4th Workshop on
SPECIALTY OPTICAL FIBERS AND THEIR APPLICATIONS

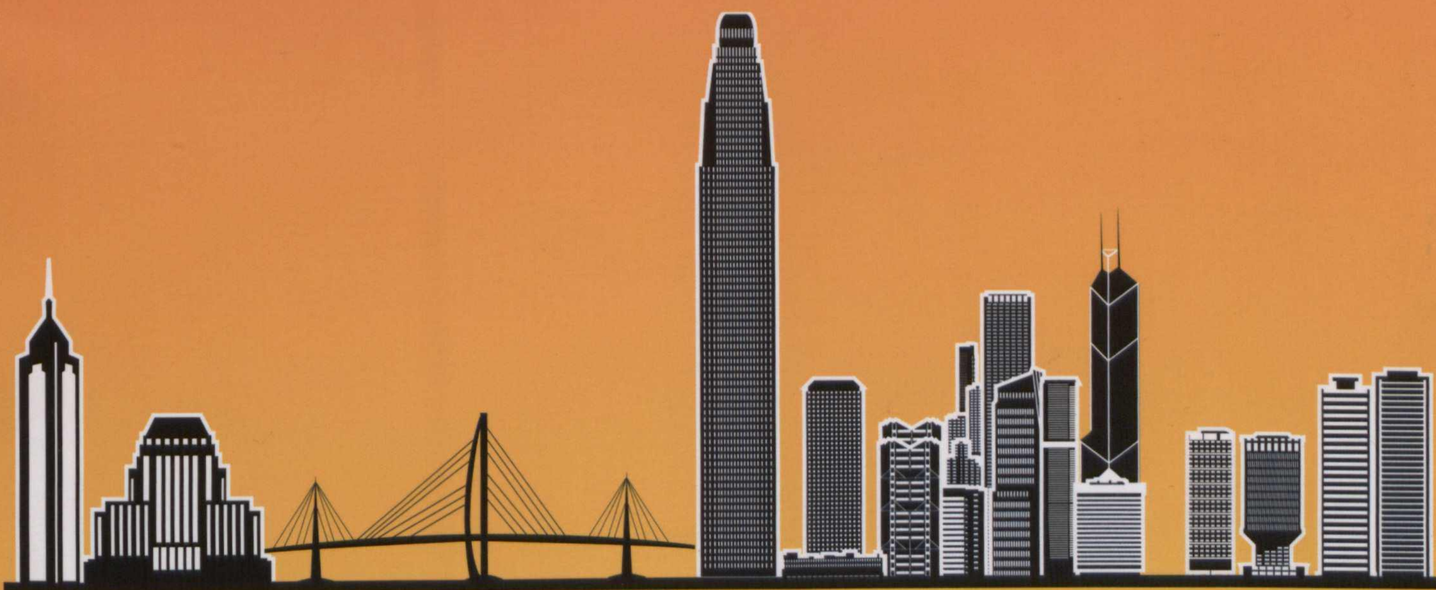
Conference Program

UNESCO
United Nations
Educational, Scientific and
Cultural Organization

INTERNATIONAL
YEAR OF LIGHT
2015

4 - 6 November 2015

Hotel ICON, Hong Kong



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Agenda of Sessions
Hotel ICON, Hong Kong

Tuesday, 3 November	
18:30—21:30	**Welcome Drink**, *Pool Deck*

Wednesday, 4 November	
08:00—08:30	**Registration**
08:30—08:45	**Welcome Remarks**, *Silverbox Ballroom*
08:45—10:05	**WW1A • Recent Achievements in Specialty Optical Fibers**, *Silverbox Ballroom*
10:05—10:35	**Coffee Break in Exhibition Hall**
10:35—12:10	**WW2A • Novel Materials and Functions I**, *Silverbox Ballroom*
12:10—13:40	**Lunch**
13:40—15:20	**WW3A • Novel Materials and Functions II**, *Silverbox Ballroom*
15:20—15:50	**Coffee Break in Exhibition Hall**
15:50—17:40	**WW4A • Non-silica Fibers**, *Silverbox Ballroom*

Thursday, 5 November	
08:00—08:30	**Registration**
08:30—10:20	**WT1A • Fiber Lasers I**, *Silverbox Ballroom*
10:20—10:50	**Coffee Break in Exhibition Hall**
10:50—12:20	**WT2A • Fiber Lasers II**, *Silverbox Ballroom*
12:20—13:50	**Lunch**
13:50—14:55	**WT3A • Nonlinear Effects in Photonic Crystal Fibers**, *Silverbox Ballroom*
14:55—16:15	**WT4A • Poster Session & Coffee Break in Exhibition Hall**
16:15—21:00	**Social Events** **Victoria Harbour Cruise, 16:15 - 18:30** **Conference Dinner at Hotel ICON, 19:00 - 21:00**

Friday, 6 November	
08:00—08:30	**Registration**
08:30—10:10	**WF1A • New Fibers Development,** ***Silverbox Ballroom***
10:10—10:40	**Coffee Break in Exhibition Hall**
10:40—12:05	**WF2A • Hollow Core Fibers and Bragg Fibers,** ***Silverbox Ballroom***
12:05—13:35	**Lunch**
13:35—14:35	**WF3A • New Telecom Applications,** ***Silverbox Ballroom***
14:35—15:35	**Trade Talks**
15:35—16:05	**Coffee Break in Exhibition Hall**
16:05—17:35	**WF4A • Fiber Sensing,** ***Silverbox Ballroom***
17:35—17:45	**Closing Remarks**

Explanation of Session Codes

WF1A.4

Meeting Name

Number
Presentation order within the session

Day of the Week
- W = Wednesday
- T= Thursday
- F = Friday

Series Number
- 1 = First Series of Session
- 2 = Second Series of Session
- 3 = Third Series of Session
- 4 = Fourth Series of Session

Session Designation

Abstracts

Wednesday, 4 November

08:45 -- 10:05
WW1A • Recent Achievements in Specialty Optical Fibers

WW1A.1 • 08:45 (Plenary)
Special or Specialty Optical Fibres?, David N. Payne[1]; *[1]Univ. of Southampton, UK.* As well as their well-known functions in telecommunications, special fibres enable applications as diverse as sensors, high-power lasers and imaging. What are the challenges and where to next?

WW1A.2 • 09:45 (Invited)
Pushing the limits in the fabrication and properties of soft glass and silica optical fibers, Heike Ebendorff-Heidepriem[1]; *[1]Univ. of Adelaide, Australia.* This paper reviews progress in the fabrication of optical fibers made from novel glasses and/or exhibiting new structures. These fibers push the boundaries in materials and optical properties for laser, nonlinearity and sensing applications.

10:35 -- 12:10
WW2A • Novel Materials and Functions I
Presider: Jacques Albert; Carleton Univ., Canada

WW2A.1 • 10:35 (Invited)
New Materials and Functions - Novel Fibre Materials and Fabrication Methods, John Ballato[1], Peter Dragic[2]; *[1]Clemson Univ., USA; [2]Univ. of illinois Urbana Champaign , USA.* Recent advances in the fabrication of optical fibres have opened the door to a myriad of novel compositions, hence performance attributes. This paper highlights compositions and characteristics of novel molten core-derived silica-based fibres.

WW2A.2 • 10:55 (Invited)
Semiconductor Optical Fibers, Anna C. Peacock[1], Fariza Suhailin[1], Li Shen[1], Natasha Vukovic[1], Sakellaris Mailis[1], Noel Healy[1]; *[1]Univ. of Southampton, UK.* We review the recent advancements in the fabrication and application of semiconductor optical fibers. Particular focus is placed on novel materials and device designs for use in optical signal processing systems.

WW2A.3 • 11:15 (Invited)
Metamaterial Fibres, Simon C. Fleming[1], Alexander . Argyros[1], Juliano G. Hayashi[1], Shicheng Xue[1], Geoff Barton[1], Boris Kuhlmey[1]; *[1]Univ. of Sydney, Australia.* Fibre drawing is a versatile micro- and nano-fabrication process which we have applied to manufacture of metamaterials, demonstrating engineered permittivity and permeability, and fabricating a hyperlens. Prospects for extending this approach will be discussed.

WW2A.4 • 11:35 (Invited)
Miniature Slow Light Delay Lines and Buffers: A Review, Misha . Sumetsky[1]; *[1]Aston Inst. of Photonic Technologies, Aston Univ., UK.* Miniature planar waveguide and fiber-based delay lines and buffers including slow light resonant structures and devices are reviewed.

WW2A.5 • 11:55
Tm^{3+}-doped Large Core Silica Fiber Fabricated by the Nanoporous Glass, Yu Yang[1], Luyun Yang[1], Yingbo Chu[1], Yunxiu Ma[1], lei liao[1], jinggang peng[1], jinyan li[1], yingbin xing[1]; *[1]Wuhan National Lab for Optoelectr, USA.* Tm^{3+} doped double cladding fiber with large core diameter was prepared through sintering nanoporous silica glass. The concentration of Tm^{3+} is up to 6000ppm . The Tm^{3+} ions distributed uniformly in the size of 30/400μm.

13:40 -- 15:20

WW3A • Novel Materials and Functions II

Presider: Claude Aguergaray; Alphanov, France

WW3A.1 • 13:40 (Invited)

New functions and materials - multimaterial fibers in biology and nanotechnology, Lei Wei[1]; *[1]Nanyang Technological Univ., Singapore.* Multimaterial fiber devices are fabricated from materials with disparate optical, electronic, and mechanical properties using scalable preform-to-fiber processing. Here we present recent progress in fiber-neuron interface and the fabrication of structured nanoparticles.

WW3A.2 • 14:00 (Invited)

Liquid and Metallic Nanowires in Fibers: A Novel Base for Nanophotonics and Optofluidics, Markus Schmidt[1,2]; *[1]Leibniz Inst. of Photonic Technology, Germany; [2]Otto Schott Inst. of Material Research, Germany.* Liquid and metallic nanowires inside microstructured optical fibers provide new functionalities for various fields such as plasmonics and biophotonics. Here I review our results on spiraling plasmons, nanoparticle tracking and coherent mid-IR light generation.

WW3A.3 • 14:20

Fabrication of planar waveguides in oxyfluoride glass-ceramics by simple heat-treatment, Kummara Venkata Krishnaiah[2,3], Yannick Ledemi[1], Raman KASHYAP[2,3], Younes Messaddeq[1]; *[1]COPL, Univ Laval, Canada; [2]The Fabulas Lab, 2Dept. of Engineering Physics, Canada; [3]Dept. of Electrical Engineering Polytechnique Montreal, Canada.* Planar waveguides were fabricated by heat-treatment of oxyfluoride glasses. The formation of transparent nanocrystallized layers of 1 to 5 micrometers thickness with an increased refractive index was evidenced during the ceramization treatments applied on the glass.

WW3A.4 • 14:35

Novel Wearable RF Textile-Integrated Antennas Made from Multi-Material Fibers, Stepan Gorgutsa[1], Mazen Khalil[1], Victor Bélanger-Garnier[1], Jeff Viens[1], Benoit Gosselin[2], Sophie Larochelle[2], Younes Messaddeq[1]; *[1]COPL, Canada; [2]Univ. Laval, Canada.* In this work, we present the emissive performance of wearable radio-frequency (RF) textiles made from multi-material fibers, for body area network applications through ISM (2.4 GHz) bands.

WW3A.5 • 14:50

Ytterbium-doped oxyfluoride nano-glass-ceramic fibers for laser cooling, Kummara Venkata Krishnaiah[1,2], Yannick Ledemi[1], Elton Soares de Lima Filho[2,3], Galina Nemova[2,3], Younes Messaddeq[1], Raman KASHYAP[2,3]; *[1]COPL, Univ Laval, Canada; [2]Dept. of Engineering Physics, École Polytechnique de Montréal, Canada; [3]Dept. of Electrical Engineering, École Polytechnique de Montréal, Canada.* Ytterbium doped oxyfluoride nano-glass-ceramic optical fibers were fabricated using two different techniques: the crucible technique (direct-melt process) and by preform drawing. The structural and photoluminescence properties have been characterized for their potential in laser cooling.

WW3A.6 • 15:05

Yb^{3+} doped large core silica fiber based on glass phase-separation technology, Luyun Yang[1], Yingbo Chu[1], Yu Yang[1], Nengli Dai[1], jinyan li[1], Yunxiu Ma[1]; *[1]Wuhan National Lab for Optoelectronics, China.* We report on the preparation and optical characteristics of an Yb^{3+} doped large core silica fiber with the active core prepared by glass phase-separation technology.

15:50 -- 17:40

WW4A • Non-silica Fibers

Presider: John Ballato; Clemson Univ., USA

WW4A.1 • 15:50 (Invited)

Smart Fibers for Sensing, Shahraam Afshar, Tanya Monro[1]; *[1]Univ. of South Australia, Australia.* We present a new class of optical fibers which allow electrical and chemical, in addition to optical, functionalities to be combined in one device providing an ideal platform for sensing applications.

WW4A.2 • 16:10

Chalcogenide Glass Fiber Tape, Yannick Ledemi[2], Jerome Lapointe[1], Steeve Morency[2], Ye-Jin Yu[2], Younes Messaddeq[2], Raman Kashyap[1]; [1]*Polytechnique de Montreal, Canada;* [2]*Canada Excellence Research Chair in Photonic Innovations, COPL, Univ. of Laval, Canada.* Meter long lengths of chalcogenide glass fiber tape with a thickness of 300 microns and an aspect ratio of ~10:1, have been fabricated by a double crucible technique for the first time to the authors' knowledge.

WW4A.3 • 16:25

Indium Fluoride Glass Fibers for Mid-Infrared applications, Mohammed Saad[1], Robert Pafchek[1], Paul Foy[1], Zack Jiang[1], David Gardner[1], Patrick Hawkins[1]; [1]*Thorlabs Inc, USA.* Abstract: Indium fluoride fibers have a wide transmission window from 0.3 to 5.5 micron. This opens the door to new applications, in aerospace, supercontinuum sources, and spectroscopy and fiber lasers. We report multimode and single mode indium fluoride glass fibers with good optical attenuation.

WW4A.4 • 16:40

Hollow Core Antiresonant Fibers in Borosilicate Glass, Walter Belardi[1], Nicholas White[1], Joris Lousteau[1], Xian Feng[1], Francesco Poletti[1]; [1]*Optoelectronics Research Centre, Univ. of Southampton, UK.* We report the first hollow-core optical fibers made of low quality borosilicate glass. Their negligible material absorption loss stemming from ultralow mode-glass overlap opens up the prospect of using cheap glasses in the optoelectronics industry.

WW4A.5 • 16:55 (Tutorial)

New Trends in POF for Telecommunications, Yasuhiro Koike[1]; [1] *Keio Photonics Research Institute, Japan.* As the new era of 4K/8K displays has arrived, tremendously high bit-rate transmission is needed. However, the metal interfaces are not suitable for its EMI problem and bulkiness. High-Speed GI-POF has been attracting a great deal of attention as a strong candidate as the new interface owing to the intrinsic properties of polymer.

Thursday, 5 November

08:30 -- 10:20

WT1A • Fiber Lasers I

Presider: Heike Ebendorff-Heidepriem; Univ. of Adelaide, Australia

WT1A.1 • 08:30 (Invited)
Hollow-core Fiber Gas Lasers, William J. Wadsworth[1], Adrain L. love[1], Jonathan C. Knight[1]; *[1]Dept. of Physics, Univ. of Bath, UK.* Hollow core optical fibers offer the opportunity to re-imagine gas lasers in a compact and flexible form. Discharge pumped atomic gas lasers take advantage of the favourable characteristics of narow discharges, without diffraction problems.

WT1A.2 • 08:50 (Invited)
Novel Fibers for High Performance Lasers and Amplifiers, Michalis Zervas[1]; *[1]Optoelectronics Research Centre, Univ. of Southampton, UK.* We review the main active and passive fiber designs for generation and delivery of high average/peak power in current fiber laser systems. Mitigation strategies of nonlinear effects and issues related to transverse modal instabilities will be discussed.

WT1A.3 • 09:10 (Invited)
Thulium and Holmium Doped Fibre Lasers for 2 μm Applications, Alexander Hemming[2], Nikita Simakov[2], John Haub[2], Adrian Carter[1]; *[1]Nufern, Australia; [2]Cyber and Electronic Warfare Division, Defence Science and Technology Organisation, Australia.* We will present recent results on thulium fibre lasers and their application to pumping fibre and solid-state based holmium-doped lasers and amplifiers. Resonantly pumped holmium-doped silica fibre devices utilising these pump sources will be discussed.

WT1A.4 • 09:30 (Invited)
Bismuth-doped Optical Fibers: Advances and New Developments, Evgeny M. Dianov[1], Sergei V. Firstov[1], Mikhail A. Melkumov[1]; *[1]Russian Academy of Sciences, Russia.* Recent results on luminescence properties of various Bi-doped fibers, the nature of Bi-related NIR emitting centers and the development of efficient Bi-doped fiber laser and optical amplifiers are presented.

WT1A.5 • 09:50
Diode Pumped Bi-doped Fiber Laser Operating at 1360nm, Naresh Kumar Thipparapu[1], Andrey A. Umnikov[1], Saurabh Jain[1], Pranabesh Barua[1], Jayanta K. Sahu[1]; *[1]Univ. of Southampton, UK.* Bi-doped phosphosilicate fibers are fabricated by MCVD-solution doping technique under different oxidation conditions.Fibers are evaluated for unsaturable loss and laser performance.A 22mW all-fiber Bi-laser is demonstrated at 1360nm by LD pumping at 1267nm.

WT1A.6 • 10:05
Tm^{3+} or Ho^{3+} Doped Fluorotellurite Microstructure Fiber for 2μm Lasing, Chuanfei Yao[1], Zhixu Jia[1], Shunbin Wang[1], Chunfeng He[1], Guanshi Qin[1], Weiping Qin[1]; *[1]Jilin Univ., China.* Tm^{3+} (or Ho^{3+})-doped fluorotellurite microstructured fibers are fabricated by using a rod-in-tube method. By using resonance pumped method, all-fiber lasing at 1896nm and 2074nm are obtained from Tm^{3+} or Ho^{3+}-doped fluorotellurite microstructured fibers, respectively

10:50 -- 12:20

WT2A • Fiber Lasers II

Presider: Walter Margulis; Acreo Swedish ICT AB, Sweden

WT2A.1 • 10:50 (Invited)
Ultra Large Mode Area Fibres with Aperiodic Cladding Structure for High Power Fibre Lasers, Philippe Roy[1,2], Romain DAULIAT[1,3], Aurelien Benoit[1,2], Dia Darwich[1,2], Jens Kobelke[3], Kay Schuster[3], Stephan Grimm[3], François Salin[4], Raphaël Jamier[1,2]; *[1]Universite de Limoges, France; [2]Xlim-CNRS, France; [3]Leibniz Inst. of Photonic Technology, Germany; [4]EOLITE Systems, France.* This communication presents the latest designs, fabrication steps and first results of large mode area fibres with aperiodic cladding structure for high power singlemode emission. Pre-compensation of thermal loading and first laser emission are detailed.

WT2A.2 • 11:10 (Invited)
Advances in Integration of Photonic Crystal Fibers in High-power Fiber Laser, *Claude Aguergaray* [1]; [1]*Alphanov, France.* Amongst others, we present a fully monolithic 40µm core, Yb-doped photonic-crystal-fiber amplifier module producing up to 210W average power at 1064nm in thermally controlled packaging, showing excellent peak-to-peak stability (<1%fluctuations) over 25 days at >100W.

WT2A.3 • 11:30 (Invited)
High Pulse Energy Stable Wave-break Soliton in a Long Ring-cavity Fiber Laser, Xijia Gu[1], Jiaqi Zhou[1]; [1]*Dept. of Electrical and Computer Engineering,, Ryerson Univ., Canada.* We demonstrated an all-fiber 50-nJ pulse energy dissipative soliton laser mode-locked by a nonlinear amplified loop mirror (NALM). Further increasing NALM pump power leads to stable twin-solitons separated in tenth of ns in every round-trip.

WT2A.4 • 11:50
High-power Efficient Yb-doped Fiber Laser with Low Quantum Defect, Guancheng Gu[1], Zhengyong Liu[2], fanting Kong[1], Hwa Yaw Tam[2], ramesh shori[3], Liang Dong[1]; [1]*Holcombe Dept. of Electrical and Computer Engineering, Clemson Univ., USA;* [2]*Dept. of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong;* [3]*SPAWAR System Center,, USA.* Using an ytterbium-doped-phosphosilicate double-clad leakage channel fiber with ~50µm core and ~420µm cladding, we have achieved ~70% optical-to-optical efficiency at 1018nm. The much larger cladding enables use of high-power low-brightness diodes, a key for efficient kW operation.

WT2A.5 • 12:05
High Power Performance of Rod Fiber Amplifiers, Mette M. Johansen[1], Mattia Michieletto[1,2], Torben Kristensen[2], Thomas T. Alkeskjold[2], jesper Laegsgaard[1]; [1]*Danmarks Tekniske Universitet, Denmark;* [2]*NKT Photonics, Denmark.* An improved version of the DMF rod fiber is tested in a high power setup delivering 360W of stable signal power. Multiple testing degrades the fiber and transverse modal instability threshold from >360W to ~290W.

13:50 -- 14:55
WT3A • Nonlinear Effects in Photonic Crystal Fibers
Presider: Kyunghwan Oh; Yonsei Univ., South Korea

WT3A.1 • 13:50 (Invited)
Novel Microstructured Fibres for Supercontinuum Generation, Xin Jiang[1], Nicolas Joly[2,1], Fehim Babic[1], Rafal Sopalla[1], Rui Song[3], Joris Lousteau[4,5], Daniel Milanese[5], John C. Travers[1], Philip S. Russell[1,2]; [1]*Max-Planck-Inst. for the Science of Light, Germany;* [2]*Dept. of Physics, Univ. of Erlangen-Nuremberg, Germany;* [3]*College of Optoelectronic Science and Engineering, National Univ. of Defense Technology, China;* [4]*Optoelectronic Research Centre, Univ. of Southampton, UK;* [5]*Inst. of Materials Physics and Engineering DISAT, Politecnico di Torino, Italy.* We report recent progress on the fabrication of photonic crystal fibre from ZBLAN and tellurite glasses and their application to generating broadband supercontinua.

WT3A.2 • 14:10 (Tutorial)
Nonlinear Effects in Novel Photonic Crystal Fibers, Nicolas Joly[2,1]; [1]*Universität Erlangen-Nürnberg, Germany;* [2]*Max-Planck-Inst Physik des Lichts, Germany.* We present recent nonlinear experiments realized in various types of solid-core and hollow-core photonic crystal fibers pumped with ultrashort pulses. Applications include UV-tunable source, multi-octave supercontinuum, and generation of correlated twin beams for quantum optics.

14:55 -- 16:15
WT4A • Poster Session

WT4A.1 • Core-to-core Crosstalk Management as an Instrument for Constructing Multicore Fiber Based Devices, Lukasz Szostkiewicz[1], Anna Ziolowicz[1,2], Marek Napierala[3,5], Lukasz Ostrowski[1], Dawid Budnicki[3], Beata Bienkowska[3], Michalina Jozwik[3], Anna Pytel[3], Mariusz Makara[3], Krzysztof Poturaj[4], Pawel Mergo[4], Tomasz Nasilowski[3]; [1]*Polish Centre For Photonics and Fibre Op, Poland;* [2]*Warsaw Univ. of Technology, Faculty of Physics, Poland;* [3]*Inphotech Ltd., Poland;* [4]*Lab of Optical Fibre Technology, Maria Curie-Sklodowska Univ., Poland;* [5]*Inst. of Applied Physics, Military Univ. of Technology, Poland.* We present multicore fiber based elements created by fine crosstalk management. We show all fiber 1x7 power splitter and WDM splitter.

WT4A.2 • Higher order modes management in hole-assisted fibers, Anna Ziolowicz[1,5], Michal Szymanski[2], Lukasz Ostrowski[2], Marek Napierala[1,3], Marta Filipowicz[1], Krzysztof Poturaj[4], Mariusz Makara[1], Pawel Mergo[4], Tomasz Nasilowski[1]; *[1]InPhoTech, Poland; [2]Polish Centre For Fibre Optics and Photonics, Poland; [3]Inst. of Applied Physics, Military Univ. of Technology, Poland; [4]Faculty of Chemistry, Maria Curie-Sklodowska Univ., Poland; [5]Faculty of Physics, Warsaw Univ. of Technology, Poland.* We present an approach to crosstalk limitation and higher order modes suppression in multicore hole-assisted fibers. Our designed and fabricated fiber is compliant with singlemode fiber standards, hence can be utilized in space division multiplexing.

WT4A.3 • Five-core Fiber for Astronomy Spectrometer Application, Chen Gongdai[1], Yang Jing[1], Chunying Guan[1], Libo Yuan[1], Hua Bai[2], Xiangqun Cui[2]; *[1]College of Science, Harbin Engineering Univ., China; [2]Chinese Academy of Sciences Inst. of Optical Technology, Nanjing Astronomical Observatory, China.* A novel special five-core fiber with one star-image transmission core centrally and four direction guiding cores around proposed to realize star-image guiding alignment, f-ratio matching, consistent transmission and accurate connection and control in the LAMOST.

WT4A.4 • Asymmetric Very Large Mode Area Fiber with Enhanced Higher Order Mode Delocalization, Zeinab S. Eznaveh[1], Jose E. Antonio-Lopez[1], Gisela Lopez-Galmiche[1], James Anderson[1], Axel Schulzgen[1], Rodrigo Amezcua Correa[1]; *[1]CREOL, Univ. of Central Florida, USA.* A novel very-large-mode-area asymmetric rod-type fiber was fabricated and experimentally characterized. The fiber supports effective and robust single-mode operation for a core diameter of 66μm making it attractive for high power amplifier systems.

WT4A.5 • Side Firing Microstructured Optical Fiber for Surgical Applications, Jose E. Antonio-Lopez[1], Ori Weisberg[2], Moshe Eshkol[2], Axel Schulzgen[1], Rodrigo Amezcua Correa[1]; *[1]CREOL, USA; [2]Asymmetric Medical , Israel.* A novel microstructered optical fiber is presented. The fiber design allows the light to be concentrated to only one side by bending the fiber, enabling simple and intuitive use of the fiber in surgical procedures.

WT4A.6 • 3D Bending Sensor Combining Multicore Fiber with a Mode-Selective Photonic Lantern, Amy Van Newkirk[1], Amado M. Velázquez-Benítez [1], Jose E. Antonio-Lopez[1], Jacques Albert[2], Rodrigo Amezcua Correa[1], Axel Schulzgen[1]; *[1]CREOL, the College of Optics and Photonics, Univ. of Central Florida, USA; [2]Dept. of Electronics, Carleton Univ., Canada.* A bending sensor is demonstrated using the combination of a mode-selective photonic lantern and a multicore fiber, for simultaneous measurements of bending direction and radius of curvature.

WT4A.7 • Fabrication and properties of a new class of Chromium doped nano-phase separated Yttria-Alumina-Silica glass core optical fiber, Debjit Dutta[1], Anirban Dhar[1], Alexander Kiryanov[2], SHYAMAL DAS[1], Sandip Bysakh[1], Mukul Paul[1]; *[1]CSIR-Central Glass and Ceramic Research, India; [2]Centro de Investigaciones en Optica, Mexico.* Fabrication of chromium doped optical fiber within nano-phase separated yttria-alumina-silica glass core through Modified Chemical Vapor Deposition (MCVD) process with solution doping technique followed by thermal annealing is presented with their material and optical characterization.

WT4A.8 • Background Attenuation of Al-doped Fibers Produced with Vapor Phase Doping Technique, Stanislav Čampelj[1], Luka Perpar[1], Peter Lukan[1], Janko Štajner[1], Aljaz Ramšak[1], Andraz Lenardič[1], Borut Lenardic[1]; *[1]Optacore d.o.o., Slovenia.* The influence of Al concentration on the background attenuation of alumosilicate fibers produced with vapor phase doping technique were investigated. Preforms were produced using CDS-03 chelate system. Background losses were reduced to 2dB/km at 1200nm.

WT4A.9 • Focused Ion Beam Structuring of Exposed-Core Microstructured Optical Fibers, Stephen Warren-Smith[1], Ricardo M. André[1,2], Jan Dellith[1], Manfred Rothhardt[1], hartmut bartelt[1]; *[1]Leibniz Inst. of Photonic Technology, Germany; [2]INESC Porto and Dept. of Physics and Astronomy, Faculty of Sciences, Univ. of Porto, Portugal.* Focused ion beam milling has been employed to create micro-structured features onto an exposed-core microstructured optical fiber. Here we detail results for fabricating and characterizing Fabry-Perot cavities using this method.

WT4A.10 • Optical properties of Tm^{3+}-doped microstructure fiber fabricated by plasma non-chemical vapor deposition, Changming xia[1], Guiyao Zhou[1], Jiantao liu[1], wei zhang[1], ying han[1], jinhui yuan[1]; *[1]Guangdong provincal key Lab of nanophotonic functional materials and devices, South china normal Univ., China.* The optical properties and fabrication technology of Tm^{3+} doped microstructure fibers based on a new fabrication process of plasma non-chemical vapor deposition in our lab are detailedly analyzed.

WT4A.11 • Yb 3+ doped three-core photonic crystal fiber prepared by porous glass for high power, Yingbo Chu[1], Yu Yang[1], Yingbo Wang[1], Xiang Shen[1], Nengli Dai[1], Haiqing Li[1], jinggang peng[1], jinyan li[1], Luyun Yang[1], Yunxiu Ma[1]; [1]*Wuhan National Lab for Optoelectronics, China.* A new type of Yb3+ doped three cores photonic crystal fiber based on porous glass realizes the high doped rare earth and obtain single mode transmission and equal field amplitude in all the active cores.

WT4A.12 • All-fiber Tunable Devices Based on Photonic Crystal Fibers with Integrated Electrodes, Pedro Torres[1], Erick Reyes-Vera[1,2], Yamile Cardona-Maya[1], Nelson D. Gómez-Cardona[1,2]; [1]*Universidad Nacional de Colombia, Colombia;* [2]*Instituto Tecnológico Metropolitano, Colombia.* Photonic crystal fibers with integrated electrodes are a promising technology to actively control light inside a fiber. Here, we report on the birefringence properties of this specialty fiber and present an all-fiber tunable multifunctional device.

WT4A.13 • Yb-doped Pedestal Aluminosilicate Fiber through Vapor Phase Doping for High Power Laser Applications, Maitreyee Saha[1], Sourav Das Chowdhury[1], Atasi Pal[1], Mrinmay Pal[1], Ranjan Sen[1]; [1]*Central Glass & Ceramics Res Inst, India.* Presenting fabrication process and characteristics of large core Yb–doped optical fibers with pedestal design using vapor phase doping technique. Preforms have uniform step–index profiles. Fibers exhibit good optical properties, suitable for high power laser applications.

WT4A.14 • Er^{3+} doped low-hydroxyl fluorotellurite microstructured fibers for 2.7 μm laser applications, Zhixu Jia[1], Chunfeng He[1], Chuanfei Yao[1], Shunbin Wang[1], Guanshi Qin[1], Weiping Qin[1]; [1]*Jilin Univ., China.* We developed a novel Er^{3+}-doped low-hydroxyl fluorotellurite microstructured fiber (EDFTMF) and demonstrated intense emissions at ~2.7 μm from a 5 cm long EDFTMF with the excitation of a 980 nm laser for the first time

WT4A.15 • Optical Frequency Comb Generation from a Bismuth-Based Actively Mode-Locked Fiber Ring Laser, Yutaka Fukuchi[1], Hiroki Shirane[1]; [1]*Tokyo Univ. of Science, Japan.* We demonstrate widely wavelength-tunable and ultra-flat optical frequency comb generation from an actively mode-locked short-cavity laser employing a short-length bismuth-oxide-based nonlinear erbium-doped fiber. A 10GHz-spaced frequency comb with a 10dB bandwidth of 250GHz is generated.

WT4A.16 • Optically tunable monolayer graphene saturable absorber for the control of pulsed fiber laser operation, Jinhwa Gene[1], Hwan Seong Jeong[2], Nam Hun Park[2], Sun Young Choi[2], Fabian Rotermund[2], Dong-Il Yeom[2], Byoung Yoon Kim[1]; [1]*Physics, KAIST, South Korea;* [2]*Dept. of Physics and Dept. of Energy Systems Research, Ajou Univ., South Korea.* We propose a tunable in-line saturable absorber through the optical control of monolayer graphene transferred onto the side-polished fiber. The nonlinear saturable absorption of graphene significantly changes with applied optical power, resulting in various pulsed laser operations in a fiber laser.

WT4A.17 • Radiation-Hardened Co-Doped Optical Fiber for High-Power 1.5µm Amplifier, Emmanuel Pinsard[1], Arnaud Laurent[1], Thierry Robin[1], Benoit Cadier[1]; [1]*iXBLUE, France.* We present the performances of a 10W output power optical amplifier operating at 1.5µm under gamma irradiation. For a total dose of 100krad, a limited gain variation of -0.012dB/krad under gamma-radiation has been observed.

WT4A.18 • Stability study of ultra-long Random distributed feedback fiber laser based on Erbium fiber, Iñaki A. Litago[1], María Ángeles Quintela[1], Hany S. Roufael[1], Jose-Miguel Lopez-Higuera[1]; [1]*Univ. of Cantabria, Spain.* A stability study of an ultra-long Random distributed feedback fiber laser (RDF-FL) is presented in this paper. Stable typical random laser radiations for 50 km to 300 km of SMF cavity lengths at given pump powers has been achieved.

WT4A.19 • Stable at High Temperatures LPG's Inscribed by a Femtosecond Fiber Laser, Hany S. Roufael[1], Antonio Quintela[1], Mauro Lomer[1], Jose-Miguel Lopez-Higuera[1]; [1]*Universidad de Cantabria, Spain.* Femtosecond laser inscribed LPGs stable at high temperatures are presented. The LPGs are written in the cladding of standard monomode optical fiber, near to the core. The achieved devices have been experimentally tested at extremely high temperatures proving their remarkable stability even at 1000ºC

WT4A.20 • Specklegram interference fiber sensing, Mauro Lomer[1], Luis Rodriguez-Cobo[1], Iñaki Aporta[1], Jose Miguel Lopez-Higuera[1]; [1]*Universidad de Cantabria, Spain.* Experimental results from interference between the speckle patterns generated by multimode fibers are presented. This scheme can increase the multiplexing capability of fiber specklegram sensors by encoding extra perturbations within the fringes resulting from the Michelson interferometer.

WT4A.21 • A Tunable All-Fiber Laser Based on a Stress-Optic Phase Modulator and a Chirped Fiber Bragg Grating, Zhangwei Yu[1,2], Micke Malmström[1], Oleksandr Tarasenko[2], Walter Margulis[1,2], Fredrik Laurell[1]; *[1]Dept. of Applied Physics, Royal Inst. of Technology (KTH), Sweden; [2]Dept. of Fiber Optics, Acreo Swedish ICT AB, Sweden.* A tunable single-wavelength Erbium-doped all-fiber laser was experimentally demonstrated. The tuning is obtained with a stress-optic phase modulator based on a twin-hole fiber and a chirped fiber Bragg grating in a medium birefringence fiber.

WT4A.22 • Pockels Fibers by Optical Poling, Isabel C. Carvalho[3], Oleksandr Tarasenko[1], Alexandre Camara[4], Joao M. Pereira[3], Walter Margulis[1,2]; *[1]Acreo Swedish ICT AB, Sweden; [2]Applied Physics, Royal Inst. of Technology, Sweden; [3]Physics, Pontificia Universidade Catolica do Rio de Janeiro, Brazil; [4]Instituto de Fisica, Universidade Estadual do Rio de Janeiro, Brazil.* Silica fibers with internal electrodes biased with HV are poled when simultaneously excited by green light. The chi2 induced measured through the Pockels effect at 1.55 μm reaches ~0.11 pm/V. Poling and erasure are studied.

WT4A.23 • A microspherical resonator embedded inside a microstructured optical fiber taper, Maria-Georgia Konstantinou[1], Kyriaki Kosma[1], Walter Margulis[2], Stavros Pissadakis[1]; *[1]FORTH-IESL, Greece; [2]Dept. of Fiber Photonics, ACREO, Sweden.* The integration of a microspherical whispering gallery mode (WGM) resonator inside a microstructured optical fiber taper is demonstrated. Preliminary WGM spectra of this in-fiber resonator in transmission mode are presented and discussed.

WT4A.24 • Octave-spanning spectrum of mode-locked Er-doped fiber laser at 208MHz repetition rate in a dispersion-varying tellurite microstructured fiber, Fang Wang[1], Zhixu Jia[1], Chuanfei Yao[1], Shunbin Wang[1], Guanshi Qin[1], Changfeng Wu[1], Weiping Qin[1]; *[1]Jilin Univ., China.* We demonstrated the generation of the octave-spanning spectrum from 800 to >2400 nm in a dispersion-varying-tellurite-microstructured-fiber pumped by an Er-doped fiber laser with a repetition rate of 208MHz and a pulse width of 71 fs

WT4A.25 • Ho^{3+}/Yb^{3+} co-doped Tellurite glasses and fibers for 1.2 μm laser applications, Shunbin Wang[1], Zhixu Jia[1], Chuanfei Yao[1], Chunfeng He[1], Guanshi Qin[1], Weiping Qin[1]; *[1]Jilin Univ., China.* Intense 1.2 μm fluorescence was observed in Ho^{3+}/Yb^{3+}co-doped tellurite glasses under the pump of a 915 nm LD. A relative gain of ~6.7 dB at 1176 nm was obtained from a Ho^{3+}/Yb^{3+}co-doped tellurite microstructured fiber

WT4A.26 • Carbon nanotube modified optical fiber surface with novel coating method for non-linear and SPR application, yang zhang[1]; *[1]Physics, Dalian Univ. of technology, China.* Carbon nanotube deposition with dipping method on gold-coated optical fiber sensors has been proposed and demonstrated. The effects of carbon nanotubes on polarization-dependent coupling of light from the fiber to the coating and on the resulting refractometric sensor properties are investigated.

WT4A.27 • Type IIa Bragg gratings formed in active fibers, Yang Ran[1], Fu-Rong Feng[1], Bai-Ou Guan[1]; *[1]Jinan Univ., China.* Type IIa gratings are formed in active fibers. The forming efficiency relies on the core diameter and the numerical aperture of the fiber. The proposed grating can be used as laser reflector with high temperature resistance.

WT4A.28 • A Novel Optical Microfiber Device Based on Mesoporous SiO_2 Nanospheres Arrays, Mingfei Ding[1], Yunyun Huang[1], Bai-Ou Guan[1]; *[1]Jinan, China.* A novel optical microfiber device based on Ag@mesoSiOnnanospheres coated fiber taper is presented.And the combination of the special selectivity film and compact fiber shows good prospect in sensing, drug delivering and so on.

WT4A.29 • High sensitive thrombin protein detection using a plasmonic tilted fiber grating biosensor, Tuan Guo[1]; *[1]Jinan Univ., China.* Plasmonic fiber-optic biosensor composed of a tilted fiber grating and nanometric coating has been proposed. *In-situ* thrombin protein detection with the detectable concentration of 1 μM has been experimentally achieved.

WT4A.30 • *In-situ* protein detection based on cut-off mode monitoring of a tilted fiber Bragg grating biosensor, Jian Xu[1], Xuejun Zhang[1], Linzi Han[1], Liu Fu[1], Tuan Guo[1], Bai-Ou Guan[1]; *[1]Jinan universuty, China.* **Tilted fiber Bragg grating biosensor with refractive index sensitivity up to ~2000 dB/RIU over the range of 1.33 and 1.34 RIU has been demonstrated. In-situ protein detection with concentration of 2.5 uM has been achieved.**

WT4A.31 • High sensitive thrombin protein detection using a plasmonic tilted fiber grating biosensor, Linzi Han[1], Ze Wu[1], Xuejun Zhang[1], Qiangqiang Fu[1], Jian Xu[1], Yong Tang[1], Tuan Guo[1], Bai-Ou Guan[1]; [1]*Jinan Univ., China.* Plasmonic fiber-optic biosensor composed of a tilted fiber grating and nanometric coating has been proposed. In-situ thrombin protein detection with the detectable concentration of 1 μM has been experimentally achieved.

WT4A.32 • In-situ glucose detection in human serum using a plasmonic tilted fiber grating with etched silver coating, Xuejun Zhang[1], Ze Wu[2], Jian Xu[1], Linzi Han[1], Qiangqiang Fu[2], Yong Tang[2], Tuan Guo[1], Bai-Ou Guan[1]; [1]*Jinan Univ., Inst. of Photonics Technology, China;* [2]*Jinan Univ., Guangdong Province Key Lab of Molecular Immunology and Antibody Engineering, China.* In-situ glucose detection in human serum has been achieved by using a silver-coated plasmonic tilted fiber grating. The concentration of the glucose is proportional to the etching rate and monitored by the SPR attenuation.

WT4A.33 • Design of Fundamental Mode Filter based on Long-Period Grating Fiber, Ming-Yang Chen[1], Jin Wei[1]; [1]*Inst. of Opt-Electronics and Communication Technologies, Jiangsu Univ., China.* A long-period fiber grating(LPFG) that can selectively filter the fundamental mode in few-mode optical fiber is proposed. By applying a appropriate chosen surrounding material and an apodized configuration, high fundamental mode loss can be achieved.

WT4A.34 • Stable Operation of All-Optical Fibre Photoacoustic Sensors, LIN Yuechuan[1,2], Wei Jin[1,2], JUN Ma[1], Chao Wang[1], Fan Yang[1,2], Hoi Lut Ho[1,2]; [1]*The Dept. of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong;* [2]*The Hong Kong Polytechnic Univ. Shenzhen Research Inst., China.* Stable operation of graphene-diaphragm fiber-tip photoacoustic gas sensor is achieved by using a modified Sagnac interferometer. Detection limit of 1.5 ppm C_2H_2 in N_2 is demonstrated and system stability is <0.4 dB over 6 hours.

WT4A.35 • Collimated Fibers with Bragg Gratings for Strain Sensing of Rapidly Rotating Mechanical Structures, Garry Berkovic[1], Shlomi Zilberman[1], Ehud Shafir[1], Yair Saadi[1], Ohad Mazor[1], Tal Goichman[1]; [1]*Soreq Nuclear Research Center, Israel.* Standard single mode fibers terminated with small diameter collimators are coupled to fiber Bragg gratings to demonstrate a generic approach for optical strain measurement in rapidly rotating structures which does not require optical ingress via the central rotation axis.

WT4A.36 • Long-Period Fiber Grating Inscribed in a Suspended-core Fiber by Femtosecond Laser Pulses, Yufeng Zhang[1,2], Yongqin Yu[1,2], Shuangchen Ruan[1,2], Chenlin Du[1,2], Wen Zhou[1,2]; [1]*College of Optoelectronic Engineering, Shenzhen Univ., China;* [2]*Shenzhen Key Lab of Laser Engineering, China.* A long-period fiber grating (LPFG) was inscribed in suspended-core fiber by femtosecond laser. The LPFG was insensitive to surrounding refractive index, and the sensitivities to temperature and strain were 4.8 pm/°C and -1.65 pm/με, respectively.

WT4A.37 • High Temperature Sensing head based on 45° Tilted Fiber End Fabricated by Femtosecond Laser in Thin Core Fiber, zhou wen[1,2], Yongqin Yu[1,2], Shuangchen Ruan[1,2], Yufeng Zhang[1,2]; [1]*Shenzhen Key Lab of Laser Engineering, Shenzhen Univ., China;* [2]*College of Optoelectronic Engineering, Shenzhen Univ., China.* A compact fiber sensing head based on 45° tilted fiber end in thin core fiber (TCF) for high temperature sensing is fabricated by femtosecond laser using line-scanning method.

WT4A.38 • Bent Optical Fiber Bragg Grating Embedded in PDMS for Vertical Compression Load Sensor, Luo Niu[1], Chi Chiu Chan[1], Pui Wah Kong[2], Li Han Chen[1]; [1]*Nanyang Technological Univ., Division of Bioengineering,School of Chemical and Biomedical Engineering, Singapore;* [2]*Nanyang Technological Univ., Physical Education and Sports Science Academic Group, National Inst. of Education, Singapore.* In this letter, a bent FBG embedded in Polydimethylsiloxane (PDMS), is proposed to measure vertical compression load. Experiments show that the sensitivity is as high as 16.9 pm/N in the range of 0-350N.

WT4A.39 • Fiber Optic pH Sensor Based on Electrostatically Self-Assembled Polymer Multilayer, Raghunandhan Ravikumar[1], Li Han Chen[2], Chi Chiu Chan[1], Zhi Qiang Tou[2], Zu Peng[2]; [1]*Nanyang Technological Univ., Singapore;* [2]*Energy Research Inst. @ NTU, Singapore.* A novel fiber optic pH sensor functionalized with electrostatically self-assembled (ESA) multilayers of chitosan(CH) and poly(acrylic acid)(PAA) has been implemented. Sensitivity of 0.7471 nm/pH was observed in the linear pH range of (2.86-6.86).

WT4A.40 • PDMS Film Coated Fiber Volatile Organic Compounds Sensor, Xiangping Ning[1,2], Li Han Chen[3], Chun Liu Zhao[1], Chi Chiu Chan[2]; [1]*Inst. of Optoelectronic Technology, China Jiliang Univ., China;* [2]*School of Chemical and Biomedical Engineering, Nanyang Technological Univ., Singapore;* [3]*Energy Research Inst. @NTU, Nanyang Technological Univ., Singapore.* A novel fiber volatile organic compounds (VOCs) sensors by using the swelling behavior of the poly (dimethylsiloxane) (PDMS) have been proposed. The sensors was fabricated by coating PDMS on a fiber Fabry-Perot interferometer end-face.

WT4A.41 • Surface Plasmon Biosensor Based on a D-shaped Microstructured Optical Fiber with Rectangular Lattice, Lu Peng [1], Fukun Shi[1], Guiyao Zhou[1], Shu Ge[1], Zhiyun Hou[1], Changming Xia[1]; [1]*South China Normal Univ. , China.* We investigate the coupling characteristics of two structures via finite element method (FEM). It indicates that the influence on sensor sensitivity caused by birefringence at d_1=0.8and the polarization by embedded ethanol is almost similar.

WT4A.42 • Non-contact Micro Vibration Measurement System Based on Non-equilibrium Optical Fiber Michelson Interferometer, Jie Zhang[1], Zhenguo Jing[1], Chuanqi Xing[1], Wei Peng[1]; [1]*Dalian Univ. Of Technology, China.* In this paper, a non-equilibrium optical fiber Michelson interferometer is used to realize non-contact micro vibration measurement. The frequency response range of 10~300Hz and the displacement resolution of 2nm in vibration are realized.

WT4A.43 • A DNA Sensitive Biosensor in Weak Acid Condition based on Graphene Functional Taper Interferometer, Bo Yu[1]; [1]*Inst. of Photonics Technology, Jinan, China.* A high sensitivity biosensor in weak acid environment based on graphene coated taper interferometer is presented. The biosensor demonstrates improved DNA concentration sensitivity of 0.84 nm/log M and lower detection limit of 1 pM. **OCIS codes:** (060.2370) Fiber optics sensors;(310.0310)Thin films.

Friday, 6 November

08:30 -- 10:10

WF1A • New Fibers Development

Presider: Wei Jin; The Hong Kong Polytechnic Univ., Hong Kong

WF1A.1 • 08:30 (Invited)
Playing Cellular Golf in Microstructured Fibres, Sebastián Estcheverry[1,2], Aziza Sudirman[3], Fredrik Laurell[2], Walter Margulis[1,2]; *[1]Dept. of Optical Fibers, Acreo Swedish ICT AB, Sweden; [2]Dept. of Applied Physics, Royal Inst. of Technology, Sweden; [3]Cobolt AB, Sweden.* We illuminate particles in a solution using fibers with cladding holes. Particles sufficiently near the fiber tip and with the correct optical signature are collected into the holes with good specificity, mimicking cell-collection for diagnostics.

WF1A.2 • 08:50 (Invited)
Low-temperature Manufacture of Optical Fibres, Gilberto Brambilla[1], Lieke Van Putten[1]; *[1]Univ. of Southampton, UK.* Optical fibres are usually pulled from preforms at temperatures in the range 1900-2200 C. As some materials are unsuitable to be pulled at high temperatures, a method to draw fibres at temperatures as low as 1300C has been developed.

WF1A.3 • 09:10 (Invited)
Anderson Localization Fibres, Arash Mafi[1,2]; *[1]Dept. of Physics & Astronomy, Univ. of New Mexico, USA; [2]Center for High Technology Materials, Univ. of New Mexico, USA.* Recent advances in the theoretical and experimental understanding of disordered Anderson localization optical fibers are reviewed, potential applications are explored, and challenges in the fundamental understanding, design and optimization, fabrication, and device implementation are discussed.

WF1A.4 • 09:30 (Invited)
Rare Earth Doped Fiber Lasers Based on Zeolite Method, Yasushi Fujimoto[1]; *[1]Inst. of Laser Engineering, Osaka Univ., Japan.* A unique functional optical silica glass fabrication method, zeolite method, is described. Zeolite method is very useful to make very short-length fiber with high rare-earth concentration, which implies the next generation's optical fibers.

WF1A.5 • 09:50 (Invited)
Soft Glass Highly Nonlinear Optical Fibers and their Applications, Yasutake Ohishi[1], Tonglei Cheng[1], Lei Zhang[1], Tong Hoang Tuan[1], Takenobu Suzuki[1]; *[1]Research Center for Advanced Photon Technology, Toyota Technological Inst., Japan.* We report on a recent progress of soft glass microstructured optical fiber research. Performance of supercontinuum and optical parametric oscillator by exploiting the degenerate four-wave mixing parametric amplification will be presented.

10:40 -- 12:05

WF2A • Hollow Core Fibers and Bragg Fibers

Presider: Yasutake Ohishi; Toyota Technological Inst., Japan

WF2A.1 • 10:40 (Invited)
Hollow core fibers for optically pumped mid-IR fiber lasers, Jonathan C. Knight[1], Rosdi Hassan[1], fei Yu[1], William J. Wadsworth[1]; *[1]Univ. of Bath, UK.* We report on demonstration of low-loss hollow-core fibers for the 3-5 μm spectral range formed from silica, and how they can be used to form the basis of a convenient, inexpensive and scalable mid-IR fiber laser.

WF2A.2 • 11:00 (Invited)
Hollow/Annular Core Fibres, Kyunghwan Oh[1]; *[1]Yonsei Univ., South Korea.* A composite silica-air fiber with a one hole and one ring core is reviewed in terms of its unique waveguide structure, modal properties and applications in various photonic devices. Adiabatic mode transformation along the hollow optical fiber provides versatile in-line fiber optic applications. In contrast, concatenation of coreless silica fiber and fiber lens provides fiber-optic Fourier transformation for efficient Bessel beam generation.

WF2A.3 • 11:20
Combining Fluid Dynamics and Electromagnetics Modelling to Improve Hollow Core Photonic Band Gap Fibres, Greg T. Jasion[1], Eric R. Numkam Fokoua[1], John S. Shrimpton[2], David J. Richardson[1], Francesco

Poletti[1]; [1]*Optoelectronics Research Centre, Univ. of Southampton, UK;* [2]*Faculty of Engineering and the Environment, Univ. of Souothampton, UK.* We combine two powerful simulation tools to predict geometry and optical properties of Hollow Core Photonic Band Gap fibres from their preform and draw parameters. Broad parametric sweeps allow identifying structures with optimum optical performance.

WF2A.4 • 11:35
High-power picosecond pulse delivery through hollow core photonic band gap fibers, Mattia Michieletto[1,2], Mette M. Johansen[1], Jens Kristian Lyngsø[2], Jesper Laegsgaard[1], Ole Bang[1], Thomas T. Alkeskjold[2]; [1]*Technical Univ. of Denmark, Denmark;* [2]*NKT Photonics Inc, Denmark.* We demonstrated robust and bend insensitive fiber delivery of high power pulsed laser with diffraction limited beam quality for two different kind of hollow core photonic band gap fibers.

WF2A.5 • 11:50
Very Large Mode Area Pixelated Bragg Fibers, Yves Quiquempois[1], Jean-Paul Yehouessi[1], Olivier Vanvincq[1], Geraud Bouwmans[1], Andy cassez[1], Laurent Bigot[1]; [1]*Univ. of Lille, France.* Generalized half-wave-stack condition combined with well-chosen hetero-structured cladding is used to design and realize scalable single-mode pixelated Bragg fibers with mode field diameter as large as 60 μm.

13:35 -- 14:35

WF3A • New Telecom Applications

Presider: Jonathan Knight; Univ. of Bath, UK

WF3A.1 • 13:35 (Invited)
Multicore Fibers, Axel Schulzgen[1], Amy Van Newkirk[1], James Anderson[1], Guillermo Salceda-Delgado[1], Zeinab S. Eznaveh[1], Jose E. Antonio-Lopez[1], Cen Xia[1], Guifang Li[1], Roy G. van Uden[2], Frans M. Huijskens[2], Hugo de Waardt[2], Ton A. Koonen[2], Chigo Okonkwo[2], Rodrigo Amezcua Correa[1]; [1]*CREOL, The College of Optics and Photonics, Univ. of Central Florida, USA;* [2]*COBRA Research Inst., Dept. of Electrical Engineering, Eindhoven Univ. of Technology, Netherlands.* Recent advances in fiber technology enable the fabrication of multi-core fibers tailored for various applications. Examples of multi-core fibers for ultra-high-density spatial division multiplexing in communications and for high temperature sensor applications will be presented.

WF3A.2 • 13:55 (Invited)
Multicore EDFA, Yukihiro Tsuchida[1]; [1]*Furukawa Electric, Japan.* Multicore EDFA has been recently investigated toward a realization of space division multiplexing. We introduce a technology necessary for cladding-pumped MC-EDFA with batch amplification and demonstrate its low power consumptioin characteristics.

WF3A.3 • 14:15 (Invited)
Ultrafast laser inscription of 3D components for spatially multiplexed telecommunications, Robert R. Thomson[1]; [1]*Inst. of Photonics and Quantum Science, Heriot Watt Univ., UK.* I will review the work that has been carried out using ultrafast laser inscription as a fabrication route to realize three-dimensional integrated fan-outs, photonic lanterns and mode-multiplexers for future applications in space-division multiplexed telecommunications.

14:35 - 15:35

Trade Talks

Presider: Alexis Mendez; MCH Engineering, LLC, USA

14:35 – 14:55
Making glass survive where no glass has ever gone before – the challenge of using optical fibers in harsh environments', Chris Emslie, Fibercore

14:55 - 15:15
Latest advances on specialty fiber probes for medical and sensing applications, Baishi Wang, Vytran LLC

15:15 - 15:35
Complex Assemblies Using Specialty Optical Fibers, Devinder Saini, Fiberguide

16:05 -- 17:35

WF4A • Fiber Sensing

Presider: Xijia Gu; Ryerson Univ., Canada

WF4A.1 • 16:05 (Invited)

Lab-on-fiber Devices, Jacques Albert[1]; *[1]Carleton Univ., Canada.* High sensitivity biochemical sensors based on the ability to control the amplitude, phase velocity, and polarization of the evanescent field of cladding-guided modes at near infrared wavelengths in standard single mode fibers will be described.

WF4A.2 • 16:25 (Invited)

Optical Fibers in Medicine: Biophotonics at Work, David D. Sampson[1,2]; *[1]School of Electrical, Electronic & Computer Engineering, Univ. of Western Australia, Australia; [2]Centre for Microscopy, Characterisation & Analysis, The Univ. of Western Australia, Australia.* Optical fibers are widely used in medicine and biology for routine tasks such as beam delivery and video endoscopy, to more advanced systems such as nonlinear endoscopy and the Microscope-in-a-Needle platform. This talk will review basic principles and survey state-of-the-art applications.

WF4A.3 • 16:45 (Invited)

Coatings for Harsh Environment Applications of Optical Fibers, Andrei A. Stolov[1], Jacob A. Wrubel[1], Jie Li[1], Michael Hines[1]; *[1]OFS Fitel LLC, USA.* The paper reviews types of coatings used in specialty optical fibers with an emphasis on application at harsh conditions, including low and elevated temperatures, hot steam, high pressure, immersion in liquids and hydrogen-rich environments.

WF4A.4 • 17:05

Femtosecond Laser Inscription of Bragg and Complex Gratings in Low-Loss Polymer and Silica Optical Fibers, Kyriacos Kalli[1]; *[1]Electrical Engineering, Cyprus Univ. of Technology, Cyprus.* The development of Bragg and superstructure gratings in coated glass and low-loss polymer optical fibers, using a femtosecond laser, is reported. The femtosecond laser operates in the green, which offers greater inscription efficiency.

WF4A.5 • 17:20

Fabrication of regenerated grating using carbon dioxide laser, Kok-Sing Lim[1], Man-Hong Lai[1], Dinusha Gunawardena[1], Harith Ahmad[1]; *[1]Universiti Malaya, Malaysia.* Grating regeneration using CO_2 laser has been demonstrated. Bragg wavelength redshifts as the irradiated laser power is elevated. The grating reflectivity begins to decay as the induced temperature is approaching the erasure temperature. The grating is completely erased and regenerated afterward.