

14:00 -- 16:00
NW4A • Nonlinear Guided Waves
Presider: Alexandre Kudlinski; Univ. of Lille, France

NW4A.1 • 14:00 Invited
Ultrabroadband Dispersive Radiation by Spatiotemporal Oscillation of Multimode Waves, Logan Wright[1], Stefan Wabnitz[2], Demetrios N. Christodoulides[3], Frank W. Wise[1]; *[1]Cornell Univ., USA; [2]Universita degli Studi di Brescia, Italy; [3]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We show that spatiotemporal oscillations of multimode solitons in graded-index fibers generate dispersive radiation spanning the mid-IR to UV. We discuss routes to compact sources of coherent ultrashort pulses across the electromagnetic spectrum.

NW4A.2 • 14:30
Solitonic supercontinuum of fs mid-IR pulses in W-type index tellurite fibers with two zero dispersion wavelengths, Stefan Kedenburg[1], Tobias Steinle[1], Florian Mörz[1], Andy Steinmann[1], Dan Nguyen[2], Dan Rhonehouse[2], Jie Zong[2], Arturo Chavez-Pirson[2], Harald W. Giessen[1]; *[1]4.PI - Univ. of Stuttgart, Germany; [2]NP Photonics, USA.* We are able to generate red-shifted dispersive waves up to a wavelength of 5.1 µm by pumping a W-type index tellurite fiber in the anomalous dispersion regime between its two zero dispersion wavelengths.

NW4A.3 • 14:45
Spatiotemporal Complexity in Step-Index Multimode Fibers, Logan Wright[1], Adrien Fusaro[2], Antonio Picozzi[2], Demetrios N. Christodoulides[3], Frank W. Wise[1]; *[1]Cornell Univ., USA; [2]CNRS, Univ. of Burgundy, France; [3]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We study supercontinuum generation in step-index fibers with a varying number of modes. We observe new spatiotemporal effects, including evidence of multimode spectral incoherent solitons, and a universal transition to spatiotemporal complexity.

NW4A.4 • 15:00
Measurement of the Raman Self-Frequency Shift of a Temporal Cavity Soliton, Miles H. Anderson[1], Francois Leo[1], Miro J. Erkintalo[1], Stephane Coen[1], Stuart G. Murdoch[1]; *[1]Physics, Univ. of Auckland, New Zealand.* We measure the Raman self-frequency shift of temporal cavity solitons over one free spectral range of detunings in a fiber resonator The relationship is found to be quadratic, in agreement with simple theoretical arguments.

NW4A.5 • 15:15
Self-Organized Instability in Nonlinear Graded-Index Multimode Fiber With Disorder, Logan Wright[1], Zhanwei Liu[1], Daniel A. Nolan[2], Ming-Jun Li[2], Demetrios N. Christodoulides[3], Frank W. Wise[1]; *[1]Cornell Univ., USA; [2]Corning Incorporated, USA; [3]CREOL, College of Optics and Photonics, Univ. of Central Florida, USA.* We show that pulses launched into multimode fibers are attracted to the fundamental mode, which has maximum spatiotemporal instability. The self-organization and instability are caused by cooperation between disorder, nonlinearity and dissipation.

Doric

BGPP

14:00 -- 15:45
BW4B • Properties: Femtosecond Writing
Presider: John Canning; Univ. of Sydney, Australia

BW4B.1 • 14:00 Invited
Fs Lasers for Complex Gratings, Integrated Circuits and Beam Shaping with Silica and Polymer Optical Fibres, Kyriacos Kalli[1]; *[1]Cyprus Univ. of Technology, Cyprus.* The versatility afforded by combining fs lasers and optical fibres is explored to realise complex gratings, integrated circuits and beam shapers in silica and polymer optical fibres.

BW4B.2 • 14:30
Thermal shift and residual absorption in ultrashort pulse written Volume-Bragg-Gratings, Daniel Richter[1], Malte P. Siems[1], Maximilian Heck[1], Thorsten A. Goebel[1], Ria G. Krämer[1], Stefan Nolte[1]; *[1]Inst. of Applied Physics, Germany.* When inscribing Volume-Bragg-Gratings into fused silica using ultrashort laser pulses residual absorption increases. We present annealing experiments, correlate results to activation energies and investigate influence on grating resonance shift.

BW4B.3 • 14:45
Photonic Crystal Fibers for Femtosecond Laser Point-by-Point Grating Inscription, Tigran Baghdasaryan[1], Thomas Geernaert[1], Karima Chah[2], Christophe Caucheteur[2], Kay Schuster[3], Jens Kobelke[3], Hugo Thienpont[1], Francis Berghmans[1]; *[1]Vrije Universiteit Brussel (VUB), Belgium; [2]Univ. of Mons (UMons), Belgium; [3]Leibniz Inst. of Photonic Technology (IPHT), Germany.* We have numerically identified hexagonal lattice parameters for PCF cladding that allow point-by-point grating writing. We designed and fabricated a PCF with suitable parameters and successfully inscribed a femtosecond point-by-point Bragg grating.

BW4B.4 • 15:00
Direct Infrared Femtosecond Laser Inscription of Chirped Bragg Gratings into Silica and Fluoride Fibers, Sergei Antipov[1], Robert J. Williams[1], Martin Ams[1], Stuart D. Jackson[1], Michael J. Withford[1], Alexander Fuerbach[1]; *[1]Macquarie Univ., Australia.* Broadband chirped fiber Bragg gratings with large group delay and a bandwidth of up to 30 nm were fabricated in single- and few mode silica and fluoride fibers by direct femtosecond laser inscription.

BW4B.5 • 15:15
Optimization of the Bragg Grating Inscription Process Using Fluorescence Microscopy, Cyril Hnatovsky[1], Dan Grobnic[1], Stephen J. Mihailov[1]; *[1]National Research Council of Canada, Canada.* Fluorescence imaging is used to visualize and adjust the femtosecond laser field inside a silica-based fiber during the Bragg grating inscription process based on side illumination through a phase mask.

Corinthian

ACOFT

14:00 -- 16:00
AW4C • Novel Fibre Technologies
Presider: Alexander Hemming; Defence Science Technology Group, Australia

AW4C.1 • 14:00 Invited
3D Printing Preforms for Fiber Drawing and Structured Functional Particle Production, Joshua Kaufman[1], Christopher Bow[1], Felix Tan[1], Alexander Cole[1], Ayman Abouraddy[1]; *[1]Univ. of Central Florida, USA.* Using our recently developed in-fiber technique for generating particles, we use 3D printing to generate preforms for fiber drawing. We fabricate particles with optical and magnetic dopants confined to specific compartments in the particle.

AW4C.2 • 14:30
Precision CO_2 laser processing of optical fibres for rapid contamination free device fabrication, Keiron Boyd[1], Simon Rees[1], Nikita Simakov[1,2], Jae M. Daniel[1], robert swain[3], eric mies[3], Alexander Hemming[1], W. Andrew Clarkson[2], John Haub[1]; *[1]DSTO, Australia; [2]Univ. of Southampton, UK; [3]Sub-micron Engineering, USA.* A rapid, contamination free and highly precise optical fibre processing technique is presented. Based on CO_2 laser processing, this technique enables precision fibre cleaving, near arbitrary end face processing and fabrication of high power devices.

AW4C.3 • 14:45
Oxygen Plasma Produced Stable Few-layer Phosphorene in the Air, Xin Gai[1]; *[1]the Australian National Univ., Australia.* Here we demonstrate a new highly-controllable method for fabricating high-quality, air-stable phosphorene films with a designated number of layers ranging from a few-down to a mono-layer.

AW4C.4 • 15:00
Hollow-Core Antiresonant Fibers with a Twist, Alessio Stefani[1], Richard Lwin[1], Alexander Argyros[1], Simon Fleming[1]; *[1]Inst. of Photonics and Optical Science (IPOS), The Univ. of Sydney, Australia.* Antiresonant hollow-core guiding fibers are investigated. By using this guiding mechanism and a flexible polymer (polyurethane) we also demonstrate how we can realize a twistable (and un-twistable) hollow-core fiber and we investigate its properties.

AW4C.5 • 15:15
Study on molten glass behavior during glass nanofiber production by laser spinning, Sho Itoh[1], Masaaki Sakakura[1], Yasuhiko Shimotsuma[1], Kiyotaka Miura[1]; *[1]Kyoto Univ., Japan.* Behavior of molten glass during laser spinning was elucidated. Voids were formed by the laser pulse traveling through the glass substrate. The shrinkage of voids was also observed between the interval of the laser shots.

Ionic	Doric	Corinthian
NP	BGPP	ACOFT

14:00 -- 16:00
NW4A • Nonlinear Guided Waves— Continued

NW4A.6 • 15:30
Nonlinear Interactions at an Optical Event Horizon in Nanophotonic Birefringent Waveguides, Charles Ciret[1], Simon-Pierre Gorza[1]; [1]*OPERA - photonics group, Université libre de Bruxelles (ULB), Belgium.* We study the reflection of a probe wave on an intense pump for both co- and cross-polarized waves. The difference between the polarization dispersion profiles strongly influences the properties of the associated frequency conversion.

NW4A.7 • 15:45
Super-resonant radiation stimulated by high-harmonics, Cristian Redondo Loures[1], Fabio Biancalana[1]; [1]*Heriot-Watt Univ., UK.* We study how the resonant radiation coming from the third harmonic generation term of an equation for ultrashort optical pulses is greatly enhanced in certain conditions. We also report similar findings in other nonlinear systems.

14:00 -- 16:00
BW4B • Properties: Femtosecond Writing— Continued

BW4B.6 • 15:30
Femtosecond Laser Inscription of Multiplexed FBG Sensors in CYTOP Polymer Optical Fibres, Antreas Theodosiou[1], Amedee Lacraz[1], Kyriacos Kalli[1]; [1]*Cyprus Univ. of Technology, Cyprus.* We combine low loss, perfluorinated polymer optical fibre and femtosecond-laser, direct-write methods to inscribe Bragg grating arrays operating in the 1500-nm wavelength window for dynamic strain sensing and compare with silica optical fibre.

14:00 -- 16:00
AW4C • Novel Fibre Technologies— Continued

AW4C.6 • 15:30
Radiation Induced Attenuation Effect in High Water Peak Polarization Maintaining Photonic Crystal Fiber, Cai Wei[1], jing jin[1], Jingming Song[1], Ningfang Song[1], Ya Li[1], Xueqin Wang[1]; [1]*Beihang Univ., China.* RIA spectra of high water peak pure-silica-core polarization maintaining photonic crystal fiber was measured. Hypotheses involving OH^- and IR absorption defect were given to interpret the nonideal RIA characteristics of PM-PCF.

AW4C.7 • 15:45
High Strength Fusion Splicing of Hollow-Core Photonic Bandgap Fiber and Single-Mode Fiber, Chunxiao Wu[1], Jingming Song[1], Zuchen Zhang[1], Ningfang Song[1]; [1]*Beihang Univ., China.* A large offset reheating method for high strength fusion splicing of hollow core photonic crystal fiber and single-mode fiber is proposed. The splice strength improves greatly, while the additional loss is well suppressed.

16:00—16:30 • Coffee Break & Exhibits, *Banquet Hall*

NOTES

Ionic — NP

16:30 -- 18:00
NW5A • Spatio-temporal Effects I
Presider: Sergei Turitsyn; Aston Univ., UK

NW5A.1 • 16:30 Invited
Principal Modes In Multimode Fibre: Modes With Minimal Mode Dispersion, Joel A. Carpenter[1], Benjamin Eggleton[2], Jochen Schroeder[3]; *[1]The Univ. of Queensland, Australia; [2]The Univ. of Sydney, Australia; [3]Royal Melbourne Inst. of Technology (RMIT), Australia.* Principal modes are temporal eigenmodes, a unique basis which to first-order, can propagate through a multimode fiber without mode dispersion. We discuss this phenomena, theoretically proposed decades ago, but observed only recently.

NW5A.2 • 17:00
Optical Fibers Enter a New Space-Time Era, Katarzyna Krupa[1,3], Alessandro Tonello[1], Richard Dupiol[3], Abdelkrim Bendahmane[3], Badr M. Shalaby[1,4], Marc Fabert[1], Alain Barthélémy[1], Guy Millot[3], Stefan Wabnitz[2], Vincent Couderc[1]; *[1]Institut Xlim-Photonique, France; [2]Dip. di Ingegneria dell'Informazione, Università di Brescia, Italy; [3]Institut ICB, Université de Bourgogne Franche-Comté, France; [4]Physics, Tanta Univ., Egypt.* We show experimentally a new type of parametric instability associated with the original phenomenon of beam self-cleaning in multimode fibers. Our experimental results are in good agreement with numerical solutions of the Gross-Pitaevskii equation.

NW5A.3 • 17:15
Optical bullets in 2-dimensional fiber arrays, Alejandro B. Aceves[1], C Castro-Castro[1], COV Shtyrina[2], Alexander Rubenchik[3], Mikhail P. Fedoruk[4], Sergei K. Turitsyn[5]; *[1]Southern Methodist Univ., USA; [2]Inst. of Computational Technologies, Russia; [3]Lawrence Livermore National Lab, USA; [4]Novosibirsk State Univ., USA; [5]Turitsyn, Sergei, UK.* We report on recent work on the properties of optical light bullets propagating in 2 dimensional fiber arrays under very general configurations, including arrays having parity-time (PT)-symmetric loss-gain profiles.

NW5A.4 • 17:30
Observations of Complex Spatiotemporal Instabilities in a Fiber Ring Resonator, Miles Anderson[1], Francois Leo[1], Stephane Coen[1], Miro J. Erkintalo[1], Stuart G. Murdoch[1]; *[1]Univ. of Auckland, New Zealand.* We report on experimental observations of complex instability dynamics of localized dissipative structures in an AC-driven nonlinear Schrödinger system. This includes chaotic oscillations and collapses, as well as transitions to spatiotemporal chaos.

NW5A.5 • 17:45
Propagation of Structured Beams in Nonlinear Media, Alison M. Yao[1], Christopher Travis[1], Gian-Luca Oppo[1], Frederic Bouchard[2], Hugo Larocque[2], Israel De Leon[2], Ebrahim Karimi[2], Robert W. Boyd[2]; *[1]Univ. of Strathclyde, UK; [2]Univ. of Ottawa, Canada.* Theoretical and experimental results of unusual propagation features of space-varying polarized light beams, vector vortex beams and Poincare' beams, in a nonlinear rubidium vapour cell are succesfully compared.

Doric — BGPP

16:30 -- 17:45
BW5B • Fundamentals: Radiation Effects
Presider: Stephen Mihailov; National Research Council Canada, Canada

BW5B.1 • 16:30 Invited
Basic Mechanisms of Ionizing Radiation Effects on Silica-Based Optical Fibers, Sylvain Girard[1], Youcef Ouerdane[1], Aziz Boukenter[1]; *[1]Universite Saint Etienne, France.* Basic mechanisms leading to the degradation of optical fiber properties by radiations are reviewed. Main parameters influencing the amplitudes and kinetics of these radiation-induced changes are discussed on the basis of application case studies.

BW5B.2 • 17:00
Improving optical fiber preform radiation resistance through fictive temperature reduction, Matthieu Lancry[1], Babu Hari Babu[1,2], Nadége Ollier[2], Hicham ELHAMZAOUI[3], Mohamed Bouazaoui[3], Bertrand Poumellec[1]; *[1]ICMMO, Universite Paris Saclay, France; [2]CEA-LSI, Ecole Polytechnique, France; [3]PhLAM, Université Lille 1, France.* The impact of fictive temperature on point defects and optical attenuation were studied in Er-doped Solgel preforms and Suprasil F300, before and after γ-irradiation. We report that lower fictive temperature leads to mcuh higher radiation resistance.

BW5B.3 • 17:15
Ionized Radiation Induced Optical Modifications in Aluminum-Doped Optical Fibers and Its Applications for Nuclear Energy Applications, Kevin P. Chen[1], mohamed zaghloul[1], aidong yan[1], rongzhang chen[1], Ming-Jun Li[2], Robert Flammang[3]; *[1]Univ. of Pittsburgh, USA; [2]Corning Inc, USA; [3]Westinghouse Electrical Company , USA.* This paper reports gamma radiation -induced optical modification in aluminum-doped optical fibers. The utilization of radiation-induced changes in optical fibers were used to measure 3D radiation fields.

BW5B.4 • 17:30
Fiber Bragg grating radiation-response dependency on the Bragg wavelength, Adriana Morana[1], Emmanuel Marin[1], Sylvain Girard[1], Claude Marcandella[2], Jocelyn Périsse[4], Philippe Paillet[2], Laurent Lablonde[3], Thierry Robin[3], Benoit Cadier[3], Jean-Reynald Macé[5], Aziz Boukenter[1], Youcef Ouerdane[1]; *[1]Laboratoire Hubert Curien, CNRS UMR5516, Université de Lyon, France; [2]CEA, DAM, DIF, France; [3]iXBlue, France; [4]AREVA NP, France; [5]AREVA, France.* We studied the dependence of the radiation-response of classical type I UV fiber Bragg gratings on the Bragg peak positions, from about 1300 nm to 1560 nm.

Corinthian — ACOFT

16:30 -- 17:45
AW5C • Optical Communications and Networks I
Presider: Frederique Vanholsbeeck; University of Auckland, New Zealand

AW5C.1 • 16:30 Invited
Designing Compact Receivers For Optical Wireless Communications And Visible Light Positioning, Jean Armstrong[1]; *[1]Monash Univ., Australia.* Novel configurations for angle diversity receivers for optical wireless communication and positioning are described. These enable signals from different transmitters to be separated within a compact receiver which can be integrated in a smart phone.

AW5C.2 • 17:00
Spectral narrowing of RF photonic filters using Brillouin gain shaping and signal interference, Amol Choudhary[1], Yang Liu[1], David Marpaung [1], Benjamin Eggleton[1]; *[1]Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), Univ. of Sydney, Australia.* UltraNarrow RF bandpass filters with a high extinction of up to 45 dB have been demonstrated by shaping the Brillouin gain and through destructive signal interference at the tail of the Brillouin response.

AW5C.3 • 17:15
Field Trial of Short Term Capacity Optimization on a Live System, David W. Boertjes[1], Andrew Leong[2], Daniel Attard[3]; *[1]Ciena Corporation, Canada; [2]Transport Engineering, Telstra, Australia; [3]Transport Solutions, Ericsson, Australia.* This field trial on a live system shows margin-mining to produce additional short-term capacity. Modulation format viability algorithms in current system conditions are presented. Measurements show suitability of this capacity-maximizing approach.

AW5C.4 • 17:30
Breakdown Flash at Telecom Wavelengths in Direct Bandgap Single-Photon Avalanche Photodiodes, Loris Marini[1], Robin Camphausen[1,2], Chunle Xiong[1], Benjamin Eggleton[1], Stefano Palomba[2]; *[1]CUDOS, The Univ. of Sydney, Australia; [2]IPOS, The Univ. of Sydney, Australia.* Breakdown flashes in single-photon avalanche diodes can adversely affect low-level-photon experiments. We present the first measurement of this phenomenon at telecom wavelengths which is essential to the design and implement of preventive measures.

18:00—19:30 • Postdeadline Papers, *Ionic*

Ionic

NP

18:00 -- 19:30
NW6A • Postdeadline Papers

JW6A.1 • 18:00 Postdeadline Submission
A coherent on-chip optical memory: storing amplitude and phase as acoustic phonons, Birgit Stiller[1], Moritz Merklein[1], Khu Vu [2], Stephen Madden[2], Benjamin Eggleton[1]; *[1]CUDOS, The University of Sydney, Australia; [2]CUDOS, Australian National University, Australia.* We demonstrate for the first time the storage of multiple phase and amplitude levels of an optical signal as coherent acoustic phonons. The storage concept is implemented on-chip with a GHz-bandwidth.

JW6A.2 • 18:15 Postdeadline Submission
Ballistic dispersive shock waves in optical fibers, Javier Nuño del Campo[1], Christophe Finot[1], Guy Millot[1], Stefano Trillo[2], Julien Fatome[1]; *[1]ICB, CNRS - Universite de Bourgogne, France; [2]Universita degli Studi di Ferrara, Italy.* We demonstrate a ballistic dispersive shock wave in optical fibers induced by cross-phase modulation on a CW landscape. The shock is characterized by a total depletion of the central part surrounded by repulsive oscillating fronts.

JW6A.3 • 18:30 Postdeadline Submission
Soliton-assisted random lasing in liquid crystals, Sreekanth Perumbilavil [2], Armando Piccardi[1], Olexandr Buchnev[3], Martti . Kauranen[2], giuseppe strangi[4], Gaetano Assanto[1,2]; *[1]Universita degli Studi Roma Tre, Italy; [2]Physics, Tampere University of Technology, Finland; [3]ORC, University of Southampton, United Kingdom; [4]Physics, Case western Reserve University, USA.* We demonstrate random lasing exploiting optical gain and light self-localization in a reorientational medium. A near-infrared spatial soliton in dye-doped nematic liquid crystals enhances efficiency and spectral features of a visible random laser.

JW6A.4 • 18:45 Postdeadline Submission
Cavity soliton frequency comb generation in silica microspheres, Stephane Coen[1], Karen Webb[1], Miro J. Erkintalo[1], Stuart G. Murdoch[1]; *[1]University of Auckland, New Zealand.* We report on experimental observations of coherent cavity soliton frequency combs in silica microspheres. By careful alignment of the sphere relative to the coupling fiber taper, we can reduce mode interactions and enable soliton formation.

JW6A.5 • 19:00 Postdeadline Submission
Shaping the radiation pattern of second-harmonic generation from AlGaAs nonlinear nanoantennas, Rocio Camacho Morales[1], Mohsen Rahmani[1], Sergey S. Kruk[1], Lei Wang[1], Lei Xu[1,2], Andrey Miroshnichenko[1], Daria Smirnova[1], Hoe Tan[1], Fouad Karouta[1], Kaushal Vora[1], Alexander S. Solntsev[1], Luca Carletti[3], Costantino De Angelis[3], Chennupati Jagadish[1], Yuri Kivshar[1], Dragomir N. Neshev[1]; *[1]Australian National University, Australia; [2]School of Physics and TEDA Applied Physics Institute, Nankai University, China; [3]Department of Information Engineering, University of Brescia, Italy.* We fabricate AlGaAs nanodisk antennas on a glass substrate and demonstrate experimentally the shaping of radiation patterns and polarization of the second harmonic emission in both forward and backward directions.

JW6A.6 • 19:15 Postdeadline Submission
Universal polarization domain walls in optical fibers as topological bit-entities for data transmission, Marin Gilles[1], Pierre-Yves bony[1], Josselin Garnier[2], Antonio Picozzi[1], Massimiliano Guasoni[1,3], Julien Fatome[1]; *[1]ICB, CNRS - Universite de Bourgogne, France; [2]University of Paris VII, France; [3]Australian National University, Australia.* We demonstrate the existence of a universal class of polarization domain-walls in conventional optical fibers. We exploit these topological polarization knots as bit-entities for data transmission beyond the Kerr limits of normally dispersive fibers.

20:00—21:30 • Meet the Professionals Happy Hour (Students Only), *Marble Foyer*

08:00—17:30 • **Registration**, *Ground Foyer*

Thursday, 8 September

Ionic	Doric	Corinthian
NP	BGPP	ACOFT

08:30 -- 10:00
NTh1A • Spatio-temporal Effects II
Presider: Giuseppe Leo, Universite Paris-Diderot Paris VII, France

NTh1A.1 • 08:30 Invited
Spatio-Temporal Dynamics Of Nonlinear Airy Beam Interactions, Marc Sciamanna[1,2], Noemi Wiersma[2], Nicolas Marsal[1,2], Delphine Wolfersberger[1,2]; *[1]CentraleSupelec, France; [2]Univ. of Lorraine, France.* We review the time-dependent self-focusing of an Airy beam in a photorefractive crystal. The interaction between two counter-propagating Airy beams yields additional dynamics, e.g. static waveguiding, time-periodic and chaotic light trajectories.

NTh1A.2 • 09:00
Spatiotemporal Self-Localization of Pulse-Train Beams: Toward 3D Solitons in Homogeneous Media, Oren Lahav[1], Ofer Kfir[1], Pavel Sidorenko[1], Maor Mutzafi[1], Avner Fleischer[1], Oren Cohen[1]; *[1]Technion Israel Inst. of Technology, Israel.* We demonstrate experimentally 3D self-localization of spatially-bright temporally-dark pulse-train beams. The pulses are collectively trapped spatially by slow self-focusing while each pulse is self-localized longitudinally by Kerr nonlinearity.

NTh1A.3 • 09:15
Spatially self-confined polychromatic beams in quadratic crystals, Katarzyna Krupa[1,2], Alessandro Tonello[1], Alexis Labruyère[1], Badr M. Shalaby[1,5], Fabio Baronio[3], Alejandro B. Aceves[4], Vincent Couderc[1]; *[1]Institut Xlim-Photonique, France; [2]Institut ICB, Université de Bourgogne Franche-Comté, France; [3]Dip. di Ingegneria dell'Informazione, Università di Brescia, Italy; [4]Dept. of Mathematics, Southern Methodist Univ., USA; [5]Physics, Tanta Univ., Egypt.* We study experimentally the spatial and spectral features of supercontinuum generation in a bulk quadratic crystal. We demonstrate the formation of the spatial polychromatic filament in the visible and near infrared domain.

NTh1A.4 • 09:30
Optical simulation of multi-dimensional nonlinear defect states with planar waveguide arrays, Alexander A. Dovgiy[1], Andrey Miroshnichenko[1], Alexander Moroz[2], Alexander Szameit[4], Demetrios N. Christodoulides[3], Andrey A. Sukhorukov[1]; *[1]Nonlinear Physics Centre, Australian National Univ., Australia; [2]Wave-scattering.com, Germany; [3]Univ. of Central Florida, USA; [4]Friedrich-Schiller-Universitaet, Germany.* We introduce a concept of universal optical simulators based on experimentally accessible planar waveguide arrays, where 1D light evolution exactly replicates dynamics of arbitrary Hamiltonians, including topologically nontrivial ring configurations.

NTh1A.5 • 09:45
Lattice Solitons Stabilized by Localized Losses in Ring Configurations, Russell Campbell[1], Gian-Luca Oppo[1]; *[1]Univ. of Strathclyde, UK.* A new family of stationary and travelling lattice solitons in cylindrical arrays of optical fibres or Bose-Einstein condensates in ring optical lattices are generated and stabilized by removal of energy in localized positions.

08:30 -- 09:45
BTh1B • Properties: UV writing
Presider: Martin Bernier; Universite Laval, Canada

BTh1B.1 • 08:30 Invited
Fabrication and Applications of Draw Tower Gratings, Manfred W. Rothhardt[1]; *[1]Fiber Optics, Leibniz Inst. of Photonic Technology, Germany.* The paper will highlight some motivation, fabrication and application aspects of FBG created during the drawing process of an optical fiber (DTG).

BTh1B.2 • 09:00
Experimental Demonstration of Real-time correction of writing errors during Fibre-Bragg grating fabrication, Adenowo Gbadebo[1], Elena Turitsyna[1], John Williams[1]; *[1]Aston Univ., UK.* We provide an experimental demonstration of a real-time technique for correcting writing errors during Fibre-Bragg grating fabrication. The corrections are applied as the grating is being written and do not require any additional post-processing.

BTh1B.3 • 09:15
Fiber Bragg Grating Inscription in Endlessly Single Mode Photonic Crystal Fiber Using Direct Write ArF Laser, Desmond Baccini[1], Kevin Cook[2], John . Canning[2], Gary Allwood[1], Graham Wild[3], Steven Hinckley[1]; *[1]Edith Cowan Univ., Australia; [2]Sydney Univ., Australia; [3]School of Engineering, RMIT Univ., Australia.* The inscription of fibre Bragg gratings in endlessly single mode photonic crystal fibre using H2 loading and direct-writing through a phase mask with a 193 nm ArF laser is reported.

BTh1B.4 • 09:30
Fiber Bragg Gratings fabricated using highly detunable Small-spot UV-writing around 1550 nm, Rex Bannerman[1], James C. Gates[1], chris holmes[1], Paolo Mennea[1], Chaotan Sima[1], Peter Smith[1]; *[1]Univ. of Southampton, UK.* We shall present a flexible technique for fabricating fiber Bragg gratings for use around 1550nm. The approach uses small-spot UV-writing on a suspended fiber to achieve highly apodised, chirped gratings with a wide tuning range.

08:30 -- 10:00
ATh1C • Optical Communications and Networks II
Presider: Sergio Leon-Saval; University of Sydney, Australia

ATh1C.1 • 08:30 Invited
Optical Networks for Healthcare, Elaine Wong[1], Pubuduni Maluge Imali Dias[1], Lihua Ruan[1]; *[1]Electrical and Electronic Engineering, Univ. of Melbourne, Australia.* We motivate the evolution of hospital networks from traditional copper to optical, and present solutions combining passive networking, time-wavelength division multiplexing, and predictive resource allocation for the emergence of Tactile Internet.

ATh1C.2 • 09:00 Invited
High Speed Temporal Modulation with Cascaded Fibre Delay Line and Micro-structured Mirrors, Woei Ming Lee[1]; *[1]Australian National Univ., Australia.* We present a novel, compact delay line demonstrating time domain OCT A-line scan rates of up to 40 kHz (theoretical maximum 1.4 MHz) with scan depths of 400 µm (theoretical maximum of 14 mm).

ATh1C.3 • 09:30
Accurate and fast chromatic dispersion estimation for PDM-QPSK optical signals with multiple data rates, Junyu Wei[1], Zhiping Huang[1], Shaojing Su[1], Chunwu Liu[1], jing zhou[1]; *[1]NUDT, China.* We use autocorrelation of signal power waveform to roughly estimate chromatic dispersion and scanning range. Then singular value of signal autocorrelation matrix is utilized to scan in estimated range for accurate value and rate extension.

ATh1C.4 • 09:45
Statistical Analysis of a Communication System Based on the Periodic Nonlinear Fourier Transform, morteza kamalian kopae[1,2], Jaroslaw Prilepsky[2], Sergei K. Turitsyn[2], Son Le[2]; *[1]aston Univ., UK; [2]Aston Inst. of Photonic Technologies, UK.* We analyse the statistical properties of the nonlinear spectrum in optical fiber influenced by ASE noise and show that the Gaussian distribution assumption for the effective noise in nonlinear Fourier domain is valid.

10:00—10:30 • **Coffee Break,** *Foyer*

Ionic — NP

10:30 -- 12:30
NTh2A • Nonlinear Quantum Photonics
Presider: Roberto Morandotti; INRS-Energie Mat & Tele Site Varennes, Canada

NTh2A.1 • 10:30 Invited
Photon pair generation in silicon protected by topology, Bryn Bell[1], Andrea Blanco[1], Matthew J. Collins[2], Mikael Rechtsman[2], Mordechai Segev[3], Benjamin Eggleton[1]; *[1]Univ. of Sydney, Australia; [2]Dept. of Physics, Pennsylvania State Univ., USA; [3]Dept. of Physics, Technion - Israel Inst. of Technology , Israel.* We experimentally demonstrate topological waveguiding of correlated photon pairs generated by four-wave mixing in a bipartite one-dimensional lattice of silicon waveguides.

NTh2A.2 • 11:00
A nonlinear waveguide array with inhomogeneous poling pattern for the generation of photon pairs and its characterization in the quantum and classical regimes, Francesco Lenzini[1], James G. Titchener[2], Sachin Kasture[1], Andreas Boes[3], Alexander Poddubny[4,5], Paul Fisher[1], Ben Haylock[1], Matteo Villa[1], Arnan Mitchell[3], Alexander Solntsev[2], Andrey A. Sukhorukov[2], Mirko Lobino[1]; *[1]Griffith Univ., USA; [2]Australian National Univ., Australia; [3]RMIT Univ., Australia; [4]ITMO Univ., Russia; [5]Ioffe Physical-Technical Inst. of the Russian Academy of Sci. Russia.* We present the realization of an inhomogeneously poled nonlinear waveguide array for the generation of photon pairs. The device is characterized by coincidence counting and a novel method based on reversed sum-frequency generation measurements.

NTh2A.3 • 11:15
Photonic cluster state generation in nonlinear waveguide arrays, James G. Titchener[1], Alexander S. Solntsev[1], Andrey A. Sukhorukov[1]; *[1]Australian National Univ., Australia.* We present a novel approach for all-optically reconfigurable integrated generation of entangled photons in cluster states through spontaneous parametric down-conversion in coupled arrays of quadratic nonlinear waveguides with special poling patterns.

NTh2A.4 • 11:30
Periodic Waveguides for Generation of Engineered Photon-pair States, Sina Saravi[1], Frank Setzpfandt[1], Thomas Pertsch[1]; *[1]Inst. of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität Jena, Germany.* We show the versatility of periodic waveguides in engineering photon-pair states, by proposing a scheme for direct and integrated generation of photon pairs in a counter-propagating spatially-entangled Bell-state, without a need for periodic poling.

NTh2A.5 • 11:45
Towards two-photon interference with a whispering gallery photon pair source, Gerhard Schunk[1,2], Golnoush Shafiee[1,2], Ulrich Vogl[1,2], Dmitry Strekalov[1,2], Alexander Otterpohl[1,2], Florian Sedlmeir[3], Harald G. Schwefel[3], Gerd Leuchs[1,2], Christoph Marquardt[1,2]; *[1]Max Planck Inst. for the Science of Light, Germany; [2]Institut fuer Optik, Information und Photonik, Univ. of Erlangen-Nuremberg, Germany; [3]Dept. of Physics, Univ. of Otago, New Zealand.* Down-converted photons from counterpropagating whispering gallery modes can be used to generate two-photon interference. We present our experimental scheme and discuss the interference visibility in case of backscattering.

Doric — NP

10:30 -- 12:30
NTh2B • Nonlinear Signal Processing
Presider: Alejandro Aceves, Southern Methodist University, USA

NTh2B.1 • 10:30 Invited
Solitary pulses in nanophotonic waveguides, Chad A. Husko[1], Andrea Blanco[2], Simon Lefrancois[2], Benjamin Eggleton[2], Thomas Krauss[3], Matthias Wulf[4], L Kuipers[4], Chee Wei Wong[5], Pierre Colman[6], Sylvain Combrie[7], Alfredo De Rossi[7]; *[1]Argonne National Lab, USA; [2]Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS), School of Physics , Australia; [3]Univ. of York, UK; [4]FOM Inst. AMOLF, Netherlands; [5]Univ. of California - Los Angeles, USA; [6]Institut d'Electronique Fontamentale (IEF),, Universite Paris-Sud, France; [7]Thales Research and Technology, France.* In this talk I focus on nonlinear pulses in nanophotonic semiconductor waveguides. Our time-resolved measurements reveal physical phenomena unique to solitons in a free-carrier medium. We support these results with analytic and numerical models.

NTh2B.2 • 11:00
Nonlinear Beam Shaping with Femtosecond Laser-Induced Volume Phase Holograms in Lithium Niobate, Mousa Ayoub[1], Haissam Hanafi[1], Dennis Niemeier[1], Joerg Imbrock[1], Cornelia Denz[1]; *[1]Inst. of Applied Physics, Germany.* We propose a method for efficient second-harmonic beam shaping in lithium niobate employing volume diffraction holograms induced by femtosecond laser lithography.We demonstrate the generation of SHG vortices with desired topological charges.

NTh2B.3 • 11:15
Sampling and Magnification Technique Based on XPM-Induced Focusing in Normally Dispersive Optical Fibers, Javier Nuño del Campo[2], Marin Gilles[2], Massimiliano Guasoni[1], Christophe Finot[2], Julien Fatome[2]; *[1]Nonlinear Physics Center, Australian National Univ., Australia; [2]Laboratoire Interdisciplinaire Carnot de Bourgogne, UMR 6303 CNRS-Université Bourgogne Franche-Comté, France.* We theoretically and experimentally investigate an all-optical magnification and sampling technique based on a XPM process between an arbitrary signal and an orthogonally polarized sinusoidal pump wave within a normally dispersive optical fiber.

NTh2B.4 • 11:30
Suppression of Pump Beats in Fiber-Based Wavelength Multicast by Backward Raman Amplification, Chaoran Huang[1], Ning Zhang[1], Chester C.T. Shu[1]; *[1]Chinese Univ. of Hong Kong, Hong Kong.* Undesirable pump beats are suppressed by up to 16.8 dB in Raman-assisted one-to-seven wavelength multicast of a QPSK signal. Q factor improvement as large as 4.6 dB is obtained over the output wavelength range.

NTh2B.5 • 11:45
A novel low-loss microstructured antiresonant triangular-core fiber for nonlinear applications, Yang Chen[1], Nicolas Joly[2], Mohammed Saleh[1], Fabio Biancalana[1]; *[1]Heriot-Watt Univ., UK; [2]MPL, Germany.* A novel simple microstructured fiber with a hollow antiresonant triangular-core is designed, which can reach a minimum transmission loss of 0.08 dB/m and dispersion 2.3 ps/km/nm at a wavelength 2.94 microns.

Corinthian — ACOFT

10:30 -- 12:30
ATh2C • Novel Fibre Technology and Applications
Presider: Stephen Madden; Australian National Univ., Australia

ATh2C.1 • 10:30 Invited
Metal Coated Active Fibres for High Power and Lightweight Laser Designs, Jae M. Daniel[1,2], Nikita Simakov[1,3], Alexander Hemming[1], W. Andrew Clarkson[3], John Haub[1]; *[1]Defence Science Technology Group, Australia; [2]Aether Photonics, Australia; [3]Optoelectronics Research Centre, Univ. of Southampton, UK.* We introduce a novel metal coated active fibre design for use in high power fibre laser systems. Comparisons with polymer coated fibres as well as the prospects of kW level power scaling will be discussed.

ATh2C.2 • 11:00
Thermal Drawing of High-Density In-Fiber Arrays of Well-Ordered 5-nm-Diameter Nanowires, Joshua Kaufman[1], Guangming Tao[1], Soroush Shabahang[1], Ayman Abouraddy[1]; *[1]Univ. of Central Florida, USA.* We present a method for fabricating high-density, well-ordered arrays of extended semiconducting nanowires through thermal fiber-drawing. We confirm that 5-nm-diameter continuous nanowires are stably produced through multiple fiber drawing steps.

ATh2C.3 • 11:15
Reversible Photo-Bleaching Effect in Bi/Er Co-Doped Optical Fiber, Mingjie Ding[1], Shu'en wei[1], Yanhua Luo[1], Gang-Ding Peng[1]; *[1]Univ. of New South Wales, Australia.* We observed a reversible photo-bleaching effect in Bi/Er co-doped optical fiber. The bismuth related luminescence could be partially bleached by the irradiation of 830 nm pump, and recovered to original level after stopping irradiation.

ATh2C.4 • 11:30
A New Design of a Circular Photonic Crystal Fiber Supporting 42 OAM Modes, Hu Zhang[1], Wenbo Zhang[1], Lixia Xi[1], Xianfeng Tang[1], Xiaoguang Zhang[1]; *[1]Beijing Univ of Posts & Telecom, China.* A design of a circular photonic crystal fiber supporting 42 OAM modes is presented, with good features of large index contrast without up-doping, the same size of all OAM modes, and good OAM mode quality.

ATh2C.5 • 11:45
Detection of Hydrazine with Pd Nanoparticles Decorated on Silver Nanostructures on a Fiber Optic LSPR Probe, Anisha Pathak[1], Banshi D. Gupta[1]; *[1]IIT Delhi, India.* A fiber optic LSPR sensor has been characterized for the sensing of hydrazine. The probe consists of silver nanostructures for LSPR and palladium nanoparticles for changing response with hydrazine concentration.

Ionic	Doric	Corinthian
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10:30 -- 12:30 NTh2A • Nonlinear Quantum Photonics— Continued

NTh2A.6 • 12:00
Improved accuracy background characterization in a statistically background-free up-conversion at a single-photon level, Ivan Burenkov[2,1], Sergey V. Polyakov[1]; [1]*NIST, USA;* [2]*JQI, Univ. of MD, USA.* We report on more than a ten-fold improvement of the accuracy of background characterization of an efficient parametric up-converter developed for frequency conversion of non-classical light. The uncertainty of this measurement is 0.15 photons/s.

NTh2A.7 • 12:15
Strong collection of Amplified Spontaneous Emission with nematicons, Serena Bolis[1,2], Tersilla Virgili[3], Jeroen Beeckman[2], Pascal Kockaert[1]; [1]*OPERA-Photonics, Université libre de Bruxelles (U.L.B.), Belgium;* [2]*ELIS Dept., Ghent Univ., Belgium;* [3]*IFN-CNR Dipartimento di Fisica, Politecnico di Milano, Italy.* Amplified spontaneous emission (ASE) generated in nematic liquid crystals is efficiently collected by a soliton generated in the same medium. The soliton guides and injects the weakly coherent polarized ASE into an optical fiber.

10:30 -- 12:30 NTh2B • Nonlinear Signal Processing— Continued

NTh2B.6 • 12:00
Controllable non-reciprocity induced by in-band photonic transitions in $\chi^{(2)}$ nonlinear optics, Kai Wang[1], Yu Shi[2], Alexander S. Solntsev[1], Shanhui Fan[2], Andrey A. Sukhorukov[1], Dragomir N. Neshev[1]; [1]*Nonlinear Physics Centre, Research School of Physics and Engineering, The Australian National Univ., Australia;* [2]*Ginzton Lab, Dept. of Electrical Engineering, Stanford Univ., USA.* We demonstrate a controllable non-reciprocity via in-band transitions of photons mediated by second-order parametric nonlinear processes, and propose a dynamic optical isolator based on directional geometric phase-shifts controlled by a single pump.

NTh2B.7 • 12:15
Excitability in laser with injected signal: beyond the pure phase dynamics model, Axel Dolcemascolo[1,2], Bruno Garbin[1,2], Bertrand Peyce[2], Stephane Barland[1,2]; [1]*INLN, France;* [2]*Univ. of Nice Sophia Antipolis, France.* We analyze neuron-like excitability of a laser with coherent forcing beyond the phase model reduction. Contrary to this oversimplified picture, we find resonant and multipulse excitability, opening novel avenues for complex all-optical operations.

10:30 -- 12:30 ATh2C • Novel Fibre Technology and Applications— Continued

ATh2C.6 • 12:00
Micro-displacement detection test using hetero-core fiber optics for thermal strain measurement, Yuya Koyama[1], Michiko Nishiyama[1], Kazuhiro Watanabe[1]; [1]*Soka Univ., Japan.* Micro-displacement measurement using hetero-core fiber optics was demonstrated toward thermal strain measurement. It was confirmed that the micrometers of displacement was successfully detected with the stability for temperature variations.

ATh2C.7 • 12:15
Reflection Induced Noise Analysis of an Air-core Photonic Bandgap Fiber Optic Gyroscope, Zuchen Zhang[1], Xiaobin Xu[1], Ningfang Song[1], Chunxi Zhang[1], Fei Teng[1]; [1]*School of Instrument Science and Opto-electronic Engineering, Beihang Univ., China.* A novel random walk model including the noise induced by reflections of an air-core photonic bandgap fiber optic gyroscope is developed. The correctness of the model has been verified by experiment.

12:30—14:00 • Lunch *(on your own)*

NOTES

Ionic	Doric	Corinthian
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14:00 -- 16:00
NTh3A • Nanolasers, Resonators and Photonic Circuits
Presider: Stephane Barland; Universite de Nice Sophia Antipolis, USA

NTh3A.1 • 14:00 Invited
Spontaneous mirror-symmetry breaking in coupled nanolasers, Alejandro M. Giacomotti, Philippe Hamel, Mathias Marconi, Fabrice Raineri, Ariel Levenson; LPN/CNRS , France. We show spontaneous mirror-symmetry breaking in two coupled photonic crystal nanolasers. A pitchfork bifurcation has been observed with only 150 intracavity photons, which makes this system promising to investigate nonlinear dynamics with few photons.

NTh3A.2 • 14:130
Roundtrip-to-roundtrip evolution of Faraday and Turing instabilities in dispersion oscillating fiber ring resonators, François Copie[1], Matteo Conforti[1], Alexandre Kudlinski[1], Arnaud Mussot[1], Stefano Trillo[2]; *[1]Université Lille 1 Laboratoire PhLAM, France; [2]Dept. of Engineering, Univ. of Ferrara, Italy.* We study the roundtrip-to-roundtrip evolution of the output spectrum of a dispersion modulated passive fiber cavity using real time spectroscopy. Our experiments reveal that Faraday and Turing instabilities can be excited independently or coexist.

NTh3A.3 • 14:45
A Giant Chirp Oscillator at Ultra-low Repetition Rates, Patrick Bowen[1,2], Miro J. Erkintalo[1,2], Richard Provo[2], John D. Harvey[2], Neil Broderick[1,2]; *[1]Dodd Walls Centre of Photonic and Quantum Technologies, New Zealand; [2]Physics, Univ. of Auckland, New Zealand.* A repetition rate of 506 kHz is achieved in an all-fibre laser, mode-locked with a nonlinear amplifying loop mirror. The laser produces 7 nJ pulses with a broad 7.5 nm spectral width, compressible to 540 fs.

NTh3A.4 • 15:00
Efficient and Coherent Conversion of 80 GHz Signals into the Optical Domain Using a Nonlinear Whispering Gallery Mode Resonator, Florian Sedlmeir[5,1], Alfredo Rueda[5,1], Sascha Preu[2], L. Enrique Garcia-Munoz[3], Harald G. Schwefel[4]; *[1]Univ. of Erlangen-Nuremberg, Germany; [2]TU Darmstadt, Germany; [3]Univ. Carlos III of Madrid, Spain; [4]Univ. of Otago, New Zealand; [5]Max Planck Inst. for the Science of Light, Germany.* We present efficient up-conversion of 80 GHz signals into the optical regime utilizing a high-Q dielectric resonator. Since the system is all-resonant and phase-matched, we reach a record power conversion of 6%.

NTh3A.5 • 15:15
Access to acoustic decay time in photonic circuits via Brillouin-based phononic memory, Birgit Stiller[1], Moritz Merklein[1], Khu Vu [2], Stephen Madden[2], Benjamin Eggleton[1]; *[1]Univ. of Sydney, Australia; [2]Research School of Physics and Engineering, Australian National Univ., Australia.* Using the principle of light storage in acoustic waves, we demonstrate the direct measurement of the acoustic decay time in an integrated photonic chip and discuss the relation to the respective Brillouin gain spectrum characterization.

14:00 -- 16:00
BTh3B • Fundamentals: Photosensitivity
Presider: Matthieu Lancry; Universite de Paris Sud, France

BTh3B.1 • 14:00 Invited
Applications Of Parallel Femtosecond Laser Writing Inside Glasses And Observation Of The Dynamics, Masaaki Sakakura[1], Yasuhiko Shimotsuma[1], Naoaki Fukuda[1], Kiyotaka Miura[1]; *[1]Kyoto Univ., Japan.* The method of parallel laser processing with a spatial light modulator, its application and the observation of the stress dynamics after parallel laser irradiation inside a glass will be presented.

BTh3B.2 • 14:30
In Situ Monitoring of Fiber Bragg Grating Evolution During Femtosecond-laser Inscription Process, Cyril Hnatovsky[1], Dan Grobnic[1], Stephen J. Mihailov[1]; *[1]National Research Council of Canada, Canada.* The development and subsequent transformation of a Type I Bragg grating into a Type II Bragg grating in SMF-28 fiber during the femtosecond-laser inscription process is monitored in real time using dark field optical microscopy.

BTh3B.3 • 14:45
Regenerated Gratings Redefined, Somnath Bandyopadhyay[1], Palas Biswas[1], John . Canning[2]; *[1]Fiber Optics Lab, CSIR-Central Glass & Ceramic Research Inst., India; [2]interdisciplinary Photonics Labs, School of Chemistry, Univ. of Sydney, Australia.* The dependency between erasing and subsequent regeneration of a Type-I grating in H_2 loaded standard single mode fiber as a function of T is explored with accelerated annealing.

BTh3B.4 • 15:00
Evidence of Chemical Complexity and Laser-Driven Autocatalysis in Type IA FBGs, George Simpson[2], Kyriacos Kalli[1], John . Canning[3], Amedee Lacraz[1]; *[1]Cyprus Univ. of Technology, Cyprus; [2]Deloitte Touche Tohmatsu, Australia; [3]Univ. of Sydney, Australia.* We observe the first chemical complexity for Type IA FBG growth under prolonged UV laser exposure. Out-of-phase oscillatory behaviour in GeOH/SiOH formation provides evidence of laser-driven autocatalysis and chemical origins for grating formation.

BTh3B.5 • 15:15
Comparison of first and third-order high temperature stable H_2 loaded ultrafast induce FBG's, Sondos A. Alqarni[1], joe habel[2], Martin Bernier[2], Christopher . Smelser[1]; *[1]Carleton Univ., Canada; [2]Laval Univ., Canada.* In this presentation we examine the temperature stability of ultrafast induced first and third-order gratings in hydrogen loaded SMF-28 fiber. We find that third-order devices demonstrate high temperature stability without regeneration.

14:00 -- 16:00
ATh3C • Metamaterials and Micromaterials
Presider: Adrian Carter; Nufern, Australia

ATh3C.1 • 14:00 Invited
Nonlinear Microcavities: from rainbow lasers to frequency combs, Silvia Soria[1], Daniele Farnesi[1,2], Andrea Barucci[1], Giancarlo C. Righini[1,2], Gualtiero Nunzi Conti[1]; *[1]IFAC CNR Nello Carrara API, Italy; [2]Centro Studi e Ricerche "E. Fermi", Italy.* We demonstrate $c^{(3)}$-based nonlinear interactions in silica solid and hollow resonators, consisting in third harmonic generation and Raman assisted TSFG in the visible and broadband hyper-parametric oscillation in forward and backward directions.

ATh3C.2 • 14:30
A Unified Model for Active Multilayer Microsphere Resonators, Shahraam Afshar[1,2], Jonathan Hall[2], Tess Reynolds[2], Matthew Henderson[2], Nicolas N. Riesen[2], Tanya Monro[1,2]; *[1]Univ. of South Australia, Australia; [2]School of Physical Sciences, The Univ. of Adelaide, Australia.* We derive a unified model for calculating the power spectrum and resonance positions of multilayer microsphere resonators. The model may include a dipole in any layer, or a uniform distribution of dipoles resembling an active layer.

ATh3C.3 • 14:45
Random Laser in a Fibre: Guiding and Scattering Contribute to Reduced Threshold, Charlotte Hurot[1,3], Wan Zakiah Wan Ismail[1,2], Judith M. Dawes[1]; *[1]Macquarie Univ., Australia; [2]Science and Technology, IslamicScience Univ., Malaysia; [3]Ecole Centrale de Lyon, France.* A random laser is demonstrated in a hollow-core photonic-crystal optical fibre, with dye solution and dielectric or metallic nanoparticles. The threshold is significantly reduced compared with the bulk solution due to optical guiding and scattering.

ATh3C.4 • 15:00
Far-field subdiffraction imaging using metamaterial fiber, Xiaoli Tang[2,1], Boris Kuhlmey[2], Alessandro Tuniz[2], Simon Fleming[2], Alexander Argyros[2]; *[1]Fudan Univ., China; [2]School of Physics, The Univ. of Sydney, Australia.* We demonstrated far-field subdiffraction imaging at terahertz frequencies using tapered metamaterial fibre. Far field imaging was obtained by utilizing the focusing and magnification capability of the tapered metamaterial fibre.

ATh3C.5 • 15:15
Three-Dimensional Optical Metamaterials with Magnetic Hyperbolic Dispersion, Sergey S. Kruk[1], Zi Jing Wong[2], Ekaterina Pshenay-Severin[1], Kevin OBrien[2], Dragomir N. Neshev[1], Xiang Zhang[2], Yuri Kivshar[1]; *[1]Australian National Univ., Australia; [2]NSF Nanoscale Science and Engineering Center, Univ. of California, USA.* We measure the topological transition between the elliptic and hyperbolic dispersion in a multilayer fishnet metamaterial. In the hyperbolic regime, we demonstrate enhancement of thermal emission, which becomes directional, coherent and polarized.

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14:00 -- 16:00
NTh3A • Nanolasers, Resonators and Photonic Circuits– Continued

NTh3A.6 • 15:30
Nonlinear single sideband microwave to optical conversion using an electro-optic WGM-resonator, Alfredo Rueda[2,3], Florian Sedlmeir[1,3], Michele C. Collodo[4], Ulrich Vogl[2], Birgit Stiller[5], Gerhard Schunk[2,3], Dmitry Strekalov[2], Christoph Marquardt[2], Johannes M. Fink[6], Oskar Painter[7], Gerd Leuchs[2], Harald G. Schwefel[1]; [1]*Univ. of Otago, New Zealand;* [2]*Max Planck Inst. for the Science of Light, Germany;* [3]*SAOT - School of Advanced Optical Technologies, Univ. of Erlangen, Germany;* [4]*ETH Zurich, Switzerland;* [5]*Univ. of Sydney, Australia;* [6]*IST Wien, Austria;* [7]*California Inst. of Technology, USA.* Nonlinear electro-optical conversion of microwave radiation into the optical telecommunication band is achieved within a crystalline whispering gallery mode resonator, reaching 0.1% photon number conversion efficiency with MHz bandwidth.

NTh3A.7• 15:45
Microcavity Raman lasing and sensing application, Bei-Bei Li[1], Xue-Feng Jiang[1], Li Wang[1], Yun-Feng Xiao[1]; [1]*Peking Univ., China.* We demonstrated low-threshold Raman lasing in a slightly deformed microcavity. By monitoring the beat frequency of split-mode microcavity Raman lasers, single nanoparticle detection was experimentally realized.

14:00 -- 16:00
BTh3B • Fundamentals: Photosensitivity– Continued

BTh3B.6 • 15:30
Phase-shifted gratings and negative-index gratings fabricated by 800 nm femtosecond laser overexposure, Jun He[1,2], Yiping Wang[1], Changrui Liao[1], Chao Wang[1], Shen Liu[1], Ying Wang[1], Kaiming Yang[1], Yanhua Luo[2], Gang-Ding Peng[2]; [1]*Key Lab of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, College of Optoelectronic Engineering, Shenzhen Univ., China;* [2]*School of Electrical Engineering and Telecommunications, Univ. of New South Wales, Australia.* Polarization dependent phase-shifted fiber Bragg gratings were first fabricated with 800 nm femtosecond laser overexposure and a uniform phase mask. Negative-index FBGs with enhanced thermal stabilities were further created by thermal regeneration.

BTh3B.7 • 15:45
Dynamics of the Fluorescence Intensity during Fiber Bragg Gratings Inscription in SMF28 and Pure Silica Core Fiber using 800 nm Fs Radiation, Dan Grobnic[1], Cyril Hnatovsky[1], Rune Lausten[1], Stephen J. Mihailov[1]; [1]*SDT, NRC, Canada.* Blue florescence measured during FBG inscription with a fs-IR laser in SMF-28 and pure silica core (PSC) fiber correlates well with type-I grating formation but decreases in Ge-doped fibers and increases in PSC fiber.

14:00 -- 16:00
ATh3C • Metamaterials and Micromaterials– Continued

ATh3C.6 • 15:30
Metamaterial Experiment for Undergraduate Teaching, Simon C. Fleming[1]; [1]*Univ. of Sydney, Australia.* Metamaterials are a hot research topic which has excited significant media interest. A novel undergraduate experiment provides hands-on fabrication of a metamaterial and characterization of diffraction-free propagation.

ATh3C.7 • 15:45
Electric and magnetic response of a coupled dipole-nanofiber system, Shaghik Atakaramians[1], Andrey Miroshnichenko[2], Ilya Shadrivov[2], Tanya Monro[3], Yuri Kivshar[2], Shahraam Afshar[3]; [1]*Univ. of Sydney, Australia;* [2]*Australian National Univ., Australia;* [3]*Univ. of South Australia, Australia.* We demonstrate that a coupled dipole-fiber system can yield electric and magnetic response depending on the orientation of the dipole source with respect to the fiber.

16:00—16:30 • Coffee Break, *Foyer*

NOTES

Ionic	Doric	Corinthian
NP	BGPP	ACOFT

16:30 -- 18:00
NTh4A • Optical Pulse Phenomena
Presider: Fabio Biancalana; Heriot-Watt Univ., UK

NTh4A.1 • 16:30 Invited
Interactions Between Solitons And Dispersive Waves In Photonic Crystal Fibers, Alexandre Kudlinski[1], Matteo Conforti[1], Arnaud Mussot[1]; *[1]Univ. of Lille, France.* We review our work about emission of dispersive waves from solitons and their nonlinear interaction in fibers. Soliton annihilation, solitonization of dispersive waves and trapping of dispersive waves in a solitonic cage will be presented.

NTh4A.2 • 17:00
Heteroclinic Structure of Parametric Resonance in Fibers with Periodic Dispersion, Matteo Conforti[1], Arnaud Mussot[1], Alexandre Kudlinski[1], Simona Rota Nodari[2], Guillaume Dujardin[3], Stephan De Biévre[3], Andrea Armaroli[4], Stefano Trillo[5]; *[1]PhLAM, Univ. Lille, France; [2]IMB, Univesité de Bourgogne, France; [3]Lab. Paul Painlevé, Univ. Lille, France; [4]FOTON, Université de Rennes, France; [5]Univ. of Ferrara, Italy.* We investigate the nonlinear stage of modulational instability in dispersion oscillating fibers in normal dispersion. We unveil a heteroclinic structure leading to the excitability of superbreathers and amplification outside the linear gain band.

NTh4A.3 • 17:15
High-power infrared optical parametric oscillator pumped by a slab laser with nearly uniform rectangular distribution, Xing b. Wei[1], Yuefeng Peng[1], Xingwang Luo[1], Jue Peng[1], Zan Nie[1], Jianrong Gao[1]; *[1]Inst. of Applied Electronics, China.* We present a PPMgOLN optical parametric oscillator pumped by approximate uniform rectangular distribution. Output power of 191.8 W for both the 1.68 µm signal and 2.89 µm idler lasers and 53.2% conversion efficiency were achieved.

NTh4A.4 • 17:30
Conversion efficiency of vector scattering between solitons and dispersive waves, Carlos Mas Arabi[1], Florent Bessin[1], Arnaud Mussot[1], Alexandre Kudlinski[1], Dmitry V. Skryabin[2,3], Matteo Conforti[1]; *[1]PhLAM, Univ. of Lille - CNRS, France; [2]Dept. of Physics, Univ. of Bath, UK; [3]ITMO Univ., Russia.* We predict analytically the generation efficiency of new frequencies produced by the phase-sensitive interaction between a soliton and a dispersive wave. The theoretical results are compared with experiments preformed in a photonic crystal fiber.

NTh4A.5 • 17:45
Nonlinear pulse combining and compression in multi-core fibers with hexagonal lattice, Igor Chekhovskoy[1,2], Alexander Rubenchik[3], Olga V. Shtyrina[1,2], Sergei K. Turitsyn[1,4], Mikhail Fedoruk[1,2]; *[1]Novosibirsk State Univ., Russia; [2]Inst. of Computational Technologies, Russia; [3] Lawrence Livermore National Lab, USA; [4] Aston Univ., UK.* We demonstrate an effective combining and compression using multi-core fibers with a hexagonal lattice numerically. We investigate the optimal operational conditions for maximal combining and compression and analyze a positive chirp influence.

16:30 -- 17:45
BTh4B • Properties: Sensors and Lasers
Presider: Claire Davis; DSTO, Australia

BTh4B.1 • 16:30 Invited
Femtosecond Laser Written Cladding Waveguides And Gratings For 3D Shape Sensing Applications, Christian Waltermann[2,1], Alexander Doering[1], Jan Koch[1], Philip Guehlke[2], Anna Lena Baumann[1,2], Martin Angelmahr[1], Wolfgang Schade[1]; *[1]Fraunhofer Heinrich-Hertz-Inst., Germany; [2]Photonic Inkubator GmbH, Germany.* Fs laser pulses are used to inscribe multiple evanescent coupling waveguides with FBG in the cladding of single mode fibers to create a fiberoptical 3D shape sensor in one production step. An evaluation and a sample application will be presented.

BTh4B.2 • 17:00
Narrow linewidth external cavity diode laser using UV written gratings in an integrated optical fiber platform, Stephen G. Lynch[1], chris holmes[1], Sam A. Berry[1], James C. Gates[1], Alex Jantzen[1], Teresa I. Ferreiro[1], Peter Smith[1]; *[1]Univ. of Southampton, UK.* A Bragg grating written into an attached fiber on a silicon wafer forms an external cavity for a laser diode. We detail the fabrication process and present our latest results in this highly stable platform achieving a Lorentzian linewidth of <14 kHz.

BTh4B.3 • 17:15
Ultrafast Laser Enhanced Rayleigh Scattering Characteristics in D-Shaped Fibers for High-Temperature Distributed Chemical Sensing, Kevin P. Chen[1], aidong yan[1], sheng huang[1], rongzhang chen[1], shuo li[1]; *[1]Univ. of Pittsburgh, USA.* This paper reports Rayleigh scattering enhanced in silica fibers using ultrafast laser irradiations. TiO_2 coated D-shaped fibers with enhanced Rayleigh scattering characteristics was used for distributed hydrogen sensing at 750°C.

BTh4B.4 • 17:30
Fiber Bragg gratings Inscribed in All-silica Suspended-core Photonic Microcells, chao Wang[1]; *[1]College of Optoelectronic Engineering, Shenzhen Univ., China.* We report the inscription of Bragg grating in all-silica suspended-core photonic microcell by using femtosecond laser and phase mask. The grating-embedded microcell could be an idea platform for all-fiber device and sensor applications.

16:30 -- 18:00
ATh4C • Mid-infrared Fibre Sources I
Presider: Stuart Jackson; Macquarie Univ., Australia

ATh4C.1 • 16:30 Invited
New Strategies For Mid-IR Fiber-Based Light Generation, Martin Bernier[1], Vincent Fortin[1], Jean-Christophe Gauthier[1], Louis-Rafael Robichaud[1], Real Vallee[1]; *[1]Universite Laval, Canada.* We present two innovative approaches for efficient light generation in the 2-6 µm band based on nonlinear interaction in mid-infrared transmitting optical fibers.

ATh4C.2 • 17:00
Novel Saturable Absorbers for Short-pulsed Tm:ZBLAN Waveguide Lasers, xiantao Jiang[1], Simon Gross[1], Christoph Wieschendorf[1], Han zhang[2], zhinan guo[2], Fabian Rotermund[3], Dong-Il Yeom[3], Michael J. Withford[1], Alexander Fuerbach[1]; *[1]Physics and Astronomy, Macquarie Univ., Australia; [2]Shenzhen Univ., China; [3]Ajou Univ., Korea.* Novel saturable absorbers using CNTs, graphene, topological insulators, TMDCs and black phosphorus were fabricated and characterized. Their performance for short pulse generation in Tm:ZBLAN waveguide chip lasers was analyzed.

ATh4C.3 • 17:15
Mode-Locked 305 *fs* laser pulses from an Er-Yb-Ce ZBLAN Waveguide Laser, Champak Khurmi[1], George Y. Chen[1], Wenqi Zhang[1], Tanya Monro[1], David G. Lancaster[1]; *[1]Univ. of South Australia, Australia.* Passively mode-locked 305 fs pulses are generated from an Er-Yb co-doped ZBLAN waveguide laser using a semiconductor saturable absorber mirror at a repetition rate of 158.2 MHz and 1556 nm central wavelength.

ATh4C.4 • 17:30
Modelling and optimisation of a dual-wavelength pumped 3.5 µm fibre laser at the watt leve, Andrew Malouf[1], Ori Henderson-Sapir[1], Martin Gorjan[2], David J. Ottaway[1]; *[1]Univ. of Adelaide, Australia; [2]Spectra-Physics, Austria.* A numerical model of a 3.5 µm Er^{3+} doped ZBLAN fibre laser is presented. The model is compared with recent, watt-level experimental results with good agreement.

ATh4C.5 • 17:45
Robust Low-Loss Multimaterial Chalcogenide Fiber for Infrared Applications fabricated by a Hybridized approach, Soroush Shabahang[1], Felix Tan[1], Joshua Perlstein[1], Guangming Tao[1], Oseas Alvarez[2], François Chenard[2], Kenneth Schepler[1], Ayman Abouraddy[1]; *[1]Univ. of Central Florida, CREOL, USA; [2]IRflex Corporation, USA.* A two-step approach to produce robust chalcogenide fibers with <1 dB/m loss across the infrared is introduced. It consists of double-crucible cane fabrication of highly purified chalcogenide-glass combined with multimaterial thermal fiber drawing.

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