PGC 2023 PROGRAM

Stockholm, Sweden
August 21-23

PHOTONICS GLOBAL CONFERENCE 2023

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Welcome to PGC 2023

Dear Participants,

Welcome to the Photonics Global Conference 2023 (PGC 2023) in Stockholm, Sweden! We are thrilled to have you join us from August 21 to 23, 2023, at the prestigious KTH AlbaNova Campus.

PGC 2023 is a groundbreaking event supported by Royal Institute of Technology, Southern University of Science and Technology, RISE, Stockholm City Hall, and the Chinese Society of Optical Engineering. This conference serves as a dynamic platform for renowned experts, scholars, and industry professionals worldwide to showcase their innovative ideas, methodologies, theories, and visions for the future of photonics.

Photonics, as a rapidly evolving science, has revolutionized various aspects of modern technology and industry. Through the study and application of light, we have achieved remarkable advancements, including faster communication, precise sensing, efficient energy utilization, and breakthroughs in medical and biotechnological fields. At PGC 2023, we aim to explore further possibilities and foster continued growth in these areas.

We welcome international academics, researchers, practitioners, and students to actively participate, contributing to the broader and deeper applications of photonics.

The special event "Women-in-STEM" is sponsored by the IEEE Photonics Society Sweden Chapter.

Lastly, we would like to give a special thanks to City Hall, as the reception will be generously hosted by the City of Stockholm in the beautiful and renowned City Hall.

Conference Committee

International Conference Photonics Global Conference (PGC 2023)

Committees

General Chairs

Perry Shum
Southern University of Science and Technology, China

Xiaodan Pang
KTH Royal Institute of Technology, Stockholm, Sweden

Chunyong Yang
South-Central Minzu University, China

Zabih Ghassemlooy
Northumbria University, UK

Oskars Ozolins
RISE Research Institutes of Sweden, Stockholm, Sweden

Program Chairs

Rui Lin
Chalmers University of Technology, Gothenburg, Sweden

Rafael Puerta
Ericsson, Stockholm, Sweden

Yating Wan
King Abdullah University of Science & Technology, Saudi Arabia

Sergei Popov
KTH Royal Institute of Technology, Stockholm, Sweden

Vjaceslavs Bobrovs
Riga Technical University, Latvia

Local Organizing Committee Chairs

Max Min Yan
KTH Royal Institute of Technology, Stockholm, Sweden

Yuchuan Fan
RISE Research Institutes of Sweden, Sweden

Yan-Ting Sun
KTH Royal Institute of Technology, Stockholm, Sweden

Jun Gao
KTH Royal Institute of Technology, Stockholm, Sweden

Committees

Track Chairs

Track 1: Semiconductor And Integrated Optical Devices

Track Chair(s):

Jianguo Liu
Institute of Semiconductors, CAS, China
Yuefei Cai
Southern University of Science and Technology, China
Richard Schatz
Southern University of Science and Technology, China

Track 2: Optical Subsystems, Systems and Networks

Track Chair(s):

Freddy Hongyan Fu
Tsinghua University, China
Jianqiang Li
LightsAI Solution, USA
Qirui Huang
Huawei International Pte Ltd, China
Xijia Zheng
Google LLC, Sunnyvale, CA, USA

Track 3: Silicon Photonics

Track Chair(s):

Wei Jiang
Nanjing University, China
Jianji Dong
Huazhong University of Science and Technology, China

Track 4: Microwave Photonics

Track Chair(s):

Hao Hu
Technical University of Denmark, Denmark
Xianbin Yu
Zhejiang University, China
Zixiong Wang
Tianjin University, China
Lei Deng
Huazhong University of Science and Technology, China

Track 5: Advanced Materials for Photonics

Track Chair(s):

Xiaolong Chen
Southern University of Science and Technology, China
Mingyu Zhang
Harbin Institute of Technology, Shenzhen, China
Jinshui Miao
University of Chinese Academy of Sciences, China
Kai Wang
Southern University of Science and Technology, China
Aung Ko Ko Kyaw
Southern University of Science and Technology, China

Track 6: Biophotonics and Optical Biomedicine

Track Chair(s):

Junle Qu
Shenzhen University, China
Sihua Yang
South China Normal University, China
Aaron Ho-Pui Ho
The Chinese University of Hong Kong, China
Kai Wang
Southern University of Science and Technology, China
Gina Chen
Southern University of Science and Technology, China

Track 7: Fiber-Based Technologies and Applications

Track Chair(s):

Sze Y. Set
The University of Tokyo, Japan
Yiyang Luo
Chongqing University, China
Wenjun Ni
South-Central Minzu University, China
Dajuan Lyu
Yangtze Optical Fibre and Cable Joint Stock Limited Company (YOFC), China

Track 8: Plasmonics and Metamaterials

Track Chair(s):

Qingfeng Zhang
Southern University of Science and Technology, China
Yanjun Liu
Southern University of Science and Technology, China
Longqing Cong
Southern University of Science and Technology, China

Track 9: Optical Sensors and Systems

Track Chair(s):

Changyuan Yu
The Hong Kong Polytechnic University, China
Zhiyong Zhao
Huazhong University of Science and Technology, China

Conference Venue

KTH AlbaNova Campus

Roslagstullsbacken 21, Stockholm, Sweden

CONFERENCE ROOMS:

Level	Meeting Room	August 21	August 22	August 23
3F	FA32			★
4F	FR4		★	★
4F	FB41	★	★	★
4F	FB42			★
5F	FB51	★	★	
5F	FB54		★	
5F	FB55		★	★

★KTH will arrange for participants to travel together by bus from AlbaNova to City Hall for the "Reception" around 17:55 on August 22.

★Proviant Albano Address: Albanovägen 24, 114 19 Stockholm House 2, floor 4

Presentation Guideline

Oral Presentation

- The duration of an invited speech is 25 minutes, for normal presentation slot is 15 minutes. Please target your lecture for a duration of about 10 minutes for the presentation plus about 5 minutes for questions from the audience.
- Your punctual arrival and active involvement in each session will be highly appreciated.
- Get your presentation PPT or PDF files prepared and backed up.
- Laptops, projector & screen, laser sticks will be provided by the conference organizer.

Poster Presentation

- It's expected that at least one author stands by the poster for (most of the time of) the duration of the poster session. This is essential both to present your work to anyone interest in it and to make sure that your presence is verified by committee.

Security

- Please ensure that you take your belongings with you at all times when leaving a room. Do not leave bags or laptops unattended.

Name Badge

- For security purposes, delegates, speakers, exhibitors and staff are required to wear their name badge to all sessions and social functions. Entrance into sessions is restricted to registered delegates only. If you misplace your name badge, please replace at the registration counter.

Agenda Overview

Sign-in & Conference Materials Collection	August 21, 2023 09:00-17:00 Venue: 5F of AlbaNova

August 21, 2023 | Monday		
Time	**Activity**	**Room**
14:00-17:20	**Workshop on Advanced Optical Imaging Technologies** **Chair:** **Liangcai Cao,** Tsinghua University, China	FB41
	Workshop on Illuminating Wireless: The Emergence of VLC and FSO in the 6G Era **Chair:** **Xiaodan Pang,** KTH Royal Institute of Technology, Sweden	FB51
19:00-	**VIP Reception**	Proviant Albano

August 22, 2023 | Tuesday		
Time	**Activity**	**Room**
	Opening Ceremony **Chair:** **Xiaodan Pang,** KTH Royal Institute of Technology, Sweden	
09:00-09:20	**Welcome Address** **Oskars Ozolins,** KTH Royal Institute of Technology, Sweden **Opening Speech** **Perry Shum,** Southern University of Science and Technology, China	FR4
	Award Ceremony	
	Plenary / Keynote Speech **Chair:** **Rui Lin,** Chalmers University of Technology, Sweden	
09:20-10:00	**Speech Title: On Challenges and Opportunities When LEDs "go nano"** **Lars Samuelson,** Inst. of Nanoscience & Applications, SUSTech, Shenzhen, China / Hexagem AB, Ideon Science Park, Lund, Sweden / NanoLund, Lund University, Lund, Sweden	FR4
10:00-10:40	**Speech Title: The Way Towards Flexible Optical Networks** **Lena Wosinska,** Chalmers University of Technology, Sweden	

August 22, 2023 | Tuesday		
Time	**Activity**	**Room**
	Plenary / Keynote Speech **Chair: Rafael Puerta,** Ericsson	
10:40-11:20	**Speech Title: Dye-free Bond-Selective Imaging at the Same Sensitivity of Fluorescence Microscopy** **Ji-Xin Cheng,** Boston University Photonics Center, USA	FR4
11:20-12:00	**Speech Title: Scaling Capacity, Density, and Energy in Optical Communications: From Ultra-Long-Haul to Chip-to-Chip** **Peter J. Winzer,** Nubis Communications, USA	
12:00-13:30	**Lunch Break**	Proviant Albano
13:30-15:35	**Session 1:** Semiconductor and Integrated Optical Devices-Part I	FB51
	Session 2: Optical Subsystems, Systems and Networks-Part I	FB41
	Session 3: Advanced Materials for Photonics-Part I	FB55
	Session 4: Silicon Photonics-Part I	FB54
15:35-15:50	**Break**	Foyer
15:50-17:45	**Session 5:** Optical Sensors and Systems-Part I	FB51
	Session 6: Optical Subsystems, Systems and Networks-Part II	FB41
	Session 7: Fiber-Based Technologies and Applications-Part I	FB55
	Session 8: Microwave Photonics	FB54
19:00-	**Reception**	City Hall

August 23, 2023 | Wednesday		
Time	**Activity**	**Room**
09:00-10:30	**Session 9:** Semiconductor and Integrated Optical Devices-Part II	FA32
	Session 10: Optical Subsystems, Systems and Networks-Part III	FB55
	Session 11: Fiber-Based Technologies and Applications-Part II	FB41
	Session 12: Plasmonics and Metamaterials-Part I	FB42
10:30-10:45	**Break**	Foyer
10:45-12:00	**Session 13:** Semiconductor and Integrated Optical Devices-Part III	FA32
	Session 14: Optical Subsystems, Systems and Networks-Part IV	FB55
	Session 15: Advanced Materials for Photonics-Part II	FB41
	Session 16: Biophotonics and Optical Biomedicine	FB42
12:00-14:00	**Women-in-STEM**	FR4
	Award Ceremony	
14:00-15:15	**Session 17:** Optical Sensors and Systems -Part II	FA32
	Session 18: Optical Subsystems, Systems and Networks-Part V	FB55
	Session 19: Advanced Materials for Photonics-Part III	FB41
	Session 20: Silicon Photonics-Part II	FB42
15:15-15:30	**Break**	Foyer
15:30-17:35	**Session 21:** Plasmonics and Metamaterials-Part II	FA32
	Session 22: Optical Subsystems, Systems and Networks-Part VI	FB55
	Session 23: Fiber-Based Technologies and Applications-Part III	FB41

Plenary / Keynote Speaker

Conference Room	FR4	Time	09:20-10:00, August 22, 2023

Lars Samuelson

Inst. of Nanoscience & Applications, SUSTech, Shenzhen, China

Hexagem AB, Ideon Science Park, Lund, Sweden

NanoLund, Lund University, Lund, Sweden

Bio: Lars Samuelson is since 1988 Professor at Lund University and since 2021 also Chair Professor at SUSTech, Southern University of Science and Technology, in Shenzhen, China and Dean of the Institute of Nanoscience and Applications, INA. His research is focused on nanoscale materials physics, with a special focus on epitaxial growth, optical properties and on potential applications in optoelectronics. Beside the academic research he also has strong engagements as Chief Scientists in high-tech companies such as Glo AB and Hexagem AB. He is a Member of the Royal Swedish Academy of Sciences (Physics) and of the Royal Swedish Academy of Engineering Sciences and was awarded the Einstein Professorship by the Chinese Academy of Sciences. He is Fellow of the Institute of Physics (FInst) of the UK, Fellow of the American Physical Society, APS (Materials Physics), and Int. Fellow of the Japanese Society of Applied Physics, JSAP. In 2022 he was given the top award from the Royal Swedish Academy of Engineering Sciences, the "Great Gold Medal". Samuelson is the author of well over 700 articles with h-index 90 by Web-of-Science, and 108 by Google Scholar, and listed in the top 1% highly cited researchers by Web-of-Science), and has given >300 plenary/invited talks at international conferences and workshops.

Title: On Challenges and Opportunities When LEDs “go nano”

Abstract: While nitride LEDs with chip sizes of above several hundreds of microns have been widely applied for solid state lighting as well as in communications, there is an urgent need to reduce the chip size so that such LEDs can be used as individual pixels for next generation self-emissive displays. In this talk I will present our unique materials research that enables arrays of relaxed sub-μm sized InGaN platelets, virtually free from dislocations with an atomically smooth top c-plane ideal for InGaN quantum well growth. The indium contents in such InGaN platelets can be tuned from 0 to 20%, so that the green and red-emitting InGaN quantum wells are grown on such templates with a low level of strain similar to highly efficient blue-emitting InGaN quantum wells on GaN substrates. Besides the obvious top application for advanced AR/VR/HUD applications, these ultra-small nanoLEDs may also find important applications in advanced imaging applications as well as in ultra-low power and high-speed optical communication.

Plenary / Keynote Speaker

Conference Room	FR4	Time	10:00-10:40, August 22, 2023

Lena Wosinska

Chalmers University of Technology, Sweden

Bio: Lena Wosinska received her PhD degree in Photonics and Docent degree in Optical Networks from KTH Royal Institute of Technology, Sweden where she established a world leading research group working on optical networks. At KTH she was a Professor of Telecommunication until October 2018. Currently she is a Research Professor with the Chalmers University of Technology, Sweden, where she moved together with her team. Her research broadly concerns optical communications and networks, with a focus on fiber access and 5G/6G transport networks, energy and cost efficiency, optical data center networks, photonics in switching, network control, reliability, security, and survivability. She has been involved in many expert assignments and was working in several EU projects, as well as leading national and international research projects.

Title: The Way Towards Flexible Optical Networks

Plenary / Keynote Speaker

Conference Room	FR4	Time	10:40-11:20, August 22, 2023

Ji-Xin Cheng

Boston University Photonics Center, USA

Bio: Ji-Xin Cheng attended University of Science and Technology of China (USTC) from 1989 to 1994. From 1994 to 1998, he carried out his PhD study on bond-selective chemistry at USTC. As a graduate student, he worked as a research assistant at Universite Paris-sud (France) on vibrational spectroscopy and the Hong Kong University of Science and Technology (HKUST) on quantum dynamics theory. After postdoctoral training on ultrafast spectroscopy at HKUST, he joined Sunney Xie's group at Harvard University as a postdoc, where he spearheaded the development of CARS microscopy that allows high-speed vibrational imaging. Cheng joined Purdue University in 2003 as Assistant Professor in Weldon School of Biomedical Engineering and Department of Chemistry, promoted to Associate Professor in 2009 and Full Professor in 2013. He joined Boston University as the Inaugural Theodore Moustakas Chair Professor in Photonics and Optoelectronics in summer 2017. Cheng is authored in 300+ peer-reviewed articles with an h-index of 93 (Google Scholar). Cheng and his team has been constantly at the most forefront of chemical imaging in innovation, discovery, and clinical translation. Chemical microscopes based on his innovations, including CARS, hyperspectral SRS, mid-infrared photothermal microscopes, are installed and used in many countries worldwide. His research has been supported by ~40 million ($) funding from federal agencies including NIH, NSF, DoD, DoE and private foundations including Chan-Zuckerburg Initiative and Keck Foundation. In 2014 He co-founded Vibronix Inc which is devoted to vibration-based imaging technologies and medical device innovations. In 2019, he co-founded Pulsethera aiming to kill superbugs by photolysis of intrinsic chromophores. In addition, Cheng is the Scientific Advisor of Photothermal Spectroscopy Corp, Pulsethera, and Axorus. Cheng is a Fellow of Optical Society of America, a Fellow of American Institute of Medicine and Biological Engineering, and associate editor of Science Advances. Cheng initiated the inaugural Gordon Research Conference on Chemical Imaging, held in Easton, MA in August 2023. Among his honors, Cheng received the 2020 Pittsburgh Spectroscopy Award from the Spectroscopy Society of Pittsburgh, the 2019 Ellis R. Lippincott Award from Optica, Society for Applied Spectroscopy, Coblentz Society, the 2016 Research Award from Purdue University College of Engineering, and the 2015 Craver Award from Coblentz Society. He was chosen as the Boston University Innovator of Year 2022.

Title: Dye-free Bond-Selective Imaging at the Same Sensitivity of Fluorescence Microscopy

Abstract: Recently developed mid-infrared photothermal (MIP) microscopy opens a new window to look at molecules inside a cell. In MIP microscopy, a visible beam is used to probe the local change of refractive index induced by mid-infrared vibrational excitation of specific chemical bonds. Since the first demonstration of depth-resolved MIP imaging of living cells and organisms (Science Advances, 2016), our team has advanced this pump-probe imaging technology in three modalities, namely scanning-based confocal MIP microscopy, camera-based wide-field MIP microscopy, and MIP tomography for high-speed volumetric bond-selective imaging. Since its commercialization into a mIRage system in 2018, MIP microscopy has found very broad applications, which include structural detection of protein aggregation in neurological diseases. More recently, MIP microscopy in the silent window has allowed click-free bond-selective imaging at the same sensitivity and resolution as confocal fluorescence microscopy.

Plenary / keynote Speaker

Conference Room	FR4	Time	11:20-12:00, August 22, 2023

Peter J. Winzer

Nubis Communications, USA

Bio: Peter J. Winzer (Fellow, IEEE) received the Ph.D. degree in electrical engineering from the Technical University of Vienna, Vienna, Austria, in 1998.,Supported by the European Space Agency, he investigated space-borne Doppler lidar and laser communications. From 2000 to 2019, he was at Bell Labs, Holmdel, NJ, USA, where he focused on fiber-optic communication systems and networks and contributed to many high-speed optical transmission records up to 1 Tb/s per carrier, including the first field trial of live 100G video traffic. Following his involvement in estimating the optical fiber Shannon capacity, he investigated spatial multiplexing (SDM) and multiple-input–multiple-output (MIMO) techniques to scale optical transport systems. Before leaving Bell Labs in 2019, he led its global optical transmissions research efforts. He then founded the venture capital-backed startup Nubis Communications, New Providence, NJ. With over 500 coauthored publications and over 80 granted patents, he has widely published and patented.,Dr. Winzer is actively involved with the IEEE Photonics Society and the Optical Society (OSA, now Optica). He is a highly cited researcher, a Bell Labs Fellow, a Fellow of the OSA, and an elected member of the U.S. National Academy of Engineering (NAE). He received multiple awards, including the John Tyndall Award, and holds an honorary doctorate from the Technical University of Eindhoven. He was the Program Chair of the 2009 European Conference on Optical Communications (ECOC) and the Program/General Chair of the 2015/2017 Optical Fiber Communication Conference (OFC). He served as the Editor-in-Chief for IEEE/OSA Journal of Lightwave Technology from 2013 to 2018.

Title: Scaling Capacity, Density, and Energy in Optical Communications: From Ultra-Long-Haul to Chip-to-Chip

Forum

Conference Room	FR4	Time	12:00-13:00, August 23, 2023

More Women-in-STEM for a Greener World

Chairs: Qin Wang (RISE AB) & Shagufta Naureen (Coherent AB)

Introduction: This forum will provide a platform for all PGC2023 participants to share the thought on getting more workforces to face current climate change and environmental degradation that threat the world. Nowadays the advanced green technology has been demonstrated its power to help the climate neutral process and boost the benefits for society. It can be believed the more workforce from ALL including Women in STEM could strengthen the world green transformation in a more efficient pave. It is an important part of the Global Sustainable Development Goals (SDGs).

TIME TABLE

Time	Activity
12:00-12:05	**Welcome and Acknowledge of IEEE Photonics Sweden Chapter** Prof. Qin Wang, RISE AB
12:05-12:20	**The Introduction of the Panelists** Dr. Shagufta Naureen, Coherent AB
12:20-12:45	**Panel Discussions**
12:45-12:55	**Initiative of contribution from the PGC2023 participants: 'why women are needed in STEM'** Dr. Shagufta Naureen, Coherent AB
12:55-13:00	**Close Remarks** Qin Wang (RISE AB) / Shagufta Naureen (Coherent AB)

Panel discussions regarding to following issues:

- For policy makers: how would you promote and encourage the school students to embrace STEM, especially for girls and young female students?
- For universities/colleges: how would you provide supervision and guidance to help the students, especially for the female students to overcome their challenges during their education journey in university/colleges?
- For institutes and companies: how would you facilitate the female researchers and engineers to have room for their career development by maximizing their creative and strength?

For everyone: how could we team each other to have all joint force to make our world greener and more sustainable regarding to both human and natural resource?

Workshop

Conference Room	FB41	Time	14:00-17:10, August 21, 2023

Workshop on Advanced Optical Imaging Technologies

Chair: Liangcai Cao, Tsinghua University, China

TIME TABLE

Time	Speaker	Affiliation
14:00-14:20	Robert Kuschmierz	TU Dresden, Germany
14:20-14:40	Shijie Feng	Nanjing University of Science and Technology, China
14:40-15:00	Zhenyue Chen	ETH / University of Zurich, Switzerland
15:00-15:20	Liangcai Cao	Tsinghua University, China
15:20-15:40	Break	
15:40-16:00	Aurelien Dantan	Aarhus University, Denmark
16:00-16:20	Chun-nien Liu	National Chung Hsing University
16:20-16:40	Shuhe Zhang	University Eye clinics, Maastricht, USA
16:40-16:55	Yiqian Yang	Tsinghua University, China
16:55-17:10	Yuchen Ma	Tsinghua University, China

Invited Speaker

Robert Kuschmierz

TU Dresden, Germany

Bio: Dr. Kuschmierz received his PhD of interfereometric dimensional metrology at TU Dresden, Germany. For his Ph.D. thesis he received the measurement technique award from the company SICK and the award for outstanding dissertations from the Dr.- Ing. Siegfried Werth Foundation. Since 2017, he is Head of the optical process metrology group at the Laboratory for Measurement and Sensor System Techniques. His current research interests include holography, wavefront shaping and artificial intelligence especially for minimally invasive, lensless endoscopy.

Title: Inverting the Complex Valued Transfer Function of Imaging Waveguides for Lenless Endoscopy

Abstract: Flexible imaging waveguides consisting of thousands of fiber cores are used for endoscopy in biomedical applications. Conventionally, they are used to transfer intensity information only, while the light phase is scattered. This results in pixelated images. Additionally, 3D information is lost. I will introduce the concept of phase preserving flexible waveguides. These can relay the objects far field for unpixellated 3D imaging. The waveguides are based on advances in fiber design, fiber drawing technology, digital holography and additive manufacturing. Desired phase functions such as Fresnel lenses can be added as well. This allows imaging with sub-micron resolution for instance for in vivo all optical biopsies. The component acts as a flexible, long (> 1m) and ultrathin (<500 µm) imaging lens and can potentially replace objective lenses to enable endoscopic applications for standard microscopy systems.

Invited Speaker

Shijie Feng

Nanjing University of Science and Technology, China

Bio: Shijie Feng received his PhD in optical engineering at Nanjing University of Science and Technology (NJUST) in 2017. He was a research assistant at Centre for Optical and Laser Engineering, Nanyang Technological University from 2015 to 2016. He was a postdoctoral researcher at NJUST from 2017 to 2019. Currently, He is an associate professor at the Department of Electronic and Optical Engineering of NJUST. He has published more than 60 journal papers. His research interests include phase measurement, high-speed 3D imaging, fringe projection, machine learning, and computer vision.

Title: High-Speed Real-Time Structured Light 3d Imaging Using Deep Learning

Abstract: Optical metrology is playing a significant role in many fields because of its merits of noninvasiveness, flexibility, and high accuracy. In optical metrology, fringe-pattern analysis is indispensable to many tasks, e.g., interferometry, fringe projection profilometry, and digital holography. In recent years, many advances have emerged in the field of optical metrology that benefit from harnessing the power of deep learning. The fringe-pattern analysis using deep learning has shown promising performance in measuring complex contours by using a single fringe image. As a data-driven approach, it can exploit useful hidden clues that may be overlooked by traditional physical models, thus showing potentials for resolving the contradiction between the efficiency and the accuracy in the phase demodulation. In this talk, I will review the basics, achievements and newest developments of deep-learning-based approaches for high-speed real-time structured light 3D imaging, such as fringe pattern analysis, phase unwrapping, and 3D reconstruction.

Invited Speaker

Zhenyue Chen

ETH / University of Zurich, Switzerland

Bio: Dr. Zhenyue Chen is a senior scientist in Prof. Daniel Razansky's group in the Institute of Biomedical Engineering at University and ETH Zurich. He received his Ph. D. degree in Optical Engineering in 2016 from Beijing Institute of Technology. During 2016-2019, he worked as a postdoc in Technical University of Munich and Helmholtz Center Munich, focusing on optoacoustic imaging techniques. His current work focuses on biomedical imaging with novel and hybrid modalities including optics, optoacoustics and MRI. He has co-authored more than 50 papers in peer-reviewed journals and serves as a reviewer for a variety of journals such as Optics Letters, Optics Express, Journal of Biophotonics, ACS Photonics, IEEE TMI.

Title: Advancing Cerebral Blood Flow Imaging: Optical Technologies for Large Field of View and High Spatio-Temporal Resolution

Abstract: Cerebral blood flow imaging (CBFI) is a powerful technique used to measure and visualize blood flow in the brain. The regulation of cerebral blood flow (CBF) involves a complex network of blood vessels that supply the brain, maintaining a constant flow to support its metabolic demands. Abnormalities in CBF can provide essential insights into underlying conditions such as stroke, brain tumors, vascular diseases, or neurodegenerative disorders. Thus, CBFI plays a significant role in unraveling brain function and evaluating various neurological conditions. In this talk, I will introduce the advantages and limitations of different CBFI techniques, with particular emphasis on two optical imaging methods developed within our group. I will showcase their applications in stroke studies and functional neuroimaging, highlighting their potential contributions to advancing our understanding of these critical areas. Furthermore, I will address the challenges and potential future pathways for CBFI in the context of in vivo deep tissue imaging.

Invited Speaker

Liangcai Cao

Tsinghua Univesity, China

Bio: Liangcai Cao, professor of the Department of Precision Instruments, Tsinghua University, received his BS/MS and PhD degree from Harbin Institute of Technology and Tsinghua University, in 1999/2001 and 2005, respectively. Then he became an assistant professor at the Department of Precision Instruments at Tsinghua University. He is now a tenured professor and director of the Institute of Opto-electronic Engineering. He was a visiting scholar at UC Santa Cruz and MIT in 2009 and 2014, respectively. His research interests are holographic imaging and holographic display. He is a fellow of SPIE and OPTICA.

Title: Aberration-Free High Bandwidth Holographic Imaging

Abstract: Objective measurements of the morphology and dynamics of label-free cells and tissues can be achieved by quantitative phase with low phototoxicity and no photobleaching. The morphology and dynamics of label-free tissues can be exploited by sample-induced changes in the optical field from quantitative phase imaging. Its sensitivity to subtle changes in the optical field makes the reconstructed phase susceptible to phase aberrations. We import variable sparse splitting framework on quantitative phase aberration extraction in holographic microscopy. By formulating the aberration extraction as a convex quadratic problem, the background phase aberration can be fast and directly decomposed with the specific complete basis functions such as Zernike or standard polynomials. We integrate the proposed framework into the high bandwidth holographic microscopy. The aberration-free two-dimensional and three-dimensional imaging experiments are demonstrated, showing the relaxation of the strict alignment requirements for the holographic microscopes.

Invited Speaker

Aurelien Dantan
Aarhus University, Denmark

Bio: Aurelien Dantan got his PhD from Université Pierre et Marie Curie, Paris, France in 2005 working on quantum optics with cold atoms. After one postdoctoral year at the Institut d'Optique in Orsay he moved to Aarhus University in Denmark to work on cavity quantum electrodynamics with trapped ions. In 2013 he became an associate professor at Aarhus University and started activities in the field of optomechanics. His group currently investigates nanomechanical resonators for various applications within photonics, sensing and optomechanics.

Title: Optical Spatial Differentiators with Ultrathin, Freestanding Subwavelength Gratings

Abstract: We report on the application of ultrathin, suspended subwavelength gratings to the spatial differentiation of optical beams. We first discuss the structural, optical and mechanical characterization of various gratings fabricated on highly pretensioned, few hundreds of namometer-thick SiN films by electron beam lithography and chemical etching. We then demonstrate first- and second-order spatial differentiation of Gaussian beams in transmission impinging on these gratings at oblique and normal incidence, respectively. We also report polarization-independent first-order spatial differentiation with specifically designed grating structures and briefly discuss potential applications of such nanostructured thin films for optical processing, optomechanics and sensing.

Invited Speaker

Chun-nien Liu
National Chung Hsing University

Bio: Chun-Nien Liu received the B.S. degree in physics from the National Changhua University of education, Changhua, Taiwan, and the M.S. and Ph.D. degrees from the department of photonics, National Sun Yat-sen University, Kaohsiung, Taiwan, in 2010 and 2015, respectively. Currently, he is an Assistant Professor in the Department of Electrical Engineering, National Chung Hsing University, Taichung, Taiwan. His research interests are broadband Cr-doped fiber, specialty fiber, fiber microlens, near-field measurement of fiber coupling, LiDAR module, and high-power LED based on glass host. He is a member of the Optical Society of America.

Title: Broadband Rare-Earth Doped Crystal Fibers for High Axial Resolution OCT Light Source

Abstract: We report the fabrication and characteristics of broadband rare-earth doped crystal fibers for high axial resolution optical coherence tomography (OCT) light source. As we know, OCT has rapidly advanced in noninvasive biomedicine imaging technology. For fiber-based OCT applications, several types of broadband light sources with a high axial resolution have been used, such as super-luminescent diodes, photonic crystal fiber, and Ti:sapphire laser. However, the characteristics of these light sources did not exhibit Gaussian spectrum. The resolution of fiber-based OCT system became poor owing to the pixel crosstalk resulting from the high side-lobe noise of non-Gaussian spectrum. In contrast to non-Gaussian spectrum, an amplified spontaneous emission (ASE) can exhibit both broadband and near-Gaussian spectrum. A fiber laser was employed to collect near-Gaussian ASE light in order to improve the power intensity of a light source for a fiber-based OCT system. In this study, the initial success in the development of the CeDFs and CrDFs indicates that the fabricated crystal fibers may be widely applicable as a new generation broadband source for the use in various spectroscopic OCT applications. Therefore, the proposed broadband and high axial-resolution light source has a great potential for future OCT source applications, such as biological research and industrial inspection.

Invited Speaker

Shuhe Zhang
University Eye clinics, Maastricht, USA

Bio: Shuhe Zhang is a PhD student at Maastricht University Medical Center +, funded by China Scholarship Council. His research interests include computational imaging, image processing, and medical image analysis.

Title: Elfpie: an Error-Laxity Fourier Ptychographic Iterative Engine

Abstract: Fourier ptychographic microscopy (FPM) combines the principles of synthetic aperture and phase retrieval with computational imaging to reconstruct a high-resolution image of a specimen from a set of low-resolution images taken with different illumination angles. It is a

powerful imaging technique that enables high-resolution imaging of specimens that are difficult to image with traditional microscopes. However, the image platform for FPM requires careful calibration of the illumination sources to ensure that (1) there is no background fluctuation and (2) vignetting effect in the raw images, and (3) the images captured under different angles are consistent and can be combined effectively. The dark-field images and bright-field images are often captured using different exposure setting for high signal-to-noise ratios, which further limits the application of FPM. To overcome these limitations, we redesign the iterative engine for Fourier ptychographic imaging, and present a simple but efficient and robust reconstruction algorithm for Fourier ptychographic microscopy, termed error-laxity Fourier ptychographic iterative engine (Elfpie), that is simultaneously robust to (1) noise signal (including Gaussian, Poisson, and salt & pepper noises), (2) problematic background illumination problem, (3) vignetting effects and (4) misaligning of LED positions, without the need of calibrating or recovering these system errors. In Elfpie, we embed the inverse problem of FPM under the framework of feature extraction/recovering and propose a new data fidelity cost function regularized by the global second-order total-variation regularization. The closed-form complex gradient for the cost function is derived and is back-propagated using the AdaBelief optimizer with an adaptive learning rate. The Elfpie was tested on both simulation and experimental data. In general, compared against SOTA methods, the Elfpie is robust to Gaussian noise with a 100 times larger noise, salt & pepper noise with 1000 times larger noise and Poisson noise with 10 times larger noise. The Elfpie is able to reconstruct high-fidelity samples under LED position misalignments up to 2 mm. It enables high reconstruction quality even on a homemade FPM platform. It can also bypass the vignetting effect, for which all SOTA methods fail to reconstruct the sample pattern. The ELFPIE is K times faster than the traditional FPM reconstruction routine where K is the number of LEDs. Apart from FPM, our proposed cost function and optimizer also benefit other phase retrieve problems including but not limited to lens-less imaging and GS-like algorithms.

Invited Speaker

Yiqian Yang

Tsinghua University, China

Bio: Yiqian Yang received her Bachelor degree of Opto-electronic Science Technology (cooperate with Nankai University) from the Department of Precision Instrument, Tianjin University in 2022. Then she became a PhD candidate of Optical Engineering at the Department of Precision Instruments, Tsinghua University. Her research interest is quantum holography.

Title: Robust Propagation of a Steady Optical Beam through Turbulence with Extended Depth of Focus

Abstract: Finding appropriate strategies to increase the robustness to turbulence with extended depth of focus (DOF) is the common requirement in developing high-resolution imaging through air or water medium. However, the conventional lens with a specially designed structure requires high manufacturing costs and is limited by the lack of dynamic modulation characteristics. Spatial light modulator (SLM), the unique flat-panel optical device, can break through the distance limitation of beam propagation for the dynamic modulation property. In this work, we address the

dynamic generation of the steady optical beam (STOB) based on the mechanism of transverse wave vector elimination. STOB generated by the SLM has significant advantages over Gaussian beams for the characteristics of peak intensity, robust propagation, extended-DOF beam profile, and dynamic wavefront modulation over a long distance under strong turbulent media. Our versatile, extensible, and flexible method has promising application scenarios for the realization of turbulence-resistant circumstances.

Invited Speaker

Yuchen Ma

Tsinghua University, China

Bio: Yuchen Ma received his BS degree from the Department of Physics, Xi'an Jiaotong University in 2022. Then he became a PhD candidate of Optical Engineering at the Department of Precision Instruments, Tsinghua University. His research interests are computational imaging and lensless imaging.

Title: Towards SeE-through Camera via Ar Lightguide

Abstract: As the foundation of virtual content generation, cameras are crucial for augmented reality (AR) applications, yet their integration with transparent displays has remained a challenge. Prior efforts to develop see-through cameras have struggled to achieve high resolution and seamless integration with AR displays. In this work, we present LightguideCam, a compact and flexible see-through camera based on an AR lightguide. To address the overlapping artifacts in measurement, we present a compressive sensing algorithm based on an equivalent imaging model that minimizes computational consumption and calibration complexity. We validate our design using a commercial AR lightguide and demonstrate a field of view of 23.1° and an angular resolution of 0.1° in the prototype. Our LightguideCam has great potential as a plug-and-play extensional imaging component in AR head-mounted displays, with promising applications for eye-gaze tracking, eye-position perspective photography, and improved human-computer interaction devices, such as full-screen mobile phones.

Workshop

Conference Room	FB51	Time	14:00-17:15, August 21, 2023

Workshop on Illuminating Wireless: The Emergence of VLC and FSO in the 6G Era

Chair: Xiaodan Pang, KTH Royal Institute of Technology, Sweden

TIME TABLE

Time	Speaker	Affiliation
14:00-14:30	Mahdieh Joharifar	KTH Royal Institute of Technology, Sweden
14:30-15:00	Giulio Cossu	Scuola Superiore Sant'Anna, Italy
15:00-15:30	Iman Tavakkolnia	University of Strathclyde, UK
15:30-15:45	Break	
15:45-16:15	Nobby Stevens	KU Leuven, Belgium
16:15-16:45	Panagiotis Diamantoulakis	University of Macedonia, Greece
16:45-17:15	Sotiris Tegos	University of Macedonia, Greece

Invited Speaker

Mahdieh Joharifar

KTH Royal Institute of Technology, Sweden

Bio: I am a PhD researcher at KTH Royal Institute of Technology in Photonics in high-speed communications. I have a bachelor's and Master's in Electrical Engineering.

Title: Free-Space Optical Transmission with Multilevel Signals in Long-wave mid Infrared window

Abstract: Supporting faster data transmission with lower latency is becoming necessary in future generations of optical wireless communication systems. Photonics-assisted technologies show superiority compared to radio frequency electronic technologies in generating ultraband bandwidth signals at high carrier frequencies in the terahertz and infrared bands. The long-wave mid-IR band shows great potential due to its intrinsic merits of low propagation loss and high tolerance of atmospheric perturbations. A promising source for this frequency window is the quantum

optoelectronic devices, such as directly modulated-quantum cascade laser (DM-QCL) and externally modulated QCLs, and in the photodetector category, quantum cascaded detectors (QCD) and Quantum Well Infrared Photodetector (QWIP). The on-off keying (OOK), 4-level pulse amplitude modulation (PAM4), 6-level PAM (PAM6), and 8-level PAM (PAM8) signals are applied in the FSO transmission system to maximize bit rate and spectral efficiency. The system's performance is being evaluated with the bit error rate (BER) and the eye diagrams.

Invited Speaker

Giulio Cossu

Scuola Superiore Sant'Anna

Bio: Giulio Cossu received M.S. degree in physics from University of Pisa (Italy), in 2010. He obtained his Ph.D. degree in 2014 at Scuola Superiore Sant'Anna (SA), Pisa. Currently, he is Assistant Professor at SA. The main topic of his thesis was the investigation of innovative solutions for Optical Wireless Communications (OWC). His research interests include the areas of optical propagation through the atmosphere, optical characterization, and optical communication. He was the scientific responsible/technical officer for SA of the project "High Throughput Optical Network (HYDRON)" and "HYDRON Simulation TestBed", both founded by European Space Agency (ESA). He was in the workgroup about the development of optical wireless links for Intra/Extra Spacecraft and AIT scenarios within the framework of the TOWS project, founded by ESA. He is author or co-author of about 70 publications and holds 4 international patents.

Title: Optical Wireless Communication for Intra-Satellite

Abstract: In a Spacecraft, a huge amount of cabled electrical connections is needed by many different units to exchange digital data. This increases the overall mass, the space occupancy, and the routing design time. Optical Wireless Systems can be effectively implemented for communication onboard satellites to replace the physical cables. This provides high electromagnetic compatibility, security and compatibility with pre-existing protocols.

Invited Speaker

Iman Tavakkolnia

University of Strathclyde

Bio: Iman Tavakkolnia is a Chancellor's Fellow (Lecturer) at the Electronic and Electrical Engineering department at the University of Strathclyde. He is also a member of LiFi Research and Development Centre. His research focuses on developing a fundamental understanding of the energy efficiency of current and future telecommunication systems and lies on the frontier of communication theory, advanced materials, signal processing, and optical communications. Iman Tavakkolnia obtained his PhD degree from the University of Edinburgh in 2018.

Title: Optical Wireless Communication for 6g and beyond

Abstract: In the pursuit of defining and shaping 6G architecture on a global scale, we are witnessing the extension of the radio frequency (RF) spectrum to higher frequencies including the optical spectrum. This is derived by features such as extereme cell densification, physical layer security, and emerging applications. In this talk, the role optical wireless communication in 6G and beyond will be reviewed, with a focus on the UK's flagship project REASON.

Invited Speaker

Nobby Stevens
KU Leuven

Bio: Nobby Stevensreceived the master's degree in physical engineering from Ghent University, Ghent, Belgium, in 1997, the D.E.A. degree from the Institut National Polytechnique de Grenoble, Grenoble, France, in 1997, and the Ph.D. degree from Ghent University, in 2004. From the end of 1997 to August 1998, he was Product Development Engineer with Philips. In August 1998, he performed research on the numerical modeling of electromagnetic fields interacting with the human body with the Department of Information Technology, Ghent University.
In June 2004, he joined Agilent EEsof, Santa Rosa, CA, USA, as a Research and Development Engineer, where he was involved in computational electromagnetics. Since November 2008, he has been performing research within the WaveCore research group of the ESAT department of KU Leuven in Ghent, Belgium. In 2018, he was appointed as an Associate Professor with the Faculty of Engineering Technology, KU Leuven. His research focus lies within the realm of indoor positioning by means of optical wireless signals.

Title: RSS-based Optical Wireless Positioning: Strengths and Challenges

Abstract: In this work, the principle of RSS-based optical wireless positioning is elaborated. In a recorded demonstration, a on-the-fly performance comparison is shown with UWB and acoustic positioning in a representative warehouse environment. However, a number of significant challenges are hindering the widespread adoption and valorisation of this indoor positioning solution.

Invited Speaker

Panagiotis Diamantoulakis
University of Macedonia

Bio: (Senior Member, IEEE) received the Diploma (five years) and the Ph.D. degree from the Department of Electrical and Computer Engineering, Aristotle University of Thes- saloniki, Thessaloniki, Greece, in 2012 and 2017, respectively. Since 2022 he is a Postdoctoral Fellow with the Department of Applied Informatics, Uni- versity of Macedonia, Thessaloniki, Greece. Since 2017, he has been a Postdoctoral Fellow with Wire- less Communications and Information Processing (WCIP) Group, AUTH and since 2021, he has been a Visiting Assistant Professor with the Key Lab of Information Coding and Transmission, Southwest Jiaotong University, Chengdu, China. His research interests include

optimization theory and applications in wireless networks and smart grids, optical wireless communications, and goal-oriented communications. He is a Working Group Member of the Newfocus COST Action "European Network on Future Generation Optical Wireless Communication Technologies." He serves as an Editor of IEEE Open Journal of the Communications Society, Physical Communications (Elsevier), and Frontiers in Communications and Networks, while during 2018-2023 he has been an Editor of IEEE Wireless Communications. He was also an Exemplary Editor of the IEEE Wireless Communications Letters in 2020, and an Exemplary Reviewer of the IEEE Communications Letters in 2014 and the IEEE Transactions on Communications in 2017 and 2019 (top 3% of reviewers).

Title: Toward the Integration of Optical Wireless Technology in 6G Networks

Abstract: The expectations of academia and industry regarding the 6G key performance indicators (KPIs) tend to converge to an ever-increasing growth in the deployment of machine-type nodes in 2D/3D service areas, and the necessity of even higher reliability, lower latency, and higher data rates. Apart from higher data rates, lower latency, and higher number of connected devices, 6G is foreseen to be the enabler of i) energy sustainable communication, ii) security, privacy, and trustworthiness by design, and iii) networked sensing and localization. As it will be discussed in this talk, the aforementioned requirements constitute a game changer in the design of wireless communication networks, which traditionally has been dominated by radio-frequency (RF) technologies, especially in the sub-6 GHz spectrum area. Consequently, the effective utilization of wireless technologies operating across multiple RF and optical spectrum bands under a cross-band design in the PHY and MAC layer becomes of paramount importance. This approach can break the frontiers of wireless communications and facilitate the achievement of the 6G KPIs. To provide further insights into these opportunities, specific examples and preliminary results will be presented, with emphasis on the created challenges and future research directions.

Invited Speaker

Sotiris Tegos
University of Macedonia

Bio: Sotiris A. Tegos received the Diploma (five years) and the PhD degree from the Department of Electrical and Computer Engineering, Aristotle University of Thessaloniki, Thessaloniki, Greece, in 2017 and 2022, respectively. He works as a Post-doctoral Fellow in the Wireless Communications and Information Processing (WCIP) group. In 2018, he was a Visitor Researcher with the Department of Electrical and Computer Engineering, Khalifa University, Abu Dhabi, United Arab Emirates. His research interests include wireless power transfer, optical wireless communications, and multiple access in wireless communications. He was an Exemplary Reviewer in IEEE Wireless Communications Letters for 2019 and 2022 (top 3% of reviewers).

Title: Modular Arithmetic Broadcasting (MAB) for VLC

Abstract: Aiming at massive connectivity and enhanced spectral efficiency, non-orthogonal multiple access (NOMA) has been extensively investigated in the context of optical wireless

communications and especially of visible light communications (VLC). However, the use of successive interference cancellation (SIC) at the receiver is a limiting factor because of increased complexity, particularly in downlink NOMA. In this work, we propose a practical SIC-free constellation-based scheme for VLC networks, namely modular arithmetic broadcasting (MAB). The performance of the considered system is evaluated in terms of bit error probability, for which closed-form expression are derived. Numerical results validate the theoretical analysis and highlight the superiority of the proposed scheme over SIC-based NOMA.

Technical Session

Conference Room	FB51	Time	13:30-15:35, August 22, 2023

Session 1: Semiconductor and Integrated Optical Devices-Part I

Chair: Yuefei Cai, Southern University of Science and Technology, China

TIME TABLE

Time	Speaker	Affiliation
13:30-13:55	Yongquan Zeng	Wuhan University
13:55-14:20	Ajanta Barh	DTU Electro, Technical University of Denmark
14:20-14:45	Handong Sun	University of Macau
14:45-15:10	Erik Norberg	OpenLight
15:10-15:35	Anders Gustafsson	Solid State Physics and NanoLund; Lund University

Invited Speaker

Yongquan Zeng
Wuhan University

Bio: Dr. Yongquan ZENG is a professor at the School of Electronic and Information Engineering, Wuhan University, China. He graduated from University of Science and Technology of China in 2013 with a bachelor's degree in Materials Physics and from Nanyang Technological University with a Ph.D. degree in 2018. From 2018 to 2021, he was a postdoctoral researcher at the School of Electrical and Electronic Engineering, Nanyang Technological University and then joined Wuhan University. He is mainly engaged in the research of III-V infrared semiconductor lasers, and has made many innovative achievements in the frontier fields of random lasers, chaotic microcavities, and topological photonics. So far, he has published over 30 first-authored/co-authored research papers in high-impact journals, e.g. Nature, Science, Nature Communications, ACS Photonics, Advanced Optical Materials, and Photonics Research.

Title: Topological Photonics for Semiconductor Laser Engineering

Abstract: As a compact on-chip laser source, semiconductor laser works as a core device for various optoelectronic applications including telecommunication, pump source, sensing and metrology. However, the rapid growth of data traffic and the trend for large-scale, high-density and multifunctional optoelectronic integration calls for semiconductor lasers with good performance and design agility for functional integrations. Extended from condensed matter physics, the concept

of topology has been applied to the regime of photonics and inspired a variety of robust photonic device applications such as optical delay lines, amplifiers, isolators, power splitters and lasers. It also provides a new freedom to engineer the properties of photonic devices, including semiconductor laser resonators. In this presentation, I will talk about utilizing the principle of topological photonics for engineering the semiconductor lasers with robust performance and novel emission features. We have realized a multimode semiconductor laser with an unconventional triangular cavity and a single-mode microcavity laser with a nontrivial polarization-winding emission profile. These work may inspire more interesting investigations of topological laser and its potential applications.

Invited Speaker

Ajanta Barh

DTU Electro, Technical University of Denmark

Bio: Ajanta Barh is an Associate Professor in DTU Electro, Technical University of Denmark since May 2023. After her PhD in Physics from IIT Delhi, India in 2015, she joined DTU Denmark as a postdoc (2016 – 2019), where she developed novel broadband mid-infrared detectors for sensing and imaging applications. In 2019, she joined ETH Zurich, Switzerland, as a senior postdoc, where she leaded a research team to develop ultrafast solid state and semiconductor laser systems operating in the short-wave-infrared, towards application in frequency metrology and sensing. Her current research interests include mid-infrared photonics, ultrafast lasers, nonlinear optics, and related applications. She has authored/co-authored more than 90 peer-reviewed journal and conference publications.
Ajanta is a senior member of OPTICA (formerly OSA), elected Chair (2018 – 2020) and vice-chair (2021 – 2023) of the OPTICA-Nonlinear Optics Technical group. She is a member of the Technical Programme Committee of international conferences: IEEE WRAP (2017, 2019), Ultrafast Optics UFO 2022 – 2023, PGC 2023. She reviewed various research grants (European). She is a recipient of DFF-Sapere Aude research leader grant 2022.

Title: Ultrafast Semiconductor Lasers and Saturable Absorbers Operating in the Short-Wave Infrared

Abstract: In this talk, I will discuss our recent work on semiconductor saturable absorber mirrors (SESAM) and optically pumped vertical external cavity surface emitting lasers (VECSEL) operating in the short-wave infrared spectral range. We developed GaSb-based novel, high-performance SESAMs and VECSELs working in the 2 – 2.4 μm range. We thoroughly characterized the semiconductor devices and demonstrated SESAM modelocked ultrafast VECSEL delivering femtosecond to picosecond pulses with up to 100's of mW average output power at multi-gigahertz repetition rates. Furthermore, we were able to integrate the saturable absorber and gain section into a single semiconductor chip and demonstrated world's first ultrafast MIXSEL at 2 μm range.

Invited Speaker

Handong Sun
University of Macau

Bio: Handong SUN is working as a Distinguished Professor in the Institute of Applied Physics, University of Macau. Before he moved to Macau in May 2023, he has been a professor of Physics in Nanyang Technological University, Singapore. Prof. Sun's research interests include Optoelectronic Materials & Devices, Semiconductor Physics; Optical Spectroscopy; Nano-Materials & Technology, etc. He was named a Fellow of American Physical Society in 2016 with citation "For outstanding contributions to optoelectronics with novel characterization and deep understanding of photonic materials and structures, leading to practical high-performance devices.". He was awarded 2023 OPTICA Fellow with citation "For outstanding contributions to the research of optoelectronics and photonics, particularly innovative application of materials and structures into microcavity lasers".

Title: Microlasers Enabled by Modifying Electronic Structures of Colloidal Nanoplatelets and Orientated Assembly

Abstract: Colloidal semiconductor lasers have attracted enormous attention in the past 2 or 3 decades. Although initial focus has been put on colloidal quantum dots, the unwanted dissipative Auger recombination inherent in quantum dots largely hinders the lowering of pump threshold. Alternatively, the colloidal nanoplatelets shall demonstrate much reduced Auger recombination rate and have been envisaged as a desirable nanomaterial for lasing. In this talk, we present some novel approaches of manipulating the optical properties of CdSe based nanoplatelets by halide ligation and core/shell configuration. We further developed effective assembly technique - using liquid-interface kinetically driven self-assembly to form ultra-thin, close-packed layers of colloidal core/shell nanoplatelets to realize high quality microlasers. This soft matter based technology is shown significant in integrated photonic circuits.

Invited Speaker

Erik Norberg
OpenLight

Bio: Erik Norberg received the Ph.D. degree in electrical engineering from the University of California Santa Barbara (UCSB), Santa Barbara, CA, USA, in 2011. He is currently the Sr. Director of Silicon Photonics Platform at OpenLight, USA. He is an author/coauthor of more than 55 papers and 15 patents.

Title: Silicon Photonics with Heterogenous IIIV Lasers - Applications in Datacom, HPC and LiDAR

Abstract: This talk will review OpenLights IIIV-on-SOI silicon photonics technology platform which includes fully integrated InP-Lasers, 100GBaud capable modulators, detectors, high-power amplifiers and an array of state-of-art silicon and nitride components. Built using an open market and high-volume BiCMOS foundry (Tower Semiconductor), this complete PDK library offers a path to designing high-performance and low-cost PIC solutions serve a multitude of emerging optical applications.

Invited Speaker

Anders Gustafsson

Solid State Physics and NanoLund, Lund University

Bio: Anders received his B.Sc., Licentiate and Ph.D degrees at Lund University and is a professor in solid state physics at Lund University. He is the Vice Head of Division of Solid State Physics and a Director of Postgraduate Studies for the Faculty of Engineering at Lund University.

Anders Gustafsson's research reserach interest is in optical and electrical properties of low-dimensional semiconductor nanostructures. This is done either by spatially-resolved photoluminescence (µPL) or cathodoluminescence (CL). The main focus is on micron-sized III-Nitride platelets for use as nano-LEDs.

Title: Optical Investigations of Nano-LEDs Based on Micron-Sized III-Nitride Platelets

Abstract: The next generation of displays for virtual and augmented reality (VR/AR) is expected to be based on micron-sized light-emitting diodes (µ-LEDs) that emit the three basic colours (red, green and blue). The blue and green µ-LEDs in direct emissive displays are currently based on III-nitrides (InGaN) and the red ones are based on AlGaInP. We present a study of the optical properties of µ-LEDs based on sub-micron sized InGaN platelets. The platelets consist of a single quantum well (QW) with a high indium content sandwiched between barriers of lower indium content. The indium content needed in the QW depends on the targeted emission wavelength. The platelets can cover the entire visible range. Due to their sub-micron size, they are referred to as nano-LEDs. In this study, we focus on platelets for red emission, but the technology is equally suitable for the less technologically challenging blue and green emitting nano-LEDs.

The platelets were seeded by selective area growth of short GaN nanowires from a regular array of submicron sized holes in a SiN mask on GaN-on-sapphire substrates. In a second growth step, the nanowires grew into a sub-micron sized pyramids with a hexagonal base. The mask blocked most of the threading dislocations from propagating from the substrate and the pyramids are virtually dislocation free. The pyramids were flattened using chemical mechanical polishing, resulted in a flat top c-facet. This was used as templates to grow low-strain, single QW heterostructures. By tuning the indium contents of the QW and barriers, the strain between the QW and barriers can be kept at a manageable level. As the contact area between the substrate and platelet is small, the platelet can accommodate the strain, even for barriers with high indium contents (20%).

The structures were investigated in terms of homogeneity in emission wavelenght and local intensity using hyperspectral cathodoluminescence (CL) imaging. The main contribution to the inhomogeneity is the growth of the initial pyramid, showing facet driven variations in the indium incorporation. When imaging the QW emission in top view, we observe several dark lines, figure 1. These dark lines can also be observed when imaging the barrier emission, leading us to identify these as stacking mismatch boundaries. A series of samples where each layer was added sequentially reveals that the polished platelets are defect free, whereas the dark lines appear already in the first layer. The identification of the dark lines as stacking mismatch boundaries was confirmed by a preliminary TEM study.

Technical Session

Conference Room	FB41	Time	13:30-15:10, August 22, 2023

Session 2: Optical Subsystems, Systems and Networks-Part I

Chair: Nobby Stevens, KU Leuven, Belgium

TIME TABLE

Time	Speaker / Paper ID	Affiliation
13:30-13:55	Shan Luo	University of Electronic Science and Technology of China
13:55-14:20	Rongping Lin	University of Electronic Science and Technology of China
14:20-14:45	Sandis Spolitis	Riga Technical University
14:45-15:10	Giulio Cossu	Scuola Superiore Sant'Anna

Invited Speaker

Shan Luo

University of Electronic Science and Technology of China

Bio: Shan Luo received the bachelor degree in electrical information engineering and the master degree in signal and information processing from the University of Electronic Science and Technology of China, Chengdu, China, in 2007 and 2010, respectively, and the Ph.D. degree in information engineering from Nanyang Technological University, Singapore, in 2014. She is currently an Associate Professor with the School of Aeronautics and Astronautics, University of Electronic Science and Technology of China. Her research interests include UAV wireless communications, spectrum sharing, time-frequency signal processing, and quantum detection.

Title: A Homotopy Theory based Spectrum Prediction Approach for UAV Communications

Abstract: As unmanned aerial vehicles (UAVs) have been widely employed, the spectrum resource for UAV communication has become scarce. The UAVs may communicate based on spectrum sharing, requiring efficient spectrum prediction to improve spectrum sensing performance. However, since the existing prediction methods are generally designed to predict the spectrum states in the next moment at the current location, they can not be directly applied to UAVs which rapidly move to the next location when obtaining the prediction result. In other words, the UAVs require to predict the spectrum in the next moment at the next location. This is a method that can predict the spectrum in the joint temporal and spatial dimensions. The main challenge is that the historical data of the next location is usually impossible to obtain in advance by the UAVs. This

presentation introduces a new prediction approach that firstly estimates the historical data of the next location based on the homotopy theory (HT) and then performs the prediction based on the hidden Markov model (HMM), referring to the HT-HMM based prediction. Experimental results show that the HT-HMM based approach can efficiently predict the spectrum states of the next location.

Invited Speaker

Rongping Lin

University of Electronic Science and Technology of China

Bio: Rongping Lin received the Ph.D. degree from the School of Electrical and Electronic Engineering, Nanyang Technological University, Singapore, 2013. From2012-2013, he was with City University of Hong Kong as a Senior Research Assistant. He is currently an Associate Professor with the School of Information and Communication Engineering, University of Electronic Science and Technology of China (UESTC), Chengdu, China. His research interests include network optimization, networking protocol design, wireless communications, and edge computing.

Title: Time-efficient Service Function Chaining Embedding in Hybrid Optical-Electronic Networks

Abstract: Network function virtualization (NFV) makes use of softwares and general-purpose computation devices to provide various network services in terms of service function chaining (SFC), where the data flow of an application goes through a sequent network functions to obtain network services. As various network services emerging, the network traffic has grown significantly. Then the hybrid optical-electronic network is applied to carried the traffic among network functions to sustain the connections of SFC. However, to efficient embed SFC in a hybrid optical-electronic network is a challenging problem, because this problem is much harder than the SFC embedding problem in an electronic network which is already NP-hard. In this talk, we introduce a time-efficient SFC embedding algorithm in hybrid optical-electronic networks, where both optical and electronic bandwidths are coordinated with the computation resource allocation. An integer linear programming formulation is provided first, then a heuristic algorithm based on the randomized rounding method is proposed for time and performance efficiencies in large-scale problems.

Invited Speaker

Sandis Spolitis
Riga Technical University

Bio: Sandis Spolitis is a Senior Researcher, Professor, and the Head of the RTU Communication Technologies Research Center (RTU ComTech) at the Institute of Telecommunications in Riga Technical University (RTU), Riga, Latvia.

In 2015 he defended his Ph.D. thesis focused on high-speed optical access systems. He continued his research direction through the postdoctoral project NG-FAST which addressed the challenges of developing more spectrally efficient high-speed fiber optical access systems, including the implementation of a developed broadband signal spectrum slicing technique.

His research interests include but are not limited to the development and research of fiber optical metro and access networks, optical interconnects, radio-over-fiber technologies for 5G and beyond, optical frequency combs, passive optical network technologies, digital signal processing, and related fields.

Additionally, Sandis is an expert of the Latvian Council of Science, a corresponding member of the Latvian Academy of Sciences, a co-author of more than 115 research papers, 6 patents, member of IEEE.

Title: DSP-Based Scalable Spectrum-Slicing Technique for Broadband Signals

Abstract: The bandwidth of optical, electrical, and opto-electrical components is a limiting factor causing a bottleneck in optical communication networks. This talk will introduce the spectrum slicing technique, which enables to reuse of existing low-bandwidth transceiver equipment to satisfy high bandwidth demands in optical communication networks. This technique uses digital signal processing (DSP) to slice the electrical broadband baseband signal into multiple spectral slices. For example, a broadband electrical signal occupying a 40 GHz baseband can be sliced into four spectral slices, each occupying a 10 GHz bandwidth. These electrical slices are then modulated on single or multiple optical carriers, transmitted through the fiber optical communication network, and received by the optical receiver, where the initial electrical data signal is restored. The technique supports time-division multiplexing (TDM) and wavelength division multiplexing (WDM) technologies. It is scalable in terms of the number of spectral slices and their occupied bandwidth, adding an extra degree of freedom for network owners. Furthermore, each spectral slice contains only a portion of the data signal. In that way, this technique can support network security if different routes or media (e.g., optical fiber, copper cables, wireless) are used.

Invited Speaker

Giulio Cossu

Scuola Superiore Sant'Anna

Bio: Giulio Cossu received M.S. degree in physics from University of Pisa (Italy), in 2010. He obtained his Ph.D. degree in 2014 at Scuola Superiore Sant'Anna (SA), Pisa. Currently, he is Assistant Professor at SA. The main topic of his thesis was the investigation of innovative solutions for Optical Wireless Communications (OWC). His research interests include the areas of optical propagation through the atmosphere, optical characterization, and optical communication. He was the scientific responsible/technical officer for SA of the project "High Throughput Optical Network (HYDRON)" and "HYDRON Simulation TestBed", both founded by European Space Agency (ESA). He was in the workgroup about the development of optical wireless links for Intra/Extra Spacecraft and AIT scenarios within the framework of the TOWS project, founded by ESA. He is author or co-author of about 70 publications and holds 4 international patents.

Title: Optical Wireless Communication for Intra-Satellite

Abstract: In a Spacecraft, a huge amount of cabled electrical connections is needed by many different units to exchange digital data. This increases the overall mass, the space occupancy, and the routing design time. Optical Wireless Systems can be effectively implemented for communication onboard satellites to replace the physical cables. This provides high electromagnetic compatibility, security and compatibility with pre-existing protocols.

Technical Session

Conference Room	FB55	Time	13:30-15:35, August 22, 2023

Session 3: Advanced Materials for Photonics-Part I

Chair: Susobhan Das, Aalto University, Finland

TIME TABLE

Time	Speaker	Affiliation
13:30-13:55	Siqi Yan	Huazhong University of Science and Technology
13:55-14:20	Ilya Sychugov	KTH Royal Institute of Technology, Sweden
14:20-14:45	Aung Ko Ko Kyaw	Southern University of Science and Technology
14:45-15:10	Xinyu Liu	Singapore Eye Research Institute

Invited Speaker

Siqi Yan

Huazhong University of Science and Technology

Bio: Siqi Yan received his Bachelor's and PhD degrees in Optics Engineering from Huazhong University of Science and Technology in 2013 and 2018, respectively. From 2019 to 2021, he worked as a postdoctoral researcher in the Silicon Photonics for Optical Communications (SPOC) center at the Technical University of Denmark. In November 2021, he joined the School of Optical and Electronic Information at Huazhong University of Science and Technology as an associate professor. Over the years, he has published more than 30 academic papers in SCI-indexed journals, including Nature Communications, Light: Science and Applications, and Opto-Electronic Advances. He is currently responsible for various projects such as the National Natural and Science Fund and Key Research and Development Plan of Hubei Province. His primary research interests are high-performance silicon/graphene integrated optoelectronics chips and their applications in optical communication systems.

Title: Silicon/Graphene Hybrid Integrated Optoelectronics Chips

Abstract: Graphene is a two-dimensional material with a hexagonal lattice structure made up of carbon atoms, which has exceptional optoelectronic properties such as high thermal conductivity, broad light absorption wavelength, and ultrafast carrier mobility. As a result, various graphene-based optoelectronic devices have been developed with exceptional performance, including ultrafast photodetectors and energy-efficient thermo-optical modulators. This talk will cover the

typical applications of silicon-graphene hybrid integrated chips, including high-performance thermal tuning, ultrafast photodetectors with large responsivity, and ultrafast nonlinear activators in optical neural networks. Our findings demonstrate the tremendous potential of silicon-graphene hybrid devices in creating unprecedented optoelectronic devices.

Invited Speaker

Ilya Sychugov
KTH Royal Institute of Technology

Bio: Obtained Master Degree in Nuclear Physics from Moscow Engineering Physics Institute in 2001. After receiving Ph.D. in 2007 from KTH Royal Institute of Technology, Stockholm, in the field of Solid State Physics, worked for five years as a postdoc at NTT and NIMS (Japan) in the area of Nanomaterials and Characterization. Currently employed as an Associate Professor at the School of Engineering Sciences of KTH. Main interest is in the field of physics of nanostructures and nanophotonics. Research highlights include pioneering results in single-dot spectroscopy of silicon quantum dots, developing their polymer nanocomposites with a high quantum yield towards light converting applications, and contribution to understanding of light interaction with cellulose nanocomposite materials, such as transparent wood. Recipient of Göran Gustafssons Award for young researchers in 2013. Co-author of > 80 peer-reviewed scientific articles, 2 patents, and >10 invited presentations at international conferences. Teaching courses, among other, "Basic Physics", "Quantum Materials and Devices", "Luminescence Spectroscopy of Semiconductors".

Title: Luminescent Silicon Nanocrystals: from Single Dot to Light-Converting Applications

Abstract: Fundamental photophysical properties of Si quantum dots (QDs) were investigated on a single-particle level to understand the mechanism of light conversion [1-3]. Emission, absorption and lifetime data were obtained for individual silicon nanocrystals with either oxide or ligand passivation. In comparison with theory we found that core-related luminescence from Si QDs emanates from an indirect-bandgap state for all practical size range of Si QDs. Small intermixing of direct-bandgap character due to quantum confinement effect takes place, but relevant only for higher energy states pertinent to the light absorption process. Quantum size effect from Si bandgap (1.1 eV) up to 2 eV has been clearly demonstrated by observation of sharp emission linewidths in a broad energy range [3].

Despite partly forbidden character of the recombination process, luminescence from Si QDs may still possess high quantum efficiency when a defect-free core with proper surface passivation realized. We have demonstrated a new synthesis method, which can reduce pre-cursor cost by an order of magnitude from the established HSQ-based method [4]. Si QDs prepared in this way have near-unity internal and > 50% external (quantum yield) quantum efficiency. They also possess a large Stokes shift, which suppresses re-absorption of the emitted light of importance in a number of applications.

One such application is a semi-transparent photovoltaics for glazing in building-integration. It is based on a luminescent solar concentrator concept, where high efficiency and a large Stokes shift

are necessary requirements for nanophosphors [5-6]. In this configuration absorbed solar light is re-emitted and a large fraction of it is guided by total internal reflection to the edges for collection by standard solar cells. As a proof-of-concept we fabricated 20x20 cm2 prototypes, where Si QD-doped polymer layer is sandwiched between glass plates in a triplex geometry. Such "solar windows" feature high transparency (>80%), low haze (<3%), high color rendering index (~ 88) and, at the same time, deliver up to 0.6 W of electrical peak power under one sun [7-8]. Another application is in bio-labeling, where long lifetime of Si QD emission (~ us) makes them sensitive to surface chemistry. It was shown previously that the presence of nitrogen moieties on nanocrystal surface may introduce a fast, ~ ns, recombination channel, which can take over carrier recombination from the QD core. Here we used this effect to monitor amino acids in the cell, where their binding of Si QDs manifested in shifted luminescence from near-infrared to blue and drastically reduced the lifetime, acting as an efficient amino acid probe in live cells [9].

Invited Speaker

Aung Ko Ko Kyaw

Southern University of Science and Technology

Bio: Aung Ko Ko Kyaw is an Associate Professor in the Department of Electrical and Electronic Engineering at Southern University of Science and Technology (SUSTech). He received both B.Eng. and Ph.D. degrees from Nanyang Technological University, Singapore. Before joining SUSTech, he worked as a post-doctoral fellow at the laboratory of Nobel Laureate Prof. Alan Heeger at University of California, Santa Barbara (UCSB), a visiting scholar at the Max Planck Institute for Polymer Research, Germany, and a Scientist at the Institute of Materials Research and Engineering of A*STAR, Singapore. He has published more than 100 papers in well-regarded journals such as Energy Environ. Sci., Adv. Mater., Adv. Energy Mater., Adv. Sci., ACS Nano, Nano Energy, Nano Lett., as well as 4 book chapters, and applied for 16 patents. He has citation over 7300 and H-index of 38. His research interest focuses on developing organic and perovskite-based optoelectronic devices for various applications, such as energy harvesting, sensing, imaging, and wearable devices. He is recognized as one of the World's Top 2% Scientists by Stanford University. He is also a recipient of international awards such as Green Talents from German Federal Ministry of Education and Research and IAAM medal.

Title: High-Detectivity Perovskite and Organic Photodetectors for Imaging Sensors

Abstract: As an emerging candidate for next-generation light sensing, solution-processed photodetectors based on perovskites and organic materials have great development potential in flexible image sensors, wearable sensors for real-time health monitoring, optical communication, etc. due to their capability of large-area fabrication with low-cost, lightweight, and flexible features. However, at present, the detectivity (a figure-of-merit for photodetection) of these types of photodetectors is far below the background-limited infrared photodetection limit, restricting them in many practical applications. In this talk, I will present different approaches aimed at enhancing the detectivity of perovskite and organic photodetectors from various aspects. These approaches

include interface engineering through charge transporting layer [1] and interfacial layer [2], manipulating the morphology of bulk-heterojunction in the organic photodetector [2,3], and control of doping for manipulating interfacial built-in electric field in perovskite photodetectors [4]. Furthermore, I will present our successful demonstration of high-quality visible and near-infrared imaging using an 80 × 260 pixel organic photodetector fabricated through these approaches.

References

1. C. Shan, F. Meng, G. Li*, Kyaw* et al., J. Mater. Chem. C, 9, 7632 (2021)
2. C. Shan, Kyaw* et al., Chem. Eng. J., 471, 144451 (2023)
3. M. S. Kim, D. Luo, Kyaw*, D. H. Wang* et al., Adv. Optical Mater., 11, 2202525 (2023)
4. D. Wu*, W. Li, Kyaw* et al., Adv. Sci., 8, 2101729 (2021)

Invited Speaker

Xinyu Liu

Singapore Eye Research Institute

Bio: Dr. Liu Xinyu's research is centered on the translational reseach of ophthalmic imaging technologies. Dr. Liu Xinyu completed his undergraduate studies at the School of Precision Instrument and Optoelectronics Engineering, Tianjin University. He completed his PhD study at the School of Electrical and Electronic Engineering, Nanyang Technological University in Singapore. He spent two years studying at Harvard Medical School and Massachusetts General Hospital as a visiting scholar. Currently, he serves as a researcher at the Singapore Eye Research Institute and is also an assistant professor at the Duke-NUS Medical School.

Title: Investigating Remodeling of Collagen Fibers in the Sclera during Myopia Onset and Progression Utilizing Triple-input Polarization-Sensitive Optical Coherence Tomography

Abstract: Predictive biomarkers are crucial for myopia management, providing guidance for the appropriate timing of interventions. Typically, pathological remodeling of collagen in the posterior sclera of myopic eyes is only observed ex vivo. In this study, we introduce the triple-input polarization-sensitive optical coherence tomography (TRIPS-OCT), an innovative technique designed for measuring posterior scleral birefringence. We demonstrate that TRIPS-OCT outperforms dual-input polarization-sensitive OCT in terms of imaging sensitivity and accuracy in both guinea pigs and humans. Furthermore, we applied TRIPS-OCT to investigate the remodeling of the posterior sclera in both preclinical and clinical settings. Our study reveals that posterior scleral birefringence has promising potential as a non-invasive biomarker for assess the progression of myopia.

Technical Session

Conference Room	FB54	Time	13:30-14:20, August 22, 2023

Session 4: Silicon Photonics-Part I

Chair: Qian Li, Peking University Shenzhen Graduate School

TIME TABLE

Time	Speaker	Affiliation
13:30-13:55	Ching Eng PNG	Institute of High Performance Computing (IHPC), Agency for Science, Technology and Research (A*STAR)
13:55-14:20	Hao Hu	Technical University of Denmark

Invited Speaker

Ching Eng PNG

Institute of High Performance Computing (IHPC), Agency for Science, Technology and Research (A*STAR)

Bio: Ching-Eng (Jason) Png is Director of the Electronics and Photonics Department at Institute of High Performance Computing (IHPC), A*Star, Singapore. He received his PhD degree from the University of Surrey, UK, MBA from INSEAD, France and Tsinghua University, China. Dr. Png's current research interests include quantum photonics, deep learning and electromagnetics. He is Editorial Board Member for Photonics, and Journal of Light & Laser: Current Trends.

Accolades won include the prestigious Royal Academy of Engineering Prize, Vebleo Scientist Award, IET Innovation Award - Software Design (highly commended), IEE Hudswell Scholarship, Skolkovo Prize, and Spring TECS Proof-of-Value grant. He serves on SPIE Photonics West technical program committee, is Founding Chair of URSI Singapore Chapter, and is passionate about mentoring and diversity in science. Dr. Png is elected Fellow of the IET and Vebleo.

Title: Accelerating Novel Passive Silicon Device Discovery

Abstract: Design, modeling, and simulation of silicon photonics involves forward solutioning of the optical response for a corresponding physical waveguiding geometry. This is then solved numerically via Maxwell equations and can be expensive computationally, causing significant bottleneck especially cases with dense meshing. An alternative is deriving appropriate photonic geometries for a known optical response or inverse modeling. Machines learning has been shown to be effective for capturing, interpolating, and optimizing multi-dimensional phenomena. Through traditional hard photonic computing with machine learning, we accelerate and novel design

discoveries for selected silicon photonics components. Here, we report modeling results showing the key aspects of optical modal solutioning via machine learning, prediction of group index, and programmable power dividers.

Invited Speaker

Hao Hu

Technical University of Denmark

Bio: Hao Hu is currently a senior researcher at DTU Electro, Technical University of Denmark, Lyngby, Denmark. From Mar. 2013 to Sep. 2013, he was a visiting scientist at the Bell Labs, Crawford Hill, New Jersey, USA. In 2013, he received the Research Talent award from Independent Research Fund Denmark (DFF). In 2014, Dr. Hu's achievement was selected as "The 20 Greatest Engineering Feats of 2014" with ranking #7, for the world-record optical fiber transmission at 43 Tbit/s using a single laser source. In 2016, Dr. Hu led a team and won the prestigious European Commission's Horizon Prize for breaking the optical transmission barriers. In 2017, he was awarded VILLUM Young Investigator, which is an award in Denmark for talented up-and-coming researchers. In 2022, his team developed a new chip-based beam steering technology based on an integrated optical phased array, which lays the groundwork for chip-based Light Detection and Ranging (LiDAR).

Title: Silcon Optical Phased Array

Abstract: Optical phased array (OPA), the optical counterpart of the phased array at radio frequencies, can electronically steer an optical beam without any moving parts. To achieve a 180° field of view (FOV), the array emitters should be spaced half-wavelength or less. However, a conventional OPA based on a waveguide grating array as emitters suffers from strong crosstalk between adjacent waveguides when the pitch is half-wavelength or less. We experimentally demonstrate a two-dimensional aliasing-free beam steering regime for an integrated OPA with the entire 180° FOV.

Technical Session

Conference Room	FB51	Time	15:50-17:25, August 22, 2023

Session 5: Optical Sensors and Systems-Part I

Chair: Jiawei Wang, Harbin Institute of Technology Shenzhen, China

TIME TABLE

Time	Speaker / Paper ID	Affiliation
15:50-16:15	Giuseppe Rizzelli Martella	Fondazione LINKS
16:15-16:40	A. Ping Zhang	The Hong Kong Polytechnic University
16:40-16:55	Paper ID: 6461	Huazhong University of Science and Technology
17:55-17:10	Paper ID: 3080	Aarhus University
17:10-17:25	Paper ID: 2003	Chongqing University

Invited Speaker

Giuseppe Rizzelli Martella

Fondazione LINKS

Bio: Giuseppe Rizzelli is senior researcher at the LINKS Foundation and lecturer at Politecnico di Torino in Turin, Italy.He received his PhD in Electronics Engineering from Alcalá University (Madrid, Spain) in 2018, where he worked on distributed Raman amplification for both long-haul and unrepeatered optical communications.
Prior to enrolling in the PhD program, he was affiliate researcher at the Lawrence Berkeley National Laboratory (CA, USA) where he worked on mode-locked lasers synchronization.He recently joined the Computing Photonics and Electromagnetism division of the LINKS Foundation, where his main research focus is on short-reach optical communications both for metro access and datacenter scenarios.

Title: Analysis of Coherent Detection Solutions for Short Reach Optical Communications

Abstract: The current challenge for access networks, at the physical layer, is to increase the capacity above 100 Gbps per wavelength. This target may require a revolution for short reach links, moving from direct detection to advanced modulation formats and coherent detection. In this scenario, it will even be possible to envision a convergence of the access with the metro segment, also considering that wavelength routing functionalities based on Reconfigurable Optical Add Drop Multiplexers (ROADM) can be inserted at the boundary between the two network domains. In this paper we show our latest results in the analysis of coherent detection applied to short reach optical communications and, specifically, to the access network segment with a passive optical network architecture and to the data center interconnects scenario based on multimode fibers.

Invited Speaker

A. Ping Zhang
The Hong Kong Polytechnic University

Bio: Prof. Zhang received the BSc and MSc degrees from Zhejiang University (ZJU) in 1997 and 2000, respectively, and received the PhD degree from The Hong Kong Polytechnic University in 2003. He started his academic career in ZJU in 2003 and was promoted to Associate Professor in 2005. He worked as a Research Scholar in State University of New-York at Buffalo (UB) and University of California, San Diego (UCSD) in 2006-2008, and 2011, respectively. He joined the Department of Electrical Engineering of The Hong Kong Polytechnic University as an Associate Professor in 2012 and is the Professor at the same department since 2020.

Title: Directly Printed Micro/Nano-Photonic Sensors for High-Sensitivity Label-Free Biodetection

Abstract: Micro/nano-photonic sensors have become one of most promising technologies for high-sensitivity quantitative biodetection. However, photonic biosensors are far from fully developed in part because of various challenges in fabrication. Here we present directly printed micro/nano-photonic sensors for high-sensitivity label-free detection of biomarkers. Based on a digital ultraviolet exposure technology, a precision photoreduction technology is developed to directly print the micropatterns of size-controlled gold nanoparticles for plasmonic biosensing, while an optical 3D micro-printing technology is demonstrated to directly print high-Q whispering-gallery-mode (WGM) microlaser biosensors for ultrasensitive enzyme-linked immunosorbent assay. These directly printed micro/nano-photonic biosensors may play an important role in the future revolutionization of clinical diagnosis and personalized healthcare.

Paper ID: 6461

Title: A Overall fiber optic DAS Simulation Model Based on Macro-micro Combined Analysis
Author(s): Cunzheng Fan, Hao Li, Zhijun Yan and Qizhen Sun
Affiliation: Huazhong University of Science and Technology
Abstract: The physical process of acoustic sensing in DAS has the characteristics of both long-distance and small-detail-scale, which is difficult to describe with existing models. To solves the problem, a macro-micro combined DAS model, is proposed for describing the overall DAS sensing process in the paper. The model includes macro transmission model, macro noise analysis model, and micro backscatter model. Then, the three sub models are carefully discussed, leading to the relatively perfect theory about light transmission, noise analysis and backscatter generation, respectively. What's more, simulation cases based on our model are introduced, where bidirectional EDFA relay DAS is displayed in detail as an example. The cases prove the model can provide strong guidance for subsequent experiments and other works.

Paper ID: 3080

Title: Optomechanical squeeze film sensors for absolute saturation vapor pressure measurements

Author(s): Robin V. Nielsen, Mohsen Salimi, Sepideh Naserbakht, Andreas Naesby, John V. E. Andersen, Henrik B. Pedersen and Aurelien Dantan

Affiliation: Aarhus University

Abstract: In this work we report on the realization of micromechanical squeeze film pressure sensors based on SiN membrane sandwiches and the construction and calibration of a novel instrument for the direct and absolute determination of the saturation vapor pressures of low-volatile substances.

Paper ID: 2003

Title: Non-measurable range elimination of dispersive interferometry ranging

Author(s): Jingsheng Huang, Jindong Wang and Tao Zhu

Affiliation: Chongqing University

Abstract: Dispersive interferometry (DPI) is a potent tool for both scientific and industrial areas as it enables high-accuracy measurement. However, the non-measurable range (NMR) and ambiguity area severely limits application scenarios and measuring range of DPI. Here, to eliminate the inherent limitations in DPI, we present a method that guarantees the phase difference corresponding to each wavelength in the interference spectrum is different by quantitative group delay modulation to improve the DPI structure. Simulation analysis results demonstrate that this method can completely resolve these limitations, thereby the performance of the DPI system can be greatly improved. This method could also be applied to emerging applications such as optical coherence tomography (OCT), long-distance ranging and precision light detection and ranging (LIDAR).

Technical Session

Conference Room	FB41	Time	15:50-17:45, August 22, 2023

Session 6: Optical Subsystems, Systems and Networks-Part II

Chair: Qirui Huang, Huawei International Pte Ltd, China

TIME TABLE

Time	Speaker / Paper ID	Affiliation
15:50-16:15	Tianhua Xu	University of Warwick
16:15-16:40	Lu Zhang	Zhejiang University
16:40-17:05	Filippo Cugini	CNIT
17:05-17:30	Alexander Ling	Centre for Quantum Technologies, National University of Singapore
17:30-17:45	Paper ID: 6934	LINKS Foundation; Politecnio di Torino

Invited Speaker

Tianhua Xu

University of Warwick

Bio: Dr. Xu received his Ph.D. degree in the area of Optical Communications and Intelligent Signal Processing in School of Information and Communication Technology (ICT), at Royal Institute of Technology (KTH), Sweden. His current research interests include optical communication systems and networks, intelligent signal processing, machine learning techniques, optical sensing systems and opto-electronics. He is a Senior Member of American Physical Society (APS) and a Fellow of Higher Education Academy. Dr. Xu is an Associate Editor of IEEE Access and Journal of the European Optical Society-RP. He has been the Chair of Optics in Digital Systems Technical Group in Optical Society of America (Optica), and the TPC co-chair/members of over 20 IEEE conferences, e.g. GLOBECOM, ICC etc. He is the project manager for an EU Horizon 2020 Grant and a UK National Grid Project. He has published over 120 journal and conference papers (including over 30 invited) and 2 invited book chapters.

Title: Advanced Signal Processing and Detection in Optical Communication Systems

Abstract: Fiber and wireless optic communications have played significant roles in increasing the data capacity of modern transmission systems. Laser and channel nonlinear distortions in optical fiber systems and the inter-symbol-interference and the time-varying channel impulse response in

optical wireless communication systems have deteriorated the detection and the demodulation of transmitted symbols from the received signals in corresponding systems. In the first part, we will discuss the performance of an advanced Kalman filter in mitigating the laser phase noise and the fiber nonlinearities under dispersion-unmanaged and dispersion-managed long-haul optical link conditions. In the second part, we will present two signal detection schemes in ultra-violet optical wireless communication systems by designing optimal linear and high-dimensional combinations of extracted ultra-violet signal-related geometrical features.

Invited Speaker

Lu Zhang
Zhejiang University

Bio: Lu Zhang is a full-time research professor at Zhejiang University, PhD supervisor. He received bachelor's degree from Southeast University in 2014 and PhD degree from Shanghai Jiao Tong University in 2019. He was a visiting PhD student from 2016 to 2017 at KTH Royal Institute of Technology sponsored by China Scholarship Council (CSC). Since 2018, He was a visiting research engineer at KTH Royal Institute of Technology and Kista High-speed Transmission Lab of RISE AB. His research interests include ultra-fast THz communications, THz sensing, fiber-optic communications and photonics AI.

Title: Photonics Terahertz Secure Communications

Abstract: With the evolution of the broadband information age characterized by massive data transmission and secure management of information, the terahertz band with rich spectrum resources effectively supports the transmission of high-speed wireless services. However, the propagation characteristics of terahertz waves, such as reflection and scattering, will lead to the endogenous risk of being eavesdropped. Aiming at the
safe and reliable demand for high-speed wireless service transmission, this talk integrates the endogenous quantum noise effect of optoelectronic devices and microwave photonics technology. This talk proposes to use quantum noise cipher technology to break through the security bottleneck of the photonics terahertz communication systems.

Invited Speaker

Filippo Cugini
CNIT

Bio: Filippo Cugini is Head of Research Sector at CNIT, Pisa, Italy. His main research interests include theoretical and experimental studies in the field of packet and optical networking. He currently serves as Coordinator of the ECSEL BRAINE Project, aiming at boosting Artificial Intelligence at the network Edge. Moreover, he serves as Technical Leader of the H2020 B5G-OPEN Project (14 Partners, 5.5M€ budget) and Project Coordinator of the Horizon Europe SEASON Project, targeting design and validation of next generation programmable multi-band optical networks.
He is co-author of 14 patents and more than 300 international journal and conference publications.

Title: IP over WDM White Box and SmartNICs for Disaggregated Programmable Optical Networks

Abstract: This talk will first discuss benefits and challanges of programmable white box equipped with coherent pluggable modules. Furthermore, the talk will present the potential of SmartNICs equipped with coherent transceivers.

Invited Speaker

Alexander Ling

Centre for Quantum Technologies, National University of Singapore

Bio: Associate Professor Ling is a Principal Investigator of the Centre for Quantum Technologies based at the National University of Singapore. His research interest is on the challenge of building a global quantum network and has operated entanglement technologies in space and other challenging physical environments. Recently, he also led Singapore's Quantum Engineering Programme.

Title: Observation of Entanglement Generation on a Cube Satellite

Abstract: In 2019, the Centre for Quantum Technologies operated a Cube Satellite, SpooQy-1, in low Earth orbit. During the 2 years of satellite life time, the team observed the generation of polarisation entangled photon pairs onboard the satellite, and studied radiation damage effects on various components. In this talk, I will share some of the most interesting observations from this mission and to suggest the next possible steps in augmenting Earth's based quantum networks from space.

Paper ID: 6934

Title: Analytical Performance Estimation Methods for Modern Optical Communications systems

Author(s): Giuseppe Rizzelli Martella and Roberto Gaudino

Affiliation: Giuseppe Rizzelli Martella, LINKS Foundation; Roberto Gaudino, Politecnio di Torino

Abstract: In this paper we present two different analytical tools for fast performance estimation of optical transmission systems based on both direct detection (DD) and coherent detection (CoD). We introduce the main equations used to model the communications systems and then validate the analytical results against full time domain numerical simulations. Several scenarios are considered ranging from short reach transmission over multimode fiber (MMF), to long-haul ROADM-based links and coherent detection. Our findings show an excellent agreement in every investigated condition based on realistic device parameters and advanced modulation formats typical of modern high-speed communications.

Technical Session

Conference Room	FB55	Time	15:50-17:45, August 22, 2023

Session 7: Fiber-Based Technologies and Applications-Part I

Chair: Lon Wang (Alex), National Taiwan University

TIME TABLE

Time	Speaker / Paper ID	Affiliation
15:50-16:15	Dongmei Huang	The Hong Kong Polytechnic University
16:15-16:40	Qian Li	Peking University Shenzhen Graduate School
16:40-17:05	Jindong Wang	Chongqing University
17:05-17:30	Xiaohui Li	Shaanxi Normal university
17:30-17:45	Paper ID: 7067	Beihang University

Invited Speaker

Dongmei Huang

The Hong Kong Polytechnic University

Bio: Dr. Dongmei Huang received her Ph.D. from The Hong Kong Polytechnic University in 2020, Hong Kong. She is currently an assistant professor in the Department of Electrical Engineering, The Hong Kong Polytechnic University. Her research focuses on both fundamental physics including mode locked lasers, swept lasers, nonlinear optics, integrated optics, and applications of photonics including biomedical imaging, high resolution measurement and LiDAR, optical fiber sensing. She is the guest editor of Photonics. She served as local arrangement chairs of OECC 2021 and ACP/IPOC 2022, and a TPC member of OECC 2021. She has co-authored 50 papers including 28 journal papers, 18 conference papers and 6 invited talks at international conferences and 7 patents. She won the Young Scientist Award in Optoelectronics Global Conference (OGC) 2022 and the Best Student Paper Award in International Conference on Optical Communications and Networks (ICOCN) 2018.

Title: Frequency Comb Generation in Coupled Nonlinear Microcavities

Abstract: Microcavity based optical frequency combs with Kerr nonlinearity attract much attentions for their various applications and compact configurations for chip-scale integration. In this talk, we present theoretical analysis of modulation instability and soliton microcomb generation in a coupled nonlinear microcavity system. By coupling an auxiliary cavity, new modulation instability and bistability regions are created at the blue-detuned side with respect to the main cavity resonances. A new soliton microcomb excitation scheme by tuning the coupling in coupled microcavities will be presented.

Invited Speaker

Qian Li
Peking University Shenzhen Graduate School

Bio: Qian Li received the Bachelor of Science degree from Zhejiang University, Hangzhou, China, in 2003, the Master of Science degree from the Royal Institute of Technology (KTH), Stockholm, Sweden, in 2005, and the Ph.D. degree from the Hong Kong Polytechnic University, Hong Kong, in 2009. After graduation she was a Visiting Scholar at the University of Washington, Seattle and Postdoctoral Fellow at the Hong Kong Polytechnic University. In 2012 she joined School of Electronic and Computer Engineering (ECE) in Peking University as an Assistant professor. Since 2013 she is Associate Professor at ECE. Her research interests include ultrafast optics, nonlinear optics, and integrated optics. She is PI of around ten research funds. Dr. Li is senior members of Institute of Electrical and Electronics Engineers (IEEE) and senior member of the Optical Society of America (OSA). From 2015 she is an advisor of OSA Student Chapter in Peking University Shenzhen Graduate School. From 2019 she is an advisor of Peking University Shenzhen Graduate School IEEE Photonics Society Student Branch Chapter.

Title: Experimental and Numerical Study of All-Polarization-Maintaining Linear Cavity Mode Locked Fiber Lasers

Abstract: We have demonstrated a novel, robust and compact fiber laser mode-locked by nonlinear polarization evolution (NPE) in the all-polarization-maintaining linear cavity. The reflectivity of the artificial saturable absorber (SA) is analyzed to explain the mode-locking mechanism in the laser cavity. The suggested linear cavity fiber laser provides a competitive low-noise light source for optical applications appropriate for complex environments. Both the experimental and numerical study will be presented in this talk.

Invited Speaker

Jindong Wang
Chongqing University

Bio: Jindong Wang is an assistant research fellow and a postdoctoral fellow in College of Optoelectronic Engineering, Chongqing University. He received his B. S., M.S. and Ph. D. degree in 2016, 2018 and 2021 respectively in engineering at the College of Precision Instruments and Optoelectronic Engineering, Tianjin university. Dr. Wang's research interests are in the area of on-chip soliton microcomb, fiber sensing, precious absolute ranging and space optical communication. He has published more than 20 peer reviewed papers in international journals including Photonics Research、Optics Letters、IEEE Transactions on Industrial Electronics, etc.

Title: Absolute Length Metrology with Nanoscale Accuracy using On-chip Microcomb

Abstract: High-precision length metrology constitutes a vital supporting technology in various fields, notably industrial manufacturing, aerospace, aviation, maritime, and scientific research.

Stringent demands have been placed on length measurement, with requirements for measurement range, accuracy, and speed continually advancing. Laser ranging technology has consistently served as the primary solution for large-scale measurements. An emerging novel chip-scale microresonator-based soliton optical frequency comb (soliton microcomb, SMC) has been gaining prominence, which exhibits compact dimensions, simple-structure, high repetition rate, and smooth spectral envelope, and thus holds the promise of significant breakthroughs in the realm of distance measurement. Here, we demonstrate a high-performance length metrology system based on a chip-scaled SMC. Combined with an auxiliary dual-frequency phase-modulated laser range finder, the none-dead-zone measurable range ambiguity is extended up to 1500 m. Within 80 m, the measurement error is less than 1μm, and the repeatability accuracy is less than 50nm. The proposed system is experimentally implemented in both indoor and outdoor environments. In the outdoor baseline field, real-time, high-speed (up to 35 kHz) measurement of a long distance of ~1179 m is achieved with a minimum Allan deviation of 5.6 μm at an average time of 0.2 ms.

Invited Speaker

Xiaohui Li

Shaanxi Normal university

Bio: Li Xiaohui is a professor at the School of Physics and Information Technology, Shaanxi Normal University. He mainly engaged in the research of ultrafast photonic technology, wide-band ultrashort pulse fiber laser and pulse dynamics, ultrafast photonics and application of two-dimensional materials. He has undertaken and completed the National Natural Science Foundation of China, the Shaanxi Normal University Outstanding Youth Academic Backbone Funding Program, a number of national key laboratory open funds, etc. He has published more than 100 papers in international journals such as, Small, Adv. Opt. Mater., ACS Photonics, Nanophotonics, Opt. Lett., Opt. Express. Eight papers were selected as cover articles of related journals. He is invited to serve as the guest editor of 5 international optical journals, and more than 30 domestic and international academic journal reviewers in the fields of optics and engineering technology.

Title: Sub-hundred Femtosecond Pulsed Fiber Laser Generations and Related Progress

Abstract: Fiber lasers have become the focus of current research in the field of laser due to their low pumping threshold power, high conversion efficiency, good heat dissipation, wide tunable range, high coupling efficiency (fully compatible with existing optical fiber communication systems and optical fiber sensing systems), and compact structure. The advantages and disadvantages of fiber lasers are mainly measured by their various properties including repetition frequency, pulse width and line width. In this report, how to further optimize the characteristics of the pulsed output beam and long-term working stability will be discussed, and the latest experimental progress will be reported. Through the regulation and suppression of intra-cavity dispersion and various nonlinear effects, the NPR-based 89 fs ultrashort pulse laser, the short-cavity high repetition rate laser with a repetition frequency of nearly 200 MHz, and a narrow linewidth laser with a spectral width smaller than 0.05 nm were realized.

Paper ID: 7067

Title: Space-multiplexing fiber meta-tip for efficient polarization conversion in near-infrared regime

Author(s): Qingcheng Song, Wenlin Luan and Xia Yu

Affiliation: Beihang University

Abstract: In this paper, a four-channel space-multiplexing fiber meta-tip is successfully realized. The fiber meta-tip is implemented by integration of a polarization conversion metasurface and a four-channel fiber-tip. The designed a-Si metasurface achieves linear-to-circular polarization conversion at wavelength of 833 nm to 868 nm. The ellipticity of transmitted light is designed to be 0.98, and measured up to 0.951 at 852 nm. In addition, the ellipticity of the four-channel fiber output is measured as 0.918, 0.917, 0.914, and 0.897. Using the integration approach proposed in this paper, the four-channel space-multiplexing fiber meta-tip can be further extended to more channels.

Technical Session

Conference Room	FB54	Time	15:50-17:45, August 22, 2023

Session 8: Microwave Photonics

Chair: Idelfonso Tafur Monroy, Eindhoven University of Technology, Dutch

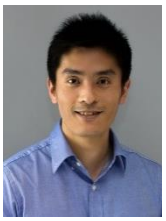
TIME TABLE

Time	Speaker / Paper ID	Affiliation
15:50-16:15	Kan Wu	Shanghai Jiao Tong University
16:15-16:40	Xin (Scott) Yin	IMEC - Ghent University
16:40-17:05	Zhixin Liu	University College London
17:05-17:30	Terry Tao Ye	Southern University of Science and Technology
17:30-17:45	Paper ID: 9686	Zhejiang University

Invited Speaker

Kan Wu

Shanghai Jiao Tong University



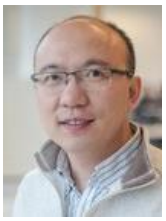
Bio: Dr. Kan Wu received his bachelor and master degrees in Shanghai Jiao Tong University in 2006 and 2009. He received his Ph.D. in Nanyang Technological University in 2013. Since 2013, Dr. Kan Wu is a professor in the department of Electronic Engineering in Shanghai Jiao Tong University. Dr. Kan Wu's research interests include mode-locked fiber lasers, photonic integration and optoelectronic devices. Dr. Kan Wu has published more than 50 papers including journals of Nature Communications, Light Science and Applications, Physical Review X, Optica, etc.

Title: Recent Progress on Erbium-Doped Lithium Niobate Amplifiers and Lasers

Abstract: Thin-film lithium niobate has attracted wide interest in photonic research. In this talk, we will briefly introduce our recent progress on erbium-doped lithium niobate amplifiers and lasers.

Invited Speaker

Xin (Scott) Yin
IMEC - Ghent University



Bio: Xin (Scott) Yin is a Staff Scientist at imec and professor at Ghent University, Belgium. He has extensive experience in managing research activities, particularly in international projects, such as PIEMAN, EUROFOS, MARISE, C3PO, DISCUS, Phoxtrot, MIRAGE, SPIRIT, WIPE, Teraboard, STREAMS, PICTURE, QAMeleon, 5G-PHOS, PlasmoniAC, POETICS, NEBULA, UniQorn and GreenTouch consortium. He has authored and co-authored more than 250 journal, book chapter and conference publications in the field of high-speed electronics and advanced fiber-optic communications, and received GreenTouch 1000x Award in recognition of his competence to collaborate with industry and research leadership. He is a member of the ECOC and Optica APC technical program committees (TPC).

Title: Integrated Transceiver Electronics for Novel Photonic Applications

Abstract: As everyday connectivity continues to evolve towards higher data rates with minimum latency, the demand for enhancing performance and integration drives front-ends development innovation. Optical transceiver technologies require energy-efficient, high-density, high-baud-rate electronics which can be closely integrated with advanced photonics devices. This presentation will illustrate a number of recent developments of application-specific high-speed electro-optic transceiver circuits for signal generation and reception at 100+ Gbaud, and ultra-low-noise receiver circuits for quantum applications.

Invited Speaker

Zhixin Liu
University College London

Bio: Zhixin Liu received his PhD degree in Information Engineering from the Chinese University of Hong Kong and joined the Optoelectronics Research Centre (ORC) at the University of Southampton in 2013. In 2016, he joined the Department of Electronics and Electrical Engineering at UCL as a lecturer and became an associate professor in 2021.

His research interests include optical signal processing and its applications in communication systems and scientific instruments. He has pioneered frequency comb assisted data conversion and low-latency data communications that have led to several world's first demonstrations. As a principal investigator, Dr Liu has co-authored more than 100 papers in international peer-reviewed journals and conferences, including several high-profile papers in Nat. Electron, Nat. Comm and invited papers in top IEEE/OSA journals. He holds four patents, including two licenced to telecom and datacom vendors. Dr Liu has been PI on more than 10 grants from Industry and Research Councils. He is Co-I on the £6.1m Programme grant.

Title: Enabling Low and Stable Latency Communication Using Clock and Frequency Referenced Access Networks

Abstract: The rise of timing-critical applications such as virtual reality and connected car fleets, combined with the rapid growth of the number of user devices, creates new challenges for the latency and reliability of user-cloud data communications. Currently user-cloud communications rely on time-scheduled data frames through tree-topology fibre networks, incapable of assuring guaranteed connections with low or stable latency, which is necessary for, e.g. remote surgeries and safe operations of self-driven cars. Besides, their scalability to a larger user count is limited. Here we show that clock and optical frequency synchronisation, enabled by burgeoning frequency comb and signal processing techniques, can provide each user with dedicated optical bandwidth to enable scalable user-cloud communications that guarantee simultaneously high per-use data rate and low latency. Our approach provides accurate clock and optical frequency synchronisation over deployed optical fibre links, which will be beneficial for many applications, including accurate navigation, quantum communications, and astronomy.

Invited Speaker

Terry Tao Ye
Southern University of Science and Technology

Bio: Dr. Terry Ye is the Professor at the Department of Electrical and Electronics Engineering (EEE) of Southern University of Science and Technology (SUSTech), and by courtesy, an Adjunct Professor at the Department of Electrical and Computer Engineering (ECE) of Carnegie Mellon University. Dr. Ye is active in academic research as well as industrial applications in many engineering areas that include IC Designs, Neuromorphic Computing ICs, Internet-of-Things (IOT) and Wireless Sensor Devices. Dr. Ye received his Ph.D. in Electrical Engineering from Stanford University and the Bachelor of Science in Electronic Engineering from Tsinghua University (Beijing). Prior to SUSTech, Dr. Ye had been the Professor of CMU-SYSU Joint Institute of Engineering since 2014, as well as the Director of Research and Technology Development of Hong Kong R&D Center for Logistics and Supply Chain Management (LSCM) since the center's inception in 2007. He also serves as the research fellow at the University of Hong Kong and the Chief Scientist of IOT Lab at Hong Kong University of Science and Technology. Beside his academic activities, Dr. Ye is keen on industry-academic collaborations. He had held various engineering and consulting roles in China.

Title: RFID-Controlled Passive Information Meta-Surfaces (IMS) for 6G Applications

Abstract: Information meta-surfaces (IMS) have been regarded as a revolutionary technology to improve the spectral efficiency for sixth-generation (6G) wireless communications due to their ability to manipulate and direct electromagnetic (EM) waves. However, there are still problems to be solved before the widespread application of IMSs. The first is to reduce the power consumption of IMS systems, and the second is to achieve a long-range programmability and control. In this presentation, we propose to use RFID transponder chips to control the RF-switch arrays, and

consequently program the functionality of IMSs. The proposed IMS consists of RFID tags formed into arrays, each of the tag is integrated with an RF switch chip to achieve 1-bit phase reconfigurability. Through reading and writing the RFID tags from remote readers, the IMS can be programmed to switch between three functionalities, including beam splitting, beam-forming, and EM-wave absorption. Our proposed technique is the ideal solution to achieve low-power and low cost IMSs in 6G applications.

Paper ID: 9686

Title: Experimental Demonstration of Photonics Millimeter-wave Chaotic Signal Generation

Author(s): Qiuzhuo Deng, Lu Zhang, Kangpeng Ye, Zhidong Lyu, Hongqi Zhang and Xianbin Yu

Affiliation: Zhejiang University

Abstract: Photonics millimeter-wave (MMW) chaotic signal generation is proposed, which utilizes the photonic heterodyne scheme and the OEO structure for broadband and stable chaotic signals. The chaotic signal at 120 GHz is generated and analyzed experimentally, with its 20dB-bandwidth of 20 GHz. This approach will take a significant step toward realizing the complement and perfection of the photonic MMW chaos theory and practice, especially in high-speed secured wireless communications and sensing.

Technical Session

Conference Room	FA32	Time	09:00-10:15, August 23, 2023

Session 9: Semiconductor and Integrated Optical Devices-Part II

Chair: Ajanta Barh, DTU Electro, Technical University of Denmark, Denmark

TIME TABLE

Time	Speaker	Affiliation
09:00-09:25	Richard Schatz	KTH Royal Institute of Technology
09:25-09:50	Yuqing Jiao	Eindhoven University of Technology
09:50-10:15	Wei Jiang	Nanjing University

Invited Speaker

Richard Schatz

KTH Royal Institute of Technology

Bio: Richard Schatz was born in 1963. Since 1987, he has been conducting research in Photonics as a Senior Researcher and Lecturer at Royal Institute of Technology. He is also a part of Acreo-KTH Kista HST-Laboratory, Stockholm, Sweden. During 1992–1993, he was a Visiting Scientist with AT&T Bell Laboratories, Murray Hill, NJ, USA. He has developed the laser simulation software LaserMatrix for the photonics industry and authored or coauthored more than 260 journal papers and conference contributions. His research interests include modeling, design, and characterization of fiber-optical transmitters (edge emitter lasers, VCSELs, and modulators) and links, both for ON-OFF keying and more advanced modulation formats

Title: Bandwidth Enhancement, Stability and Noise of DMLs

Abstract: The directly modulated laser (DML) is a key component in optical datacom due to its simple fabrication, high modulation bandwidth and high output power. The modulation bandwidth of single section DML:s is limited by electrical parasitics, thermal effects and overdamped response at high bias. In multi-section DML:s, the bandwidth can be enhanced by utilizing the wavelength selectivity of the laser cavity. However, this will also affect the noise, linewidth, chirp and side mode suppression of the DML. Three effects will be discussed; detuned loading, photon-photon resonance and chirp to intensity conversion.

Invited Speaker

Yuqing Jiao
Eindhoven University of Technology

Bio: Yuqing Jiao obtained dual PhD degrees from both TU/e and Zhejiang University in China in 2013. He has continued his research at TU/e, where he has been working as an Assistant Professor since 2016. He has a strong background in both silicon/silica and InP material systems and electromagnetic theories. In addition, he has more than 10 years of research experience in semiconductor cleanroom laboratories. He serves as a board member of IEEE Photonics Society Benelux Chapter. He also serves as active reviewer for over 10 international journals and has (co)authored more than 60 papers in refereed international journals (including 3 invited papers) as well as more than 120 international conference papers (including 16 invited talks).

Title: Photonic Integration on a Sub-micron InP Membrane

Abstract: In this talk, the concept and recent progress on the InP membrane photonic platform are presented. The platform features nanophotonics with native light sources, as well as the capability of wafer-scale assembly onto electronics.

Invited Speaker

Wei Jiang
Nanjing University

Bio: Wei Jiang is a professor in the college of engineering and applied sciences at Nanjing University (NJU). He serves as an associate director of Optical Communications Systems & Network Engineering Research Center of Jiangsu Province, and associate director of Optical Communications Engineering Research Center of Nanjing University. Prior to working at NJU, he was an associated professor in the department of electrical and computer engineering at Rutgers, the State University of New Jersey, USA. Prof. Jiang's research interests include silicon photonics, photonic crystals, nanophotonics, and their applications in optical interconnects, optical communications, sensing, and optical computing. He proposed a waveguide superlattice and demonstrated high-density low-crosstalk waveguide integration with half-wavelength pitches, which opened the door to a new generation of optical phased arrays. Further theoretical and experimental efforts from his group recently demonstrated a half-wavelength pitch optical phased array based on a waveguide superlattice, with potential applications in solid-state LIDARs and wireless optical communications. He contributed to the fundamental understanding of silicon electro-optic and thermo-optic devices, slow light, superprism effects, and photonic crystal interface physics. In 2007, the first high-speed photonic crystal modulator was demonstrated on silicon through one of his research projects.
Prof. Jiang served on IEEE Photonics Standards Committee, program committees for CLEO and many other international conferences. He received DARPA Young Faculty Award and IEEE Region I Outstanding Teaching Award, Undergraduate Mentor Award of Nanjing University, among other honors.

Title: Waveguide Superlattices for High Density Integration and Optical Phased Arrays

Abstract: As photonics integration develops rapidly in this century, the integration density has become a critical issue. Particularly, the integration density of waveguides, the fundamental photonic element, has been limited by high crosstalk as dielectric waveguide spacings shrink towards the sub-wavelength scale. In the past ten years, high-density waveguide superlattices have been proposed and demonstrated with low crosstalk (<1%) at half-wavelength spacings. We will discuss the physics involved in high-density waveguide integration with low crosstalk, including coherent coupling and random scattering from structural imperfections. Various technical aspects of high-density waveguide integration will be discussed, including bandwidth, loss, robustness, and bending characteristics. To illustrate potential applications of high-density waveguide integration, we will present a waveguide superlattice based optical phased array (OPA). While radio-frequency phased arrays have achieved superior characteristics with half-wavelength emitter pitch decades ago, optical phased arrays have long been limited by large emitter pitches well above the wavelength. The waveguide superlattice can now help shrink the pitch to half-wavelength, and produce the long-sought OPA characteristics such as wide angle steering and high main-beam energy ratios. Such an optical phased array may find applications in light detection and ranging (LIDAR), free-space optical communications, and biomedical scanning imaging. Pertinent issues for OPAs will be discussed if time allows.

Technical Session

Conference Room	FB55	Time	09:00-10:30, August 23, 2023

Session 10: Optical Subsystems, Systems and Networks-Part III

Chair: Zhixin Liu, University College London, UK

TIME TABLE

Time	Speaker / Paper ID	Affiliation
09:00-09:25	Haik MARDOYAN	Nokia Bell Labs
09:25-09:50	Vincent Chan	Massachusetts Institute of Technology
09:50-10:15	Danshi Wang	Beijing University of Posts and Telecommunications
10:15-10:30	Paper ID: 8610	Zhejiang University; Riga Technical University; KTH Royal Institute of Technology;

Invited Speaker

Haik MARDOYAN

Nokia Bell Labs

Bio: Haik Mardoyan (m) is a senior research scientist within Bell Labs Optical transmission research domain at Paris-Saclay center in Massy, France. He got the diploma "Master of research in sciences and technology in fundamental physics and optronics" from University of Paris Sud, France. During his 23 years with Alcatel-Lucent (now Nokia Bell Labs), he takes part in large-scale research on multi-terabit/s experiments and records in the field of wavelength division multiplexing transmissions, data center, terrestrial and submarine systems. He is expert on building high baud rate transmission experiments with state of art PIC components. He worked for two research activities related to dynamic optical networks for metropolitan, datacenter, and access architectures. He is the first author of 4 postdeadline papers, the coauthor of 29 postdeadline papers at major conferences (Optical Fiber Communication Conference, European Conference on Optical Communication, Optical Amplifiers and their Applications Conference, OptoElectronics and Communications Conference), the author and coauthor of more than 140 journal and conference papers and holds 4 patents. He has participated in several European and French national projects (e.g. COHDEQ40; MIRTHE; MICROS; 100GRIA; STRADE) and was leading the Bell Labs support for the HENIAC ANR project, PANTHER FP7 European project. He is also currently leader of the QAMELEON H2020 European project whose aim is to develop a sliceable multi-QAM format SDN-powered transponders and ROADMs Enabling Elastic Optical Networks with a total net capacity up

to 3 Tb/s.

He has been listed in The Photonics100 of 2023 and he has been recognised as one of the extraordinary people leading the way in the innovation, development, and adoption of photonics technologies. Haik has been awarded as Distinguished Member of the Technical Staff of Nokia Bell Labs recognizing his pioneering scientific achievements in high-speed photonics technologies and key contributions supporting Nokia's optical strategy.

Title: High-Speed Transmitter for Coherent Optical Communication

Abstract: We review the most recent experimental demonstrations on ultra-high speed optical coherent systems. We elaborate the feasibility of the future transceivers connectivity beyond 200-GBd, fundamentally enabled by the thin-film lithium niobate I/Q modulator and large analogue bandwidth technology.

Invited Speaker

Vincent Chan

Massachusetts Institute of Technology

Bio: Vincent Chan received his BS/MS/EE/PhD from MIT (1971-1974.) He was the Head of the Communications and Information Technology Division of the MIT Lincoln Laboratory (now Cyber and Communications Divisions), and Director of the Laboratory for Information and Decision Systems. He initiated the US's Laser Intersatellite Transmission Experiment Program and the follow-on GeoLITE Program in 1980-1989. He was the first to use "Dual-Use Technology Investment" by the Clinton Administration to form and chaired: the All-Optical-Network Consortium among MIT/AT&T/DEC, the Next Generation Internet Consortium, ONRAMP among MIT/AT&T/Cabletron/Nortel/JDS, and a Satellite Networking Consortium formed among MIT/Motorola/Teledesic/Globalstar. His research focus is on communications and network architectures, intelligent network management and control and security. He chaired many advisory committees including the Defense Science Board Taskforce on Communications and Networks and DHS's Science and Technology Advisory Board, and has been active with start-ups, a Board Member of a Fortune-500 network company, and a Member of the Corporation of Draper Laboratory. He is a Life Fellow of IEEE and a Fellow of the Optical Society of America.

Title: Optical Wireless Network Architecture

Abstract: We will explore the architecture of optical wireless networks at high throughputs. The challenge is to architect the system and the network protocols (from the Physical Layer to the Application Layer) with large bandwidth-delay products and the presence of atmospheric turbulence and weather.

Invited Speaker

Danshi Wang

Beijing University of Posts and Telecommunications

Bio: Danshi Wang received the Ph.D. degree in electromagnetic field and microwave technology from the Beijing University of Posts and Telecommunications (BUPT), in 2016, where he is currently an associate professor with the State Key Laboratory of Information Photonics and Optical Communications (IPOC) in BUPT. He has authored or co-authored over 150 technical papers in international journals and conferences. His main research interests include application of machine learning in optical fiber communications, advanced optical communication systems and networks, especially digital twin optical networks, digital signal processing, optical performance monitoring, physical-informed neural network, data-driven modeling, etc.

Title: Applications of Physics-Informed Neural Network for Optical Fiber Communications

Abstract: Due to the capability of the physics-informed neural network (PINN) to solve complex partial differential equations automatically, it has revolutionized the field of scientific computing. This talk will introduce the applicability of PINN in optical fber communication and presents multiple potential solutions for time-domain, frequency-domain, and spatial-domain modeling.

Paper ID: 8610

Title: Analysis and compensation of nonlinear dynamics in optical fiber transmission with the optoelectronic reservoir computing

Author(s): Jiahao Zhang, Xianbin Yu, Vjaceslavs Bobrovs, Xiaodan Pang, Oskars Ozolins and Lu Zhang

Affiliation: Jiahao Zhang, Zhejiang University; Xianbin Yu, Zhejiang University; Vjaceslavs Bobrovs, Riga Technical University; Xiaodan Pang, KTH Royal Institute of Technology; Oskars Ozolins, KTH Royal Institute of Technology; Lu Zhang, Zhejiang University

Abstract: Optical fiber communication systems play an important role in broadband signal transmissions, where the nonlinear dynamics in the long-haul optical fiber transmissions greatly degrade the transmission performance and limit the fiber capacity and reach. This paper analyzes and compensates for the nonlinear dynamics in the long-haul optical fiber transmission with the delay-based optoelectronic reservoir computing (RC) scheme, which provides benefits like time-adaptive tracking, lowcomplexity and hardware implementation potentials. The generalization of the analysis and compensation schemes from the traditional amplitude-modulated PAM signal to the amplitudephase-modulated QAM signal is achieved by signal preprocessing. In the numerical study, the proposed RC-based fiber dynamics compensation scheme, with fiber reach from 1400km to 3000km, shows considerable performance with the digital backpropagation scheme, which is always used as the benchmark for nonlinear compensation of long-haul fiber transmissions. The realization complexity is much reduced with the RC-based schemes, which has provided a new dawn for optics-based nonlinear analysis and compensations.

Technical Session

Conference Room	FB41	Time	09:00-10:35, August 23, 2023

Session 11: Fiber-Based Technologies and Applications-Part II

Chair: Juan Diego Ania Castañón, Consejo Superior de Investigaciones Científicas, Spain

TIME TABLE

Time	Speaker / Paper ID	Affiliation
09:00-09:25	Stefan Kalsson	FMV
09:25-09:50	BISHNU PAL	Mahindra University
09:50-10:05	Paper ID: 8439	Instituto de Óptica "Daza de Valdés" (IO-CSIC)
10:05-10:20	Paper ID: 4335	Southern University of Science and Technology
10:20-10:35	Paper ID: 8104	Chongqing University

Invited Speaker

Stefan Kalsson

FMV

Bio: Stefan Karlsson is a leader of fiber optical tactical systems in the Swedish Defense Material Administration (FMV). Including high frequency transmission of sensor signals, secure communication and robust tactical installations in field environment.
Stefan has previously been working with research about fiber optical sensor systems within the Swedish National Research Institute. Within the Royal Institute of Technology, he has been involved in research about electro absorption modulators at 60 GHz within for heterogeneous broadband wireless nodes (GANDALF) and 100 Gbps research within mm-wave functions for broadband applications (IPHOBAC). Currently he is involved within AI-NET-PROTECT: concerning research about physical layer security.
He has been a presenter at several international conferences such as OFC (Optical Fiber Communication), MILCOM (Military Fiber Optical Communication), IWCS (International Wire and Cable symposium) and ONDM (International Conference on Optical Network Design and Modelling).
Stefan holds a master degree in Physics and electronics from the technical university of Linkoping, Sweden as well as research education at the Royal Institute of Technology in Stockholm, Sweden.
He is also a holder of international patents concerning fiber optical sensors.

Title: Detection of Eavesdropping Attempts from the Optical Layer

Abstract: Headline: Protection of information in optical fibers
Protection of fiber infrastructures from eavesdropping attempts is of increasing importance, especially in defense and military applications. Within the frame of AI-NET-PROTECT, FMV and Chalmers has been investigating theoretical and practical aspects to perform eavesdropping from an optical fiber. At ONDM2021 (International Conference on Optical Network Design and Modelling) theoretical aspects where discussed. Practical presumptions to couple out light from a G.657 bend insensitive fiber were presented at ONDM2022. A method of detecting changes in the state of polarization related to attempts of eavesdropping an optical fiber was presented at ONDM2023 and demonstrated at OFC2023. Future activities will involve machine learning to distinguish between activities with the intention to perform eavesdropping from the normal behavior of the system.
This invited talk will summarize the research activities in the field of protecting an optical fiber from being eavesdropped of information.

Invited Speaker

Bishnu Pal
Mahindra University

Bio: Currently Professor of Physics and Dean Ecole Centrale School of Engineering at Mahindra University Hyderabad India (formerly at IIT Delhi) has been engaged in Fiber Optics, Silicon and Mid-IR Photonics for over four decades. He has extensively published in research journals, and authored/edited several popular books/monographs. He is a Fellow of Optica (formerly OSA), SPIE, Distinguishe Fellow of Optical Society of India, SMIEEE, and Honorary Foreign Member of DKNVS (Norway). He is a recipient of Esther Foffman Beller Medal of Optica and Maria J Yzuel Educator award of SPIE and several national S&T awards. He has served the editorial advisory boards of several international journals including IEEE Photonics J, the Optica/OSA Board of Directors as a member.

Title: Application-specific Specialty Optical Fibers for Communication, Mid-IR and THz Photonics

Abstract: Inspite of the huge progress already seen in the fiber design space, opportunity for newer designs for various domain-specific applications of specialty optical fibers still exist. In this talk we will try to review some of those application areas with snap shots of my group's research including mid-IR and THz photonics.

Paper ID: 8439

Title: Optimization of Output Pulse Properties in Ultralong Ultrafast Ring Fibre Lasers Using Polarization and Gain Control

Author(s): Inés Cáceres Pablo and Juan Diego Ania Castañón

Affiliation: Instituto de Óptica "Daza de Valdés" (IO-CSIC)

Abstract: Limited polarization control in mode-locked ultralong pulsed ring lasers based on standard telecommunications fiber is shown to reduce pulse duration, noise and chirp and increase pulse peak power with values excessing 1.5 MW.

Paper ID: 4335

Title: Mode-locking of ultrafast fiber lasers based on InP QDs saturable absorbers

Author(s): Yajun Lou, Boyuan Ge and Xinhai Zhang

Affiliation: Southern University of Science and Technology

Abstract: In this study, red light emitting InP/ZnSeS/ZnS QDs are prepared by thermal injection method. The results show that the InP/ZnSeS/ZnS QDs saturable absorbers (SA) have good nonlinear saturable absorption properties with modulation depth of 24.2% and saturation intensity of 0.08 KW cm-2. Then the QD SAs are applied to the erbium-doped fiber laser (EDFL) ring cavity system, and a mode-locked laser pulse with a pulse width of 635 fs was generated. In addition, the pulse width is determined by the carrier recovery time, which is closely related to the defect density in the material. We eliminated a large number of defects in the QDs by hydrogen fluoride (HF) treatment, and reduced the pulse width from 635 fs to 450 fs. Results of time-resolved PL (TRPL) and ultrafast transient absorption spectroscopy (TAS) show that HF treatment indeed reduces defects in InP/ZnSeS/ZnS QDs, indicating by the decrease of the carrier recovery time. This is different from the reported 2D SA materials, which usually reduce the carrier recovery time by increasing the defect density. Our study will inspire new applications of QDs in ultrafast photonics and nonlinear optics.

Paper ID: 8104

Title: Wideband and Fast Optical Fiber Dispersion Measurement Using the Pulse Delay Method Based on Super-Continuum Laser

Author(s): Wei Du, Jindong Wang, Jingsheng Huang and Tao Zhu

Affiliation: Chongqing University

Abstract: This paper investigates the use of the pulse delay method based on super-continuum laser for measuring the dispersion curve of optical fibers. It offers advantages such as high accuracy, fast measurement speed, and a wide spectral range. The proposed dispersion measurement system is based on the Michelson interferometer, characterized by its simple structure and ease of adjustment. Furthermore, it allows for the measurement of dispersion in multiple devices with a single adjustment, holding significant significance in fields such as fiber optic communication and fiber optic sensing.

Technical Session

Conference Room	FB42	Time	09:00-10:15, August 23, 2023

Session 12: Plasmonics and Metamaterials-Part I

Chair: Aurelien Dantan, Aarhus University, Denmark

TIME TABLE

Time	Speaker	Affiliation
09:00-09:25	Magnus Jonsson	Linköping University
09:25-09:50	Zhen Gao	Southern University of Science and Technology
09:50-10:15	Longqing Cong	Southern University of Science and Technology

Invited Speaker

Magnus Jonsson

Linköping University

Bio: Magnus Jonsson is a professor of applied physics at Linköping University in Sweden. He leads a research group focusing on organic photonics and nanooptics (www.mpjonsson.com), based at the Laboratory of Organic Electronics (LOE). His main research interests are to develop and study novel nanooptical concepts for application in sensors, displays, energy systems and smart materials. The group particularly explores organic materials for nanooptics. As examples, they recently introduced conducting polymers as a new materials platform for dynamic plasmonics and they study cellulose-based materials for applications like radiative cooling.

Prof. Jonsson joined Linköping University as an assistant professor in 2014, become associate professor in 2016, and full professor in 2021. He was appointed Wallenberg Academy Fellow in 2019, received a Swedish Research Council Consolidator grante in 2020 and a an ERC consolidator grant in 2023. During 2011-2014, he was a postdoctoral Wenner-Gren Fellow at TU Delft in the Netherlands, and before that he did his PhD studies at Lund University and Chalmers University of Technology in Sweden. Professor Jonsson's awards and scholarships include the 2021 Journal of Optics Early Career Award, Journal of Materials Chemistry C Emerging Investigator 2017, the Elsevier Biosensors and Bioelectronics Award 2010, the St Jude Medicals Research Scholarship 2009 and MRS Graduate Student Gold Award 2009. Prof. Jonsson is the vice head of LOE and deputy director of the strategic initiative on Advanced Functional Materials at Linköping University. Besides research and teaching, he is active in outreach and research policy and in 2019/2020 he was the chair of the Young Academy of Sweden. In 2022 he was a delegate in the Royal Technology Mission to France and Germany led by H.M The King of Sweden and organized by the Royal Swedish Academy of

Engineering Sciences.

Title: Dynamic Conducting Polymer Nanooptics

Abstract: My group develops novel ways to control light and heat using organic materials like conducting polymers and cellulose. Applications include tuneable nanooptical metasurfaces, reflective color displays and energy-regulating optical materials. In this presentation, I will first focus on our work on conducting polymers as a new materials platform for dynamically tuneable plasmonics, as first demonstrated for nanostructures made from the highly conducting polymer PEDOT:Sulf.[1] By contrast to static nanoantennas made of traditional metals, we show that the optical response of the polymeric antennas could be repeatedly turned off and on again by varying the redox state of the polymer, which reversibly switches the material between optically metallic and dielectric.[1,2] Our latest work extends the topic to the organic semiconductor PBTTT and to excitonic materials.[3,4] I will then demonstrate how the same type of conducting polymers offers novel means for forming structurally colored materials with dynamic coloration,5,6 with anticipated use for reflective labels and displays in color. Finally, I will discuss our latest work on radiative cooling by which thermal energy is transferred to space via Planck radiation, including electrical tuneability at ambient conditions.[7-11]

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4. Organic Anisotropic Excitonic Optical Nanoantennas E. S. H. Kang et al. Advanced Science 2022, 9, 23, 2201907

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6. Tunable structural color images by UV-patterned conducting polymer nanofilms on metal surfaces. S. Chen et al. Advanced Materials 2021, 33, 33, 2102451

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Invited Speaker

Zhen Gao

Southern University of Science and Technology

Bio: Zhen GAO is an Associate Professor of Southern University of Science and Technology (SUSTech). He received PhD in 2018 from School of Physical and Mathematical Sciences in Nanyang Technological University, Singapore, following his B.S. degree in 2009 and M. S. degree in 2012 from Zhejiang University in Hangzhou, all majored in Electrical Engineering. His current research interests include electromagnetic wave theory and applications, photonic crystals, spoof plasmonics, metamaterials, topological photonics/phononics/circuits, and terahertz photonics. As the first author or corresponding author, he has published more than 30 papers on Nature, Nature Communications, Physical Review Letter and Advanced Materials. He received National Distinguished Youth Expert in 2020, the Chinese Government Award for Outstanding Self-financed Student Award in 2016, Ten Major Advances in Chinese Optics in 2019 and The National-level Talent in Shenzhen.

Title: Three-dimensional Nonreciprocal Topological Photonics

Abstract: Chiral edge states that propagate oppositely at two parallel strip edges are a hallmark feature of Chern insulators which were first proposed in the celebrated two-dimensional (2D) Haldane model. Subsequently, counterintuitive antichiral edge states that propagate in the same direction at two parallel strip edges were discovered in a 2D modified Haldane model. Here we report the first experimental observations of chiral and antichiral surface states, the 2D extensions of one-dimensional (1D) chiral and antichiral edge states, by constructing a three-dimensional (3D) Haldane model and a 3D modified Haldane model in 3D magnetic photonic crystals. Using microwave field-mapping measurements, unique properties of chiral and antichiral surface states have been observed directly, including the chiral and antichiral robust propagations, tilted surface dispersions, a single open Fermi arc connecting two projected WPs and a single surface Fermi loop that winds around the surface Brillouin zone (BZ). These results extend the scope of 3D topological photonic states and enrich the family of 3D magnetic topological insulators and magnetic Weyl semimetals.

Invited Speaker

Longqing Cong

Southern University of Science and Technology

Bio: Longqing Cong, Associate Professor and National Distinguished Youth Expert at SUSTech. His research interests are terahertz photonics and metamaterials for applications in sensing, imaging, and communications. He has published over 50 peer-reviewed papers with more than 5000 citations, and h-index 35. He serves as a long-term reviewer for over 40 journals, and editor for Science journal Ultrafast Science and Chinese Laser Press. He was awarded the gold medal of "MRS Singapore best PhD thesis", Best Young Scientist award by IEEE Photonics Society, IEEE senior member, and

WuSi Medal by Shenzhen government.

Title: Temproal Loss Boundary and Hybrid BIC in Terahertz Metasurfaces

Abstract: Interesting phenomena were observed in a terahertz metasurface cavity while modulated by a temporal loss boundary in an ultrafast fashion. The effects would be enhanced by a cavity possessing larger quality factors. The talk will then move to show the recent results on how to obtain robust and high quality factor BIC resonances by employing the so-called "hybrid BIC metasurfaces". The idea proposes a general strategy to improve robustness of quality factors of BICs, and could be extended to different types of BICs.

Technical Session

Conference Room	FA32	Time	10:45-12:00, August 23, 2023

Session 13: Semiconductor and Integrated Optical Devices-Part III

Chair: Richard Schatz, KTH-Royal Institute of Technology, Sweden

TIME TABLE

Time	Speaker	Affiliation
10:45-11:10	Kristinn B. Gylfason	KTH Royal Institute of Technology
11:10-11:35	Jiawei Wang	Harbin Institute of Technology
11:35-12:00	Mattias Hammar	Royal Institute of Technology

Invited Speaker

Kristinn B. Gylfason

KTH Royal Institute of Technology

Bio: Prof. Kristinn B. Gylfason received the title of Docent in Micro- and Nanosystems in 2015 and the Ph.D. degree in Electrical Engineering in 2010, both from KTH – Royal Institute of Technology, Sweden. He received the MSc and BSc degrees in Electrical Engineering from the University of Iceland in 2003 and 2001, respectively. In the spring term of 2002, he did an exchange at the University of California, Santa Barbara, USA. Since 2018 he has been an Associate Professor at the KTH division of Micro and Nanosystems. His research involves photonic nanodevices for communications and sensing applications. He has published more than 40 international journal articles (SCI indexed) and 100 international conference proceeding papers and holds 5 granted patents in the area of photonics, sensing, and micro/nanoengineering. He is a recipient of the IEEE MEMS Best Paper Award (2015 and 2020) and the Göran Gustafsson Young Researcher Price (2012), Steinmaur Foundation nanotechnology graduate study scholarship (2002). As of Jan 2023, his work has been cited more than 2,700 times, and his h-index is 24.

Title: Wafer-Level Vacuum-Sealed Low-Power Photonic MEMS for High Density Silicon Photonic Circuits

Abstract: Photonic integrated circuits (PICs) promise to be the optical equivalent of electronic integrated circuits (ICs). However, current PICs fall far short of electronic ICs in the number of devices per chip. One roadblock is the power consumption and the footprint of active photonic components. By micromechanical actuation of PICs, we show orders of magnitude reduction of power consumption compared to current thermo-optic counterparts. We demonstrate our

approach by implementing MEMS tunable photonic devices such as phase shifters, couplers, and wavelength filters. We realize our technology in a silicon photonics foundry platform and show complex circuits on a small chip. Furthermore, we show wafer-level vacuum-sealing of the silicon photonic MEMS circuits.

Invited Speaker

Jiawei Wang
Harbin Institute of Technology

Bio: Wang Jiawei is currently an associate professor in the School of Electronics and Information Engineering, Harbin Institute of Technology (Shenzhen). He received his B.S. and Ph.D. degrees from the School of Physics, Sun Yat-sen University, and the Department of Electronic and Computer Engineering, Hong Kong University of Science and Technology in 2011 and 2016, respectively. From 2016 to 2020, he was engaged in post-doctoral research at the Leibniz IFW Dresden, Germany. From 2017 to 2020, he was also a research associate of the Department of Electronics and Information Engineering at Chemnitz University of Technology, Germany. The current main research interests include integrated photonics, cavity photonics, and applications in optical sensing and optical manipulation. He has published ~40 SCI-indexed papers in Nature Photonics, Science Advances, Laser & Photonics Reviews, Nano Letters, ACS Nano, ACS Photonics, and other journals, and participated in more than 20 international and domestic well-known conferences and forums such as CLEO, SPIE Photonics West, and FiO+LS.

Title: Berry Phases in 3D Optical Microcavities

Abstract: Berry phase, an effect with a pure topological origin due to non-trivial evolution in parameter spaces, can be manipulated in miniaturized systems with a close path. In this talk, I will present the latest studies of Berry phases realized in 3D optical microcavities. The Möbius strip, a fascinating loop structure with one-sided topology, provides a rich playground for manipulating the non-trivial topological behavior of spinning particles, such as electrons, polaritons, and photons, in both real and parameter spaces. We report the experimental observation of the Berry phase generated in optical Möbius-strip microcavities. In contrast to theoretical predictions in optical, electronic, and magnetic Möbius-topology systems where only Berry phase π occurs, we demonstrate that a variable Berry phase smaller than π can be acquired by generating elliptical polarization of resonating light. Besides, a generalized Berry phase in asymmetric 3D microcavities will be discussed, with a switched scope from a cyclic and Abelian context to cases non-cyclic and non-Abelian context. It is envisioned that 3D optical microcavities as integrable and Berry-phase-programmable optical systems are of great interest in topological physics and emerging classical or quantum photonic applications.

Invited Speaker

Mattias Hammar
Royal Institute of Technology

Bio: Prof. Mattias Hammar, received his MSc (1986) and PhD (1993) degrees from the Department of Physics, Royal Institute of Technology (KTH). From 2007 he is a Professor at the Department of Electrical Engineering at KTH and during his career he has also been affiliated with the Swedish Institute of Microelectronics, IBM Research Division and Zarlink Semiconductor. He has an extensive academic and industrial experience related to optoelectronic materials and devices, he has managed or been involved in several national and international projects within the photonics area, and he is Program Director for the International Master's program in Nanotechnology at KTH.

Title: Telecom-Wavelength Photonic-Crystal SurfacE-emitting Lasers

Abstract: Photonic-crystal surface-emitting lasers (PCSELs) are attracting significant interest a range of different applications in materials processing, communication and sensing. A key attribute is that they can produce large-area singlemode emission using a two-dimensional photonic crystal cavity where in-plane propagating waves are diffracted to the vertical direction [1]. To this end, PCSELs have predominantly been fabricated in the GaAs materials system for emission in the near-infrared wavelength regime around 1 μm, but there is also a range of important applications in the longer-wavelength telecommunication wavelength regime (1.2-1.6 μm) requiring InP-based active layer. Here, we review our development efforts related to InP-based PCSELs and discuss epitaxial regrowth strategies for monolithic InP PCSELs [2], micro transfer printing for hybrid InP/Si PCSELs [3-4], buried-tunnel junction current injection for ultrathin device structures [5], as well as device-specific aspects related to thermal management [6] and size scaling to facilitate high-bitrate applications [7].

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2. C. Reuterskiöld Hedlund el al., Pysica Status Solidi A 218 (3), 2000416 (2020)
3. D. Zhao, et al., Sci. Rep. 6, 18860 (2016)
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6. S.-C. Liu et al., Applied Optics 56 (31), H67 (2017)
7. S.-C. Liu et al., IEEE Photonics Journal, 10 (3), 1 (2018)

Technical Session

Conference Room	FB55	Time	10:45-11:50, August 23, 2023

Session 14: Optical Subsystems, Systems and Networks-Part IV

Chair: Hongyan Fu, Tsinghua University, China

TIME TABLE

Time	Speaker	Affiliation
10:45-11:10	Carlos Natalino	Chalmers University of Technology
11:10-11:25	Paper ID: 2125	Beijing University of Posts and Telecommunications; China United Network Communications Group Co., Ltd
11:25-11:50	Deming Kong	Technical University of Denmark

Invited Speaker

Carlos Natalino

Chalmers University of Technology

Bio: Carlos Natalino is a researcher with the Optical Networks Unit, Department of Electrical Engineering, Chalmers University of Technology, Gothenburg, Sweden. He focuses his research on network automation and on the challenges and opportunities for application of machine learning in the network automation context. In particular, over the past years, he has been researching how to leverage machine learning for optical network design and operation, in problems such as resource efficiency (e.g., spectrum) and physical layer security. Carlos has been involved in several national and international projects funded by research bodies in EU and Brazil. He has also been involved in teaching computer programming courses in Brazil and Sweden. He is an IEEE member.

Title: Automating the ML lifecycle with ML-as-a-Service

Abstract: Machine Learning (ML) has shown immense potential for enabling the autonomous operation of optical networks. The prospective use cases include quality-of-transmission estimation, anomaly detection, and failure prediction. However, building ML models incurs a high cost, mainly associated with the human intervention required. We propose ML-as-a-Service as a solution to alleviate the cost of ML and improve the scale at which such models can be adopted.

Paper ID: 2125

Title: Neural Operator for Optical Fiber Channel Modeling: A Hybrid Physics and Data Driven Approach

Author(s): Yuchen Song, Min Zhang, Xiaotian Jiang, Lifang Zhang, Hong Zhu and Danshi Wang

Affiliation: Yuchen Song, Min Zhang, Xiaotian Jiang and Danshi Wang, Beijing University of Posts and Telecommunications; Lifang Zhang and Hong Zhu, China United Network Communications Group Co., Ltd

Abstract: Hybrid physics and data driven neural operator is introduced for fiber channel modeling, which significantly reduces the data collection requirements and enhances the reliability as well as generalization of the modeling process. This method can be easily scalable for distance, sequence length, and launch power, and is implemented for simulations of dual-polarization 16-QAM signal transmission up to 640 km with ASE noise.

Invited Speaker

Deming Kong

Technical University of Denmark

Bio: Deming Kong (M'15) received the B.S. degree in communication engineering and the Ph.D. degree in electromagnetic field and microwave engineering from Beijing University of Posts and Telecommunications (BUPT), Beijing, China, in 2008 and 2014, respectively. He continuously worked in BUPT as a postdoc until the end of 2016. He then worked as a research fellow with the Electro-Photonics Laboratory, Monash University in 2017. He joined DTU Photonic in 2018. He is currently a tenure-track researcher in DTU Electro. His research interests include optical computing, integrated optical neural networks, ultrahigh speed optical communication systems, and optical signal processing techniques.

Title: High-Precision Optical Convolution Processor for Neural Networks with Digital Inputs

Abstract: We propose and demonstrate a digital high-precision optical convolution processor for neural networks. A record high calculation precision of 16 bits is demonstrated and no accuracy loss is observed for handwritten digits recognition.

Technical Session

Conference Room	FB41	Time	10:45-12:00, August 23, 2023

Session 15: Advanced Materials for Photonics-Part II

Chair: Aung Ko Ko Kyaw, Southern University of Science and Technology, China

TIME TABLE

Time	Speaker	Affiliation
10:45-11:10	Qin Wang	RESEARCH INSTITUTES OF SWEDEN (RISE)
11:10-11:35	Muhammad Danang Birowosuto	Łukasiewicz Research Network - PORT Polish Center for Technology Development
11:35-12:00	Susobhan Das	Aalto University

Invited Speaker

Qin Wang

Research Institutes Of Sweden (RISE)

Bio: Qin Wang is a senior expert at RISE and an adjunct professor at KTH. She is working on nanostructure based optoelectronics and photonics devices for sensing, imaging, communication and life-science applications.

Title: Graphene and GraphenE-based Hybrids for Bio/Chemical and Industrial Sensing Applications

Abstract: This talk presents an overview of the graphene-related R&D work at RISE AB with focus upon sensing applications. Following three application examples will be emphasized including the design, fabrication, and verification details of the graphene-based sensors/devices:
(1) Graphene/metal plasmonic structures-based IR photodetectors
(2) Graphene quantum dots as fluorescent sensing probe for detection of amphetamine and cocaine
(3) Hybrids of graphene/ZnO tetrapods for dopamine sensing
In addition, the challenges and future perspectives of the graphene-based sensors will be addressed.

Invited Speaker

Muhammad Danang Birowosuto

Łukasiewicz Research Network - PORT Polish Center for Technology Development

Bio: Muhammad Danang Birowosuto is the research area leader of "Photonic Materials and Structures" at Łukasiewicz – PORT. He earned his Master's and PhD degrees from the University of Groningen and Delft University of Technology, respectively. Following his graduation, he served as a postdoctoral researcher at the University of Twente in the Netherlands and later as a researcher at Nippon Telephone Telegraph in Japan. During his time at both institutions, he actively conducted research in the fields of Photonics and Nanotechnology, with a specific focus on luminescence, scintillation, disordered materials, photonic crystals, plasmonic antennas, single photon sources, lasers, and applications in the telecom wavelength domain. Before assuming his current position at Łukasiewicz – PORT, he worked as a principal researcher and program manager at the CNRS International-NTU-Thales Research Alliance in Singapore. During his tenure there, he led pioneering projects centered around perovskite halide scintillators and perovskite photonics. In total, he holds 5 World and US patents and has published over 100 articles in various esteemed journals. Notably, he secured research grants totaling approximately 2 million USD during his time in Singapore and Poland. In addition to his research responsibilities, he serves as an associate editor for Frontiers in Materials and is a committee member for the International Conference on Solid State Devices and Materials (SSDM) in Japan.

Title: Beyond Perovskite Scintillators: Practical Applications, Purcell-Enhanced Properties, and Future Prospects

Abstract: Scintillating materials are vital in detecting ionizing radiations and are extensively used in diverse detection systems across fields like medical imaging, homeland security, high-energy-physics calorimetry, industrial control, and oil drilling. Quality criteria for these materials include scintillation yield, density, and timing response, which are particularly significant.

When interacting with high-energy photons like X-rays or gamma rays, the timing response becomes complex in the multi-time-scale regime, crucial for numerous applications. Solution-processable perovskite scintillators offer a promising alternative to expensive lanthanide scintillators, exhibiting comparable or superior properties for advanced imaging and detection applications.

For instance, time-of-flight functionalities require sub-100 ps time resolution, coincidence techniques demand sub-tens of nanoseconds time response, counting regime detection favors sub-μs time response, and extended afterglow over milliseconds hampers X-ray imaging.

Among various perovskite materials, two-dimensional lead halide perovskites demonstrate remarkable environmental and thermal stability, large Stokes' shifts, and broad emission, surpassing their three-dimensional and quantum dot counterparts. This study presents research progress since our inception, focusing on applications of perovskite scintillators.

Furthermore, we discuss approaches to address challenges in specific perovskite materials using the energy-sharing concept and nanophotonic structures. Techniques like photonic crystals and

plasmonic structures enable faster and brighter scintillators through Purcell enhancements. These visionary advancements open new research directions and applications at the intersection of high-energy physics and nanophotonics.

Invited Speaker

Susobhan Das
Aalto University

Bio: Susobhan Das obtained his master's degree from Indian Institute of Technology, Kharagpur in 2013. He received his Ph.D. degree in Photonics from the University of Kansas, USA in 2016. He is currently a postdoctoral researcher in Prof. Zhipei Sun's group in the Department of Electronics and Nanoengineering, Aalto University, Finland. His research interests include silicon photonics and nonlinear optics of 2D layered materials.

Title: All-Optical Control of Nonlinear Optics of 2D-Materials

Abstract: All-optical control of nonlinear photonic processes in nanomaterials is of significant interest from a fundamental viewpoint and with regard to applications ranging from ultrafast data processing to spectroscopy and quantum technology. Despite of second and third harmonic generation, high-harmonic generation, an extreme nonlinear optical phenomenon beyond the perturbation regime, is of great significance for various potential applications, such as high-energy ultrashort pulse generation with excellent spatio-temporal coherence. However, efficient control of different harmonic generation is still challenging due to the typical weak light-matter interaction. Here, we demonstrate giant and broadband all-optical ultrafast modulation of second, third, fourth and fifth harmonic generation in monolayer transition-metal dichalcogenides mediated by the modified excitonic oscillation strength produced upon optical pumping. Our results indicate that the multiple order of nonlinear optical susceptibility of monolayer molybdenum disulfide (MoS2) can be controlled optically. All-optically tunable nonlinear optical susceptibility is not only a promising technique for the characterization and study of intriguing exciton dynamics, but also a potential platform for disruptive photonic and optoelectronic applications, including all-optical modulation and imaging.

Technical Session

Conference Room	FB42	Time	10:45-12:00, August 23, 2023

Session 16: Biophotonics and Optical Biomedicine-Part I

Chair: Jinna Chen, Southern University of Science and Technology, China

TIME TABLE

Time	Speaker / Paper ID	Affiliation
10:45-11:10	Donghyun Kim	Yonsei University
11:10-11:35	Jianbo Tang	Southern University of Science and Technology
11:35-12:00	Tymish Y. Ohulchanskyy	Shenzhen University, China
12:00-12:15	Paper ID: 1249	South-Central Minzu University; Southern University of Science and Technology

Invited Speaker

Donghyun Kim

Yonsei University

Bio: Donghyun Kim received B.S. and M.S. from Seoul National University in 1993 and 1995 in Department of Electronics Engineering. He graduated from the Massachusetts Institute of Technology in 2001 with Ph.D. in Department of Electrical Engineering in the area of novel multi-dimensional display technologies and smart optical filters. He worked on next generation fiber-optic access communication systems at Photonic Research and Test Center of Corning Inc. as a senior research scientist and then investigated cellular biophotonic sensors for cell-based assays at Cornell University as a postdoctoral fellow. He has since been leading Biophotonics Engineering Laboratory of Yonsei University, Seoul, Korea. He was elected as fellow of SPIE in 2021. The main theme of his research at Yonsei has been focused on photonic technology and applications in biomedical engineering based on plasmonic techniques.

Title: Nanospeckle Illumination Microscopy Based on Plasmonic Localization for Imaging On-Chip Extracellular Vesicles

Abstract: Random distribution of nanospeckles is used for on-chip structured illumination microscopy. For nanospeckle excitation, light fields were localized by plasmonic random nanoislands. Exosomes on biochips were imaged for the proof of concept and confirm improved image resolution over the diffraction limit.

Invited Speaker

Jianbo Tang

Southern University of Science and Technology

Bio: Dr. Jianbo Tang is an Assistant Professor in the Department of Biomedical Engineering at the Southern University of Science and Technology. He earned his Doctoral degree of philosophy in Biomedical Engineering from University of Florida in 2016 and completed his postdoctoral training at Harvard Medical School and Boston University in 2020. His research focuses on developing novel optical and acoustic imaging technologies and ultrasound therapy methods for brain function and disease studies, with particular interest in small blood vessel network and its mechanism, dysfunctions, and modulation.

Title: A Comprehensive OCT Technique for the Measurement of Cerebral Blood Vessel Structure, Blood Flow Velocity, and Blood Transit Time

Abstract: Accurate measurement of the microcirculation dynamics, including the blood vessel 3D structure, blood flow velocity and the blood flow transit time can not only improve our understanding of the pathology of microcirculation dysfunction-related disease, but also provide important parameters for disease diagnosis, prevention, and early treatment. In this work, we introduce a comprehensive optical coherence tomography (OCT)-based functional imaging technology for the 3D measurement of the micro vessel networks' structure, blood flow velocity, and the blood flow transit time. The M-mode data acquisition (repeated Ascans) was employed in this technique. For blood vessel 3D structure imaging, we developed a first order field autocorrelation function (g1)-based adaptive analysis method to suppress the blood vessel tail artifacts and enhance the blood flow in small vessels. For blood flow velocity 3D imaging, we developed a set of quantitative dynamic analysis methods to measure both the axial and total blood flow velocity of the complex vessel network. We further developed a graphing method to obtain the 3D topological parameters of the 3D vessel network, including the vessel skeleton, branching, vessel diameter, and the blood flow speed at each location. With those information, we are able to, to the best of our knowledge, obtain the 3D blood transit time in the complex vessel network for the first of time. The proposed technique has the advantage of obtaining these three important blood flow biomarkers from a single data acquisition, which greatly simplifies the experiment procedure. The proposed OCT approach has a wide application in the field of microcirculation dysfunction-related disease studies.

Invited Speaker

Tymish Y. Ohulchanskyy
Shenzhen University, China

Bio: Tymish Y. Ohulchanskyy holds Ph.D. in optics and laser physics from Taras Shevchenko National University of Kyiv (Ukraine). After receiving Ph.D. in 2001, he joined as a postdoctoral associate at the University at Buffalo's Institute for Lasers, Photonics and Biophotonics, Buffalo, NY, USA, where he later became principal investigator and deputy director. Since 2016 Dr. Ohulchanskyy holds a position of distinguished professor in College of Physics and Optoelectronic Engineering at Shenzhen University, China. He is also a research professor in the Department of Chemical and Biological Engineering, University at Buffalo. Dr. Ohulchanskyy's research broadly involves photochemistry and photophysics of organic molecules and organic, inorganic and hybrid nanostructures; he is also in photobiology and develops applications of optical spectroscopy /microscopy and optical/multimodal imaging in biomedical field. He has published around 170 peer-reviewed articles (more than 17000 citations, h-index is 58).

Title: Nonlinear Optical Imaging to Assess Photobiomodulation of Alzheimer's Disease in in Vitro and in Vivo Models

Abstract: Alzheimer's disease (AD) is an irreversible and incurable neurodegenerative disease, which is the most common cause of dementia in the elderly and the number three cause of mortality worldwide after cardiovascular diseases and cancer. AD is strictly a neuropathological diagnosis associated with the presence of amyloid plaques (aggregates, fibrils) in the brain of patients with dementia. Optical properties of amyloid fibrils are found to be distinct from those of the source protein in its non-fibrillar form. These differences can be utilized for label-free imaging or characterization of such structures, which is particularly important for understanding pathogenesis of Alzheimer's disease. Despite recent discovery that amyloid fibrils exhibit enhanced multiphoton absorption properties, which are directly related to fibrillization, most studies of amyloid structures have relied on external probes, while only few have been label-free. The intrinsic two-photon excited fluorescence (TPEF) of amyloid plaques was found to correlate with the progress of aggregation, i.e. with the level of amyloid structures. The ability to image amyloid aggregates with TPEF microscopy without the use of any probes or labels was recently found, with an additional contrast obtained in the second harmonic generation (SHG) imaging, due to a high SHG susceptibility of the ordered fibrillar regions. Enhanced intrinsic TPEF and SHG are a combination of features that distinguishes amyloid aggregates from most other structures in normal tissue and can be used to characterize the AD progression. On the other hand, as it has been recently shown that lipid metabolism play a role in the AD pathogenesis of and suggested that changes in lipid metabolism may be a promising biomarker to identify brain regions susceptible to but not yet exhibiting symptoms of AD, another label-free nonlinear optical imaging technique, such as coherent anti-Stokes Raman scattering (CARS) microscopy can be employed to assess AD associated changes in lipid methabolism.
Photobiomodulation (PBM) is a phototherapy which employs red or near-infrared (NIR) light of relatively low power to stimulate, heal, regenerate, and protect biological tissues. Recently, there is

a burst in evidences that irradiation with low power NIR lasers or LEDs can non-invasively alter brain cell functions and their metabolic pathways, restoring brain tissue functions from a wide range of neuropathological conditions. In particular, it has shown a strong potential to be developed into a safe and effective neuroprotective treatment for patients with AD. Moreover, due to a lack of side-effects and neuroprotective potential, PBM is amenable to use in conjunction with other AD treatments. While positive PBM effects on AD have been established, mechanisms behind PBM therapeutic action are still not fully identified and the best PBM parameters for efficient AD treatment have not been established. This greatly slows down progress in the PBM of AD, obstructing development of the efficient therapy and calls for new approaches to evaluate PBM effects in AD models.

This talk will present our recent results on label-free nonlinear optical imaging (i.e., CARS, TPEF and SHG microscopies) applied to evaluate PBM effect on Alzheimer's disease in cell models in vitro and in a mouse model in vivo. PBM at various doses was delivered by laser diodes and LED operating at the selected NIR wavelengths (808 nm, 1064 nm) and the post-PBM changes in irradiated cells and animals were assessed in vitro, ex vivo and in vivo using nonlinear optical imaging. The imaging results, along with results of other assays, allowed us to reveal PBM action in studied systems and clarify the relevant mechanisms.

Paper ID: 1249

Title: Signal-to-noise ratio improvement of Laser Diode acoustic resolution photoacoustic microscopy

Author(s): Yongsheng Tian, Wenjun Ni, Chunyong Yang and Perry Ping Shum

Affiliation: Yongsheng Tian, Wenjun Ni and Chunyong Yang, South-Central Minzu University; Perry Ping Shum, Southern University of Science and Technology

Abstract: Acoustic resolution photoacoustic microscopy(AR-PAM) can achieve non-invasive subcutaneously blood vessels imaging. Laser diode(LD) as an excite source have becoming a tendency to promote the clinical application of this technology. However, the LD-AR-PAM system usually has low SNR problem due to low-energy and electrical clutter interference. In this paper, First, based on B-scan data temporal synchronous assumption, singular value decomposition(SVD) have be applied for electrical declutter in B-scan data. Then, for high quality and low computational costs image reconstruction, A correlation weight factor proposed to assistance synthetic aperture focusing technique (SAFT) imaging algorithm. The proposed sum-mean-standard-deviation(SMSD) weight factor can use positive and negative value directly characterize sound sources and artifacts. It is significantly different from the conventional weight who only suppress rather than eliminate artifacts, such as coherence factor(CF). The LD-AR-PAM system with above method has been applied in human hair image reconstructed. The SVD declutter results in about average 21.4 dB SNR and has average 27.1% improvement. For maximum amplitude projection (MAP) image of human hair, the lateral resolution of SAFT, SAFT+CF reach 163.3 and 153.8μm. The lateral resolution of SAFT+SMSD outperforms above beamformers and reach 96.8μm. Corresponding SNR is 23.9, 26.2 and 29.2dB, respectively. The final SNR has improved by more than 37% compare with source hair image. The results prove that our SNR improvement method greatly improves the quality of LD-AR-PAM imaging, which is an important proof to make this technology to clinical application.

Technical Session

Conference Room	FA32	Time	14:00-15:15, August 23, 2023

Session 17: Optical Sensors and Systems -Part II

Chair: Shijie Feng, Nanjing University of Science and Technology, China

TIME TABLE

Time	Speaker	Affiliation
14:00-14:25	Vaishali Badrish Adya	KTH, Royal Institute of Technology
14:25-14:50	Changrui Liao	Shenzhen University
14:50-15:15	Xiaoyi Bao	University of Ottawa

Invited Speaker

Vaishali Badrish Adya

KTH, Royal Institute of Technology

Bio: Vaishali Adya is a senior research fellow in the Nonlinear Quantum Photonics group at the Department of Applied Physics at KTH, Royal Institute of technology, Sweden where she works predominantly on squeezed light generation in waveguide systems and also on the development and characterisation of integrated squeezed light sources for gravitational wave detection, biosensing and quantum communication. During her last 10 years within the LVK collaboration, she has cultivated expertise in modelling interferometer configurations, control systems and squeezed light generation.

Title: Squeezed Light: Generation and Application to Gravitational Wave Detection

Abstract: Squeezed light technology has improved the sensitivity of precision measurement experiments ranging from gravitational wave detection to microscopy. Right from its conception in 1950's its implementation in LIGO, squeezed light generation has come a long way. In this talk, I will discuss the upgrades made to the detectors and mainly the squeezed light system which will has increased the astrophysical reach of the detectors this current observing run.

Invited Speaker

Changrui Liao
Shenzhen University

Bio: Changrui Liao is Distinguished professor in College of Physics and Optoelectronic Engineering at Shenzhen University and holds the position of Deputy Director of Guangdong and Hong Kong Joint Research Center for Optical Fiber Sensors and Director of Shenzhen Key Laboratory of Ultrafast Laser Micro and Nano Manufacturing. He received PhD degree from Hong Kong Polytechnic University in 2012 and then joined in Shenzhen University and successively served as lecturer, associate professor and distinguished professor. Prof. Liao's research interests lie in ultrafast laser 3D nanolithography and its application in optical fiber sensors, smart chip and new energy. He authored/co-authored 2 book chapters, >190 journal papers and >10 patents in the area of 3D nanolithography and optical fiber sensors. His works were cited >6000 times with an h-index of 44 (SCIE).

Title: 3D Nanoprinted Optical Fiber Sensors

Abstract: Material and structure of the optical fiber used for optical communication are relatively single and it cannot meet the increasing requirements of various optical fiber sensing applications. Optical fiber microstructured sensors combine the advantages of optical fiber and microstructure and it has become a hot research area in recent years. Femtosecond laser induced two-photon polymerization is a maskless and 3D nanoprinting method. In this presentation, I will introduce our recent research progress in 3D nanoprinted optical fiber sensors including MEMS and micro-optics. Femtosecond laser 3D nanoprinting method can significantly improve the performance of optical fiber sensors in both material and structure.

Invited Speaker

Xiaoyi Bao
University of Ottawa

Bio: Dr. Bao is a professor in Physics Department, University of Ottawa, Canada. Her research interests include distributed fiber sensors and applications for structural health monitoring (SHM), fabrication of nanofiber device for low noise fiber lasers, quantum sensing, and nonlinear optical signal processing. She is fellow of OSA and SPIE and the Royal Society of Canada, and recipient of two Canadian Association of Physicists Medals (for Outstanding Achievement in Industrial and Applied Physics -2013, and Applied Photonics -2010), Governor General's Innovation Award (2021); Canada Research Chair (Tier I) (2003-2023), and Joseph Fraunhofer Award/Robert M. Burley Prize (2023).

Title: Micro-Structured Fibers for Ultrasound and Acoustic Detection

Abstract: Micro-structured fibers have smaller dimension than telecom fibers, they are made with low effective Young's modulus by special structures and high bending materials, and hence ideal for high frequency and broadband ultrasound detection in micro-cracks and imaging biological tissues.

Technical Session

Conference Room	FB55	Time	14:00-15:05, August 23, 2023

Session 18: Optical Subsystems, Systems and Networks-Part V

Chair: Lu Zhang, Zhejiang University, China

TIME TABLE

Time	Speaker / Paper ID	Affiliation
14:00-14:25	Aditya Kakkar	Infinera Canada Inc.
14:25-14:50	Paolo Monti	Chalmers University of Technology
14:50-15:05	Paper ID: 5794	Chongqing University of Posts and Telecommunications

Invited Speaker

Aditya Kakkar

Infinera Canada Inc.

Bio: Aditya Kakkar received his B.Tech. degree in electronics engineering from the Indian Institute of Technology, Varanasi, India in 2011 and double M.Sc. degrees in electrical engineering and information technology from KTH Royal Institute of Technology, Stockholm, Sweden and Karlsruhe Institute of Technology, Karlsruhe, Germany, respectively, in 2013. He worked as Assistant Manager of Optical Systems and Networks Research at Sterlite Technologies, Ltd., India, from August 2013 to June 2014. Following this he earned his Ph.D. degree in coherent optical communications as EU Marie Curie Early-Stage Researcher at the Acreo-KTH Kista HST-Laboratory, Stockholm, Sweden in 2017. He is currently with Infinera Canada Inc. as Principal Coherent Optical System Architect leading DSP integration and application aspects of optical modems.

Title: Vertically Integrated Coherent Technologies from Access to Long Haul

Abstract: We will discuss vertically integrated coherent technologies and their benefits in holistically designing and optimizing solutions for different network applications ranging from access to long haul.

Invited Speaker

Paolo Monti
Chalmers University of Technology

Bio: Paolo Monti is a Professor and the Head of the Optical Networks Unit at Chalmers University of Technologies. His main expertise is with the design and operation of optical communication infrastructures where he focuses on various network aspects including energy efficiency, resiliency, programmability, automation, and techno-economics. He has been involved (as PI, co-PI, and/or main technical leader) in several national and international projects funded by the main research bodies in EU, USA, and Asia. His educational portfolio includes both teaching courses (undergrad, MS and Ph.D. level) and running and developing education programs in the broad ICT area. He is a Senior Member of IEEE.

Title: Optical Transport Networks in the 5G and Beyond Era

Abstract: Optical technologies are the de-facto choice for transport networks in several 5G scenarios. The talks will address some open issues in the design and operation of optical transport networks. The topics will include but will not be limited to multi-technology network design and service provisioning.Finally, the talk will conclude with an overview of the challenges we can expect when looking at beyond 5G scenarios.

Paper ID: 5794

Title: Nonlinear Post Equalizer for Visible Light Communication System Based on Deep Residual Convolutional Neural Network with Feature Concatenation

Author(s): Yuqiao Li, Tao Huang, Junpan Li, Yi Li, Yanbing Liu and Xingyu Lu
Affiliation: Chongqing University of Posts and Telecommunications

Abstract: Visible light communication (VLC) is a promising wireless communication technology but its performance is limited by linear and nonlinear distortions. In this paper, we proposed a post-equalization method based on deep residual convolutional neural network (DRCNN) with feature concatenation and demonstrated the effectiveness of the residual structure and the excellent compensation performance of DRCNN through experiments on a PAM-8 VLC system. The residual structure reduces the bit error rate (BER) by 46.7% on severely distorted data collected with direct current (DC) bias of 140mA, voltage peak-to-peak (VPP) of 0.8V, and bit rate of 450Mbps. Compared to the conventional linear FIR equalizer, the DRCNN improves the Q factor by 1.4 dB at maximum and the operating current range and voltage range of the system below the hard decision forward error correction (HD-FEC) threshold of 3.8 × 10-3 by 43.5% and 19.5%, respectively.

Technical Session

Conference Room	FB41	Time	14:00-15:15, August 23, 2023

Session 19: Advanced Materials for Photonics-Part III

Chair: Wei Jiang, Nanjing University, China

TIME TABLE

Time	Speaker	Affiliation
14:00-14:25	Pai Liu	Southern University of Science and Technology
14:25-14:50	Joanna Cybińska	Łukasiewicz Research Network – PORT Polish Center for Technology Development, Stabłowicka 147, 54-066 Wrocław, Poland; University of Wrocław, Faculty of Chemistry, F. Joliot-Curie 14, 50-383, Wrocław, Poland
14:50-15:15	Tigran Baghdasaryan	Vrije Universiteit Brussel (VUB)

Invited Speaker

Pai Liu

Southern University of Science and Technology

Bio: Dr. Pai Liu, obtained her Master's degree in Materials Science from Arizona State University, and PhD degree in Chemistry from the University of Limerick, Ireland. Later, she joined a quantum dot company as R&D manager and was responsible for developing more than 10 types of quantum dots and zinc oxides. Since 2019 she has been a research assistant professor in Sustech. Her research interest mainly includes nano semiconductor materials, quantum dots, advanced polymer composite materials, and nano metal oxide materials.

Title: Quantum Dots Display

Abstract: In the age of information explosion, high-quality display is an important driving force for the development of information technology, such as the meta-universe technology based on AR/MR , naked eye 3D, holographic display and etc., have put forward higher requirements for the ultra-small size and coherence of light-emitting components. The demand for high-quality display devices continues to increase. Quantum dot display have shown the advantages of high color saturation, wide color gamut and high brightness, that are bringing new opportunities to display market. Our work focuses on quantum dot materials, device stability studies, and ultra-high PPI, and therefore broadening the scope of the field.

Invited Speaker

Joanna Cybińska

Łukasiewicz Research Network – PORT Polish Center for Technology Development, Stabłowicka 147, 54-066 Wrocław, Poland; University of Wrocław, Faculty of Chemistry, F. Joliot-Curie 14, 50-383, Wrocław, Poland

Bio: Dr. Sc. Joanna Cybińska, Head of Advanced Materials Synthesis research group and Director of Materials Science & Engineering Center at Polish Center for Technology Development.

A graduate of master studies in the field of Chemistry at the Faculty of Chemistry of University of Wrocław. She is the co-author of 90 scientific publications (with a total IF>435; index h = 24) on the synthesis of inorganic compounds, including nanoparticles doped with rare earth ions, and organic dyes with defined physicochemical properties, e.g. luminescent or thermochromic. She participated in the realization of number projects (15), including international ones. She has completed a number of internships and research trips abroad. She was the scientific secretary of 6 international conferences. In 2005–2014 she was the Assistant Editor in the journal Opt. Mater., Elsevier. She was also the Guest Editor of 5 post-conference volumes.

Title: Hybrid Sensor Platforms for Integrated Photonic Systems Based on Ceramic and Polymer Materials (HYPHa)

Abstract: The main goal of the study within the project is creating an universal and cheap material platform based on newly tested hybrid materials. The basis of these materials will be silica compounds with the addition of some oxide as TiO2 or Al2O3, which can be used as structural matrices, polymer coatings or develop as active or protective layers. Optical activation of those platforms can be obtain by doped them by organic dyes (e.g. perylene-based dyes, which are active emitting substances) and by integrating with active two-dimensional materials (such as dichalcogenides (S, Se, Te) transition metals (TMDC). Such materials so far have been tested independently of each other or were used in other platforms, revealing unique structural properties, optical and electrical. To date, a comprehensive combination of the presented materials has not yet been made and proposed for the development of new materials for advanced applications and a market-attractive technological level. Thus the results obtained with the project can be another step toward design and production of optically active hybrids platforms for photonic. Especially crucial point seems to be an incorporation active component in the way, which allow for further structurization.

Acknowledgments

The research was co-financed by the Foundation for Polish Science from the European Regional Development Fund within the project POIR.04.04.00-00-14D6/18 "Hybrid sensor platforms for integrated photonic systems based on ceramic and polymer materials (HYPHa)".

Invited Speaker

Tigran Baghdasaryan
Vrije Universiteit Brussel (VUB)

Bio: Tigran Baghdasaryan received his PhD in Engineering Sciences at Vrije Universiteit Brussel (VUB), Belgium in 2015. From 2016 to 2022 he was Postdoctoral Research Fellow of the Research Foundation Flanders (FWO) and became Research Professor in 2022 at VUB, where he is affiliated with the Brussels Photonics (B-PHOT) research group. He has extensive expertise in design, modelling, fabrication, characterization and prototyping of advanced optical sensors in standard and specialty fibers. His research focuses on fiber Bragg gratings, photonic crystal fiber sensors and femtosecond laser micromachining of gratings and waveguides in specialty fibers. His most recent works involve 2-photon polymerization-based direct laser writing of waveguide components and resonant structures for optical interconnect and sensing applications. He has authored and co-authored 22 peer-reviewed journal publications and more than 30 conference contributions. He is an Optica Senior Member.

Title: 3D-printed Polymer Photonic Circuits and Short-Distance Optical Interconnections: Progress and Prospects for Optical Communications

Abstract: Recent advancements in the field of 2-photon polymerization based direct laser writing (2PP-DLW) enable the fabrication of waveguide components with sub-micrometer resolution in truly three-dimensional configurations. A series of low-loss and small form-factor optical waveguide building block components and devices have already been demonstrated using this technology. We will review the latest breakthroughs in the field, with a specific emphasis on their applications in optical communications.

Technical Session

Conference Room	FB42	Time	14:00-16:15, August 23, 2023

Session 20: Silicon Photonics-Part II

Chair: Deming Kong, Technical University of Denmark, Denmark

TIME TABLE

Time	Speaker	Affiliation
14:00-14:25	Lon Wang (Alex)	National Taiwan University
14:25-14:50	Yaojing Zhang	Max Planck Institute for the Science of Light
14:50-16:15	Chun-Nien Liu	National Chung Hsing University

Invited Speaker

Lon Wang (Alex)

National Taiwan University

Bio: Lon Wang (Alex) received his Ph.D. degree in Optical Sciences Center from the University of Arizona in 1988. In 1989 he joined BELLCORE, where he worked in the areas of wavelength division multiplexing technologies. Since 1992 he has been with National Taiwan University. His current interests are specialty fibers and their applications.

Title: Using Silicon-cored Fibers for Light Coupling in SiP and in Building LOF: Challenges and Opportunities

Abstract: Out of sand, a grand blessing to human beings, came two significant materials on which modern technologies are built to advance civilization. Silicon is the base of CMOS for computer chips, while silicon dioxide is of optical fiber for data transmission. Just as ubiquitous sands cover the earth, so do chips and fibers. The endless supply of sand guarantees the seemingly non-stopping development of ever-craved data processing and exchange.

However, the intrinsic properties of silicon and silicon dioxide may set the boundary against each other, limiting their applications. For example, glass fiber can only transport photons but not electrons, while a silicon platform may transmit both but is not as versatile as glass fiber in photon transmission.

The emergence of silicon-cored fiber (SCF) may allow the manipulation of both electrons and photons. We will first describe how SCF can be made and its basic characteristics. Then two applications based on SCF will be the focus of the talk, namely optical coupling in silicon photonics (SP) and lab-on-fiber (LOF). The former provides a new way of coupling light from a conventional

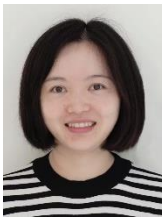
single-mode fiber to a silicon waveguide, and the latter shows a possible photonic integrated circuit on SCF.

Up-to-date literature reports and our progress will be reviewed, and vision will be cast.

Invited Speaker

Yaojing Zhang

Max Planck Institute for the Science of Light



Bio: Dr. Yaojing Zhang is a postdoctoral researcher at the Max Planck Institute for the Science of Light. She obtained her Ph.D. degree in Electronic Engineering from The Chinese University of Hong Kong in 2018, and her bachelor's degree in information engineering from Shanghai Jiao Tong University in 2014. Her research interests include silicon photonics, integrated nonlinear photonics, hybrid integration of 2D materials on silicon photonics, and related optical applications

Title: Integrated Multimode Microresonators Based on Sputtered Silicon Nitride for Low-Power Soliton Frequency Combs and Symmetry Breaking of Counterpropagating Light

Abstract: Silicon nitride photonics has experienced rapid development in the last decade. Here we present low loss waveguides and resonators based on room-temperature sputtered silicon nitride that is intrinsically hydrogen-free. The ultralow loss enables threshold powers for optical parametric oscillations down to 1.1 mW and enables the generation of bright soliton frequency combs. Furthermore, we demonstrate the first experimental observation of symmetry breaking of counterpropagating light in a multimode silicon nitride microresonator with a threshold power of 3.9 mW.

Invited Speaker

Chun-nien Liu

National Chung Hsing University

Bio: Chun-Nien Liu received the B.S. degree in physics from the National Changhua University of education, Changhua, Taiwan, and the M.S. and Ph.D. degrees from the department of photonics, National Sun Yat-sen University, Kaohsiung, Taiwan, in 2010 and 2015, respectively. Currently, he is an Assistant Professor in the Department of Electrical Engineering, National Chung Hsing University, Taichung, Taiwan. His research interests are broadband Cr-doped fiber, specialty fiber, fiber microlens, near-field measurement of fiber coupling, LiDAR module, and high-power LED based on glass host. He is a member of the Optical Society of America.

Title: Novel Optical-Phased-Array Chip with Wide Field of View and High Resolution in LiDAR for Autonomous Vehicles

Abstract: We report a compact optical-phased-array (OPA) chip with a reflective multi-layer and bipolar electronic control structure to enhance both the field-of view (FOV) and resolution in the LiDAR module. This OPA chip exhibits wide FOV of 30° × 28° and high-resolution of 0.36° × 0.36°.

Spatial light modulators are essential optical elements in applications that require the ability to regulate the amplitude, phase and polarization of light in LiDAR, optical communications, and biomedical imaging. With the push towards miniature and non-movable optical components, OPAs have been recently proposed as a promising solid-state technology to achieve fully integrated LiDAR sensors on silicon photonics (SiPh) technology. However, there are several design tradeoffs and challenges in designing of SiPh OPAs, such as the achievement of compact structures with packed and highly efficient elements sensor resolution, and range. It is essential to ensure the OPA technology to meet and exceed the autonomous vehicle requirements.

In this study, we present an all-solid-state, electrically tunable, and reflective OPA chip that can generate a specific phase or a continuous sweep between 0 and 360° at estimation rate of 1GHz to adjust independently the amplitude. The chip-surface features the 2200 individually addressable nano-resonators in a 6 × 4 mm2 area with no micromechanical elements or liquid crystals. A key feature of this design is to apply the reflective multi-layer and bipolar (NPN) electronic control structure in each nano-resonator. In this structure, the nano-resonators are used to adjust the scanning wide FOV of 30° × 28° and high angle resolution of 0.36° × 0.36°. To demonstrate proposed OPA chips used in LiDAR, we performed a three-dimensional depth scan of an emulated street scene that consisted of a 10% reflection modal and a human figure up to a distance of 10 m.

Technical Session

Conference Room	FA32	Time	15:30-16:45, August 23, 2023

Session 21: Plasmonics and Metamaterials-Part II

Chair: Xinhai Zhang, Southern University of Science and Technology, China

TIME TABLE

Time	Speaker	Affiliation
15:30-15:55	Cheng Zhang	Huazhong University of Science and Technology
15:55-16:20	Srinivasan Anand	KTH Royal Institute of Technology, Department of Applied Physics
16:20-16:45	Tianxun Gong	University of Electronic Science and Technology of China

Invited Speaker

Cheng Zhang

Huazhong University of Science and Technology

Bio: Prof. Cheng Zhang obtained his B.S. degree in Electrical Science and Technology from Shandong University in 2010, and Ph.D. degree in Electrical Engineering from the University of Michigan-Ann Arbor in 2016. He is currently a professor at Huazhong University of Science and Technology, where he leads a research team working on cutting-edge projects aimed at the exploitation of nanophotonic materials, devices and fabrication techniques for novel information, sensing and energy harvesting applications.

Title: Metasurface-empowered Advanced Imaging and Displaying

Abstract: Metasurfaces are planar arrays of subwavelength electromagnetic structures that collectively mimic the functionality of much thicker conventional optical elements, and are considered as promising solutions for various advanced imaging and displaying applications. In this talk, I will first present a new type of waveguide-based six-channel metaholograms multiplexed by the spin and azimuthal angle of an incident guided light. Six target images are encoded in the evanescent region of the metahologram's k-space, and they can be respectively displayed utilizing k-space translation strategy under guided light illumination with selected spin and azimuthal angle. Leveraging this strategy, we further demonstrate three-channel polarization-independent metaholograms and two-channel full-color metaholograms. I will then present a compact stereo waveguide AR display system using a single piece of thin flat glass integrated with a polarization-multiplexed metagrating in-coupler and two diffractive grating out-couplers. Incident light of

opposite circular polarization states carrying stereoscopic images are first steered by the metagrating in-coupler to opposite propagation directions in the flat glass waveguide, subsequently extracted by the diffractive grating out-couplers, and finally received by different eyes, forming 3D stereo vision.

Invited Speaker

Srinivasan Anand

KTH Royal Institute of Technology, Department of Applied Physics

Bio: Professor Srinivasan Anand is at the Department of Applied Physics, School of Engineering Sciences, KTH Royal Institute of Technology, Stockholm, Sweden. He has over 30 years of experience in the field of semiconductors including low-dimensional structures and nano-structured materials. His current research on semiconductor nanostructures focuses on nanophotonics and photonic integration, and on the development of associated material and process technologies. His expertise and research interests include light scattering, spectroscopy, photonic crystals and metasurfaces; solar energy conversion, light emitting devices, optical sensing, photo-detectors and non-linear optics; nanofabrication methods; and scanning probe based electrical characterization techniques.

Title: Sub-wavelength Photonic Semiconductor Nanostructures and their Applications

Abstract: Light-matter interactions at subwavelength scales provide unique optical characteristics interesting from both basic science and application perspectives. Sub-wavelength dielectric structures, Mie resonators, can scatter resonantly and confine light in small modal volumes. Individually, under certain conditions a Mie resonator can support optical anapoles with non-trivial field distributions and strong light confinement. In Mie-resonant metasurfaces new collective effects emerge due to the interaction between different modes, resulting in optical features such as hybrid modes, strong light confinement, sharp resonances and bound states in the continuum (BICs).

This talk presents an overview of our research on semiconductor-based subwavelength structures focusing on their optical properties, fabrication technologies and applications. The highlighted application examples in the visible-NIR include structural colors, optical filters, broadband anti-reflection for solar cells and optical anapoles. We discuss different methods for nanostructuring such as top-down methods, self-assembly, soft-imprinting and embedding nanostructures in transparent films. Broad-band anti-reflection and structural colors from spatially ordered and disordered assemblies of sub-wavelength nanodisks and nanopillars in different materials (metal oxides, III-Vs and Si) and composite structures for engineering effective refractive indices, are reported. A method to directly print Mie resonator arrays from nanoparticle suspensions is developed and demonstrated for broadband antireflection and structural colors functions in solar cells. Optical properties of vertically stacked Mie resonators in 2D arrays fabricated in AlGaAs/GaAs and Si/SiO2 are discussed focusing on anapolar states for strong light confinement and engineering resonances for filtering and non-linear optical applications.

Invited Speaker

Tianxun Gong

University of Electronic Science and Technology of China

Bio: Tianxun Gong obtained his Ph.D degree from Nanyang Technological University on 2015. He also worked in Singapore Bioimaging Consortium, A*STAR from 2012 to 2016. Tianxun Gong is currently an Associate Professor at University of Electronic Science and Technology of China. His research field focused on smart nano sensor technology, especially the applications of biomedical detection.

Title: Surface Enhanced Raman Scattering Sensors for Pesticide Residue and Disease Detections

Abstract: Surface Enhanced Raman Spectroscopy (SERS) is able to provide "finger prints" information of the molecules in samples, even in ultra-low concentration. Due to the different characteristic of the samples, various SERS platforms need to be developed. In my talk, I will introduce design and fabrication of various type of SERS chips. Moreover, I will introduce their applications on pesticide residue detections and biomedical detections.

Technical Session

Conference Room	FB55	Time	15:30-16:45, August 23, 2023

Session 22: Optical Subsystems, Systems and Networks-Part VI

Chair: Carlos Natalino, Chalmers University of Technology, Sweden

TIME TABLE

Time	Speaker	Affiliation
15:30-15:55	Dan Kilper	Trinity College Dublin, CONNECT Centre
15:55-16:20	Idelfonso Tafur Monroy	Eindhoven University of Technology
16:20-16:45	Iman Esmaeil Zadeh	Delft University of Technology

Invited Speaker

Dan Kilper

Trinity College Dublin, CONNECT Centre

Bio: Dan Kilper is Professor of Future Communication Networks and SFI CONNECT Centre Director at Trinity College Dublin, Ireland. He holds an adjunct faculty appointment at the Columbia University Data Science Institute and the College of Optical Sciences, University of Arizona. He is CTO and co-founder of Palo Verde Networks, Inc. and is the Green Internet and Service Provisioning topical area editor for the IEEE Transactions on Green Communications and Networking journal. He co-chairs the IEEE International Network Generations Roadmap (INGR) Optics Working Group. He received MS (1992) and PhD (1996) degrees in Physics from the University of Michigan. From 2000-2013, he was a member of technical staff at Bell Labs. His work has been recognized with a NIST Communication Technology Lab Innovator Award, Bell Labs President's Gold Medal Award, and he served on the Bell Labs Presidents Advisory Council on Research. He holds thirteen patents and coauthored six book chapters and more than one hundred seventy peer-reviewed publications. His research is aimed at solving fundamental and real-world problems in communication networks, addressing interdisciplinary challenges for smart cities, sustainability, and digital equity.

Title: The Evolving Role of Energy Efficiency in Optical Networks

Abstract: The development of communication networks has largely been driven by performance: achieving higher speeds and capacity to deliver more data. Throughout this, energy use of networks has increased even while energy efficiency has steadily improved. The introduction of new advanced capabilities such as AI and open architectures promise greater efficiency while at the same time threatening to further increase energy use. This talk will examine recent trends related to the role of energy efficiency in communication networks and the associated research challenges.

Invited Speaker

Idelfonso Tafur Monroy
Eindhoven University of Technology

Bio: Idelfonso Tafur Monroy is Professor at the Department of Electrical Engineering of the Eindhoven University of Technology leading the Quantum and Terahertz Systems group. He is principal investigator (PI) in the Center for Quantum Materials and Technology Eindhoven (QT/e) and Center for Photonics Integration (IPI) and the Center for Terahertz Science and Technology (CTST/e). Currently, PI in the CAT 2 Quantum Internet project of the Dutch Quantum Delta Growth fund.

His research interests are in the area of Terahertz systems-on-chip, Integrated quantum photonic systems such as quantum key distribution transceivers on chip, converged electronic-photonic integrated circuits for applications in quantum, secure communications, sensing and computing. He is co-author of over 500 journal and conference papers and has graduated 24 PhD students. He is co-founder of the start-up Bifrost Communications on optical fiber access solutions.

Idelfonso Tafur started his academic career in the Kharkov Polytechnic Institute in Ukraine, he received a M.Sc degree from the Bonch-Bruevitch Institute of Communications, St. Petersburg, Russia, holds a Technology Licentiate degree in telecommunications theory from the Royal Institute of Technology, Stockholm, Sweden, and a PhD degree from the Eindhoven University of Technology.

He has been director of the Photonic Integration Technology Center (PITC), Netherlands, Professor in photonics communication technologies at Technical University of Denmark, guest Professor at the Beijing University of Post and Telecommunications, visiting scientist at the University of California at Berkeley and Fellowship Professor at the ITMO University in St Petersburg Russia, and is a senior member of IEEE and OSA.

Title: Quantum Safe Data Communications Links for 6G Networking

Abstract: It is envisioned that 6G networks will embrace artificial intelligence, software defined networking and quantum technologies to be able to satisfy the requirements of such emerging large complex networks. In this talk we explore how quantum key distribution and post-quantum cryptography, can ensure quantum-safe communications for securing SDN links for ultra-fast and ultra-safe and reliable 6G networks.

Invited Speaker

Iman Esmaeil Zadeh
Delft University of Technology

Bio: After a bachelor degree in Electrical Engineering (Birjand university and Sadjad institute of technology, 2007, Iran), Iman Esmaeil Zadeh followed two master programs in System-On-Chip and Material physics and Nanotechnology simultaneously (Linköping university, Sweden). He then moved to TU Delft where he received a PhD in applied physics in 2016 on the integration of quantum light emitters, photonic circuits and superconducting nanowire single-photon detectors.

After his PhD, he worked for two years at Single Quantum B.V. (SQ) as a research engineer followed by 2 years of postdoctoral reseach. As of May 2021, he has been appointed as assistant professor in the department of Imaging Physics, faculty of Applied Sciences. Dr. Esmaeil Zadeh has authored more than 30 peer-reviewed journal papers and recieved funding from European union (including two EIC pathfinders) and Dutch research council (NWO). His lab currently conducts research in the fields of single-photon sensing and hybrid quantum photonic.

Title: Hybrid Quantum Photonics and Sensing

Abstract: Achieving fully programmable and efficient optical computing requires significant breakthroughs in multiple domains: ultra-low losses, dense integration, tunability, and the harmonious fusion of classical and quantum optical sources, all while maintaining compatibility with CMOS electronics. The attainment of these multifaceted functionalities within a single chip remains a formidable challenge. In our presentation, we will showcase our efforts focused on the hybrid integration of high-efficiency Quantum Dots (QDs) with SiC/SiN nano-photonic circuits, alongside photon number-resolving superconducting nanowire single-photon detectors. We will advocate for the utilization of a hybrid photonic platform featuring cutting-edge, CMOS-compatible SiC and ultralow-loss SiN photonics. This innovative approach is poised to address current limitations in the realm of quantum photonics and holds promising prospects for advancing the field.

Technical Session

Conference Room	FB41	Time	15:30-17:10, August 23, 2023

Session 23: Fiber-Based Technologies and Applications-Part III

Chair: Wenjun Ni, South-Central Minzu University, China

TIME TABLE

Time	Speaker	Affiliation
15:30-15:55	Guilherme B Xavier	Linköping University
15:55-16:20	Juan Diego Ania Castañón	Instituto de Óptica, CSIC
16:20-16:45	Toms Salgals	Riga Technical University (RTU)
16:45-17:10	Xuejin Li	The Chinese University of Hong Kong, Shenzhen

Invited Speaker

Guilherme B Xavier
Linköping University

Bio: Assoc. Professor Xavier has joined the faculty at Linköping University in Sweden in 2017 and was previously an Assoc. Professor at the University of Concepción in Chile. Dr. Xavier has almost 20 years of experience in research and teaching in quantum information and optoelectronics. His current interests are in high-dimensional quantum entanglement distribution, transverse spatial encoding of quantum information in optical fibers and quantum random number generation.

Title: Dynamic Encoding and Sorting of Orbital Angular Momentum States of Light Based on Photonic Lanterns

Abstract: The orbital angular momentum (OAM) degree of freedom of light is highly sought after in many applications such as data multiplexing in optical networks and in quantum information. In this talk I will present recent experimental results on fast modulation and demodulation of OAM states of light using photonic lanterns and few-mode fibers combined with a Mach-Zehnder interferometer. These results are useful for applications requiring fast encoding and decoding of information onto OAM states.

Invited Speaker

Juan Diego Ania Castañón
Instituto de Óptica, CSIC

Bio: Juan Diego Ania-Castañón is the Director of the Spanish National Research Council's (CSIC) Institute of Optics and the coordinator of its Nanoscale and Nonlinear Guided Optics group. Most of his career has been focused on the field of nonlinear fiber optics and its direct application to communications and sensing, working at the interface between the theoretical and the experimental. He obtained his PhD in theoretical physics in 2000 from Instituto de Estructura de la Materia (CSIC) and Universidad de Oviedo (Spain). In 2001 he joined the Photonics Research Group at Aston University in the UK, where he first proposed and demonstrated the concept of ultra-long Raman fiber lasers. After being awarded both a British EPSRC Advanced Research Fellowship and a Spanish Ramón y Cajal Fellowship, he eventually joined joined Instituto de Óptica (CSIC) in 2007, establishing the Nonlinear Dynamics and Fiber Optics group (currently the Nanoscale and Nonlinear Guided Optics group) with other like-minded colleagues, where he continued his work on nonlinear fiber optics and their applications. He served for four years as Deputy Director of the institute, and was later appointed its Director in 2016. He has also served as Director for CSIC's joint Centre of Physics between 2018 and 2020, and is the co-founder of FOCUS S.L. (now part of APL Photonics), a company dedicated to optical fiber sensing. He is the author or co-author of more than 200 papers and holds multiple patents in the field of fiber lasers and amplifiers.

Title: Ultralong Pulsed Fiber Ring Lasers in the Fs Regime: Recent Progress and Future Prospects

Abstract: We will provide a review on the topic of ultralong passively mode-locked femtosecond pulse fiber oscillators. This new fiber laser architecture relies on the use doped-fiber amplifiers, polarization-insensitive semiconductor saturable absorber mirrors (SESAMs) and the careful management of nonlinearities in multi-kilometric fibre rings, often with the assistance of distributed Raman amplification These new sources support stable generation of soliton-like pulses with durations below 200 fs, overcoming previously assumed limitations to pulse duration in ultralong lasers, and reach ultra-low repetition rates as low as a few tens of kHz. The unique characteristics of this new family of ultrafast fiber oscillators make them suitable for a broad range of potential applications.

Invited Speaker

Toms Salgals

Riga Technical University (RTU)

Bio: I`m from the Faculty of Electronics and Telecommunications (FET) of Riga Technical University (RTU), Riga, Latvia. My research is performed in the research-oriented unit under the RTU FET at the Institute of Telecommunications (RTU IT). My research interests include but are not limited to the development and research of WDM fiber optical access networks, radio-over-fiber (RoF) technologies, passive optical network (PON) technologies providing end-users with high-speed broadband internet connections, data center interconnects (DCI), microchips, optical frequency combs (OFCs), also development and research of fiber optic sensor systems and others. My activities are focused on ensuring the development of innovations and providing measurements and experiments for scientific institutions and industry, as well as supporting the educational process in the field of information and communication technologies in RTU.

Title: Silica Microsphere/Micro-Rod WGMR-Based Kerr-OFC Light Source for Telecommunication Applications

Abstract: Kerr optical frequency combs (OFCs) based on silica whispering gallery mode resonator (WGMR) have various applications where they are used as a light source. For telecommunication purposes, WGMR-based Kerr-OFC light source can be physically realized using silica microsphere or micro-rod resonators and can be used to replace multiple laser arrays. Kerr microresonator OFCs can achieve bandwidths of hundreds of nanometers covering different (e.g., E-, S-, C-, and L-band) telecommunication bands (according to ITU-T G. 694.1 recommendation). The application of WGMR-based Kerr-OFC light sources in wavelength division multiplexed (WDM) fiber optic communication systems covers application scenarios ranging from short reach, such as data center interconnection (DCI), to access layer fiber optic networks. WGMR resonators have several advantages compared to integrated resonators: the effective coupling of the pumping light into integrated resonators is complicated and fixed when integrated on a chip without the possibility of changing it. In addition to the possibility of fine-tuning the coupling conditions (between the resonator and tapered fiber), both types of resonators also have the advantage of fast and simple fabrication, and it is easy to control the free spectral range (FSR). The record bitrate achieved by the use of silica micro-rod WGMR-based Kerr-OFC operating in the optical C-band is 60 Gbps/λ using non-return to zero (NRZ) on-off keying (OOK) modulated signals and 100 Gbps/λ using 4-level pulse amplitude modulated (PAM-4) signals for transmission over a 2 km single-mode fiber (SMF) link. A record 50 Gbps/λ transmission of NRZ-OOK modulated signals with a novel silica microsphere WGMR-based Kerr-OFC as a light source operating in the optical C-band over 2 km SMF link is achieved.

Invited Speaker

Xuejin Li

The Chinese University of Hong Kong, Shenzhen

Bio: Li Xuejin is a professor of the Chinese University of Hongkong, Shenzhen. He received his Ph.D. degree from Tianjin University in Physical Electronics in China. His research mainly focus on optic fiber sensor technologies and thin-film device. He leads a group as the directors of Shenzhen Key Laboratory of Sensor Technology and Shenzhen Engineering Laboratory for Optical Fiber Sensors and Networks. He has published more than 180 papers in different well-known international journals, such as Biosensors and Bioelectronics, Nano Energy, Scientific Reports, Optics Letter, Optics Express, Sensors and Actuators B: Chemical, IEEE Photonics Technology Letters, Applied Physics B, Applied Optics, Journal of Physics D: Applied Physics, Plasmonics and IEEE Sensors. He holds more than 20 authorized patents. He was given the honorary titles of the Talent Project of Guangdong Province in 2008 and the Outstanding Scholar of Shenzhen University in 2013.

Title: Progress of Research on Temperature Sensors Based on Microstructured Fiber

Abstract: Optical fiber temperature sensor is an important branch of temperature sensor, which has obvious advantages. Compared with the traditional optical fiber temperature sensor, the temperature sensor based on the microstructured optical fiber may improve the performance of the sensor through the optical fiber structure designing, filling and microstructure processing. In this talk, a variety of microstructured fiber temperature sensors, including intermodal interference types of Mach-Zehnder, Michelson and F-P interferometers and fluorescence type based on demodulation method, have been studied comprehensively and profoundly. The corresponding theories, sensor systems and functional devices are constructed. Among these works, a novel multi-parameter fluorescence fiber temperature sensor with a new signal processing method based on the strong correlation between excitation light and fluorescence was proposed. And based on a small segment of liquid-filled microstructured fiber, an all-fiber Mach-Zehnder temperature fiber sensor with ultrahigh sensitivity of – 1.83 nm/◦C was developed. In addition, a Michelson-type high temperature fiber sensor with a tiny probe size of only 1.03 mm was achieved by utilizing a high-order mode in all-solid photonic bandgap fiber. Moreover, a grape-type microstructured fiber F-P interferometer sensor for high temperature measurement was proposed and demonstrated. The high temperature sensor performs a sensitivity of 17.7 pm/ ◦C at 1 570 nm and a high measurable temperature of up to 1 000 ◦C.

Poster Session

Time: 15:00-16:00, August 22, 2023
Room: Foyer

Paper ID: 966

Title: Ultrahigh Quality Microlasers from Controlled Self-Assembly of Ultrathin Colloidal Semiconductor Quantum Wells

Author(s): Yi Tian Thung, Rui Duan, Emek G. Durmusoglu, Yichen He, Lian Xiao, Calvin Xiu Xian Lee, Wen Siang Lew, Lin Zhang, Hilmi Volkan Demir and Handong Sun

Affiliation: Nanyang Technological University; Tianjin University; University of Macau

Abstract: Colloidal quantum wells (CQWs) have emerged as a promising class of gain material in various optical feedback configurations. This is due to their unique excitonic features arising from their 1D quantum confinement. However, existing methods for integrating CQW onto microresonators will cause low laser quality due to uneven CQW coating. To overcome this, the use of liquid-interface kinetically driven self-assembly is proposed to coat ultrathin, close-packed layers of colloidal CdSe/Cd1−xZnxS core/shell CQWs between 7 and 14 nm onto the surface of silica microsphere cavities. The fabricated CQW-whispering-gallery-mode microlasers possess a commendable high quality (Q) factor of 13000 at room temperature. Stable single-mode lasing output is demonstrated through evanescent field coupling between a CQW-coated microsphere and a thin uncoated microfiber in a 2D-3D microcavity configuration. These promising results highlight the suitability of the liquid-interface kinetically driven self-assembly method for realizing ultrathin CQW-coated microlasers and its high compatibility for integrating colloidal nanocrystals onto complex 3D microstructures for future miniaturized colloidal optoelectronic and photonic applications.

Paper ID: 5661

Title: Fiber-tip Tri-foci Metalens

Author(s): Jiaqi Qu, Yue Wang, Zhuo Wang, Zhi Cheng and Changyuan Yu

Affiliation: The Hong Kong Polytechnic University

Abstract: The concept of 'lab-on-fiber' has sparked an abundance of research interest in optical fiber-integrated nanophotonic devices due to their impressive capacity to modulate light at the nanoscale. This increasing demand for improved functional diversity has led to further exploration of multifunctional fiber-tip metasurface. In this study, we design and characterize an all-dielectric tri-foci metalens directly patterned on the end facet of a large-mode-area photonic crystal fiber (LMA-PCF). Polarization-insensitive center focusing and polarization-sensitive off-axis bi-focusing have been substantiated at the operation wavelength of 1310 nm. The demonstration will be further explored to develop a diverse range of applications, such as optical communication and biological chiral imaging. With its impressive capacity to modulate light at the nanoscale, lab-on-fiber technology has opened up exciting new opportunities for research and development.

Paper ID: 4554

Title: Waveguide integrated gradient nanoantenna for broadband surface-enhanced infrared spectroscopy

Author(s): Donglai An, Jing Ni, Zhouzhuo Tang, Xia Yu and Qingcheng Song

Affiliation: Beihang University

Abstract: The integration of waveguide and surface enhanced nanoantenna provides a new method for the efficient utilization of incident light by combining μm-magnitude evanescent field depth on the surface of waveguide and the field enhancement maintained at distances of up to ~100 nm. The waveguide integrated nanoantenna device avoids the need for large free-space optics and, together with on-chip lasers and detectors, can constitute an extremely small, fully integrated on-chip optical sensing system. In this work, we demonstrate waveguide integrated gradient nanoantenna for mid-infrared broadband sensing. The design of the silicon waveguide with large-core rib allows low loss transmission below 7 μm. In addition, in order to improve the sensitivity and bandwidth of waveguide integrated nanoantenna, the concept of loss engineering to optimize the parameters of surface enhanced nanoantenna and designed the gradient antenna arrangement are respectively introduced. Theoretical calculation and simulation results show that the average and maximum electric field between 5-7 μm of the designed device is increased by a factor of 42 and 55 respectively relative to evanescent field amplitude of the bare waveguide.

Paper ID: 7343

Title: Acoustic wave sensor based on the optical fiber-diaphragm composite structure

Author(s): Yujian Li, Weimin Lyu, Yifan Liu and Changyuan Yu

Affiliation: The Hong Kong Polytechnic University

Abstract: In this paper, an optical sensor based on the fiber-diaphragm composite structure is proposed for detecting low-frequency acoustic waves. The main structure of the proposed sensor is built up by an in-line Mach-Zehnder interferometer (MZI) and a round polyethylene terephthalate (PET) diaphragm. The inline MZI is fabricated based on the sandwich structure of multimode fiber (MMF)-six holes single core fiber (SHSCF)-MMF. The interference dip intensity of the MZI can change linearly with the curvature variation. If the curvature sensor is stuck closely along the diameter of the PET diaphragm, this fiber-diagram composite structure can detect low-frequency acoustic waves because the sound field information is modulated to the curvature of the sensor by the vibration of the PET diaphragm. Then, by demodulating the light intensity with a photodetector, the original acoustic information can be obtained in real-time. The experimental results show that a flat response to sound waves is achieved in the frequency range from 50 Hz to 3000 Hz.

Paper ID: 6432

Title: Drivers' Heart Rate monitoring System Based on Dual Fiber Optic Sensors

Author(s): Weimin Lyu, Jianxun Yu, Qing Wang, Shuyang Chen, Changyuan Yu and Yujian Li

Affiliation: The Hong Kong Polytechnic University

Abstract: This study investigates the application of dual fiber optic sensors-based ballistocardiography (BCG) system to monitor drivers' heart rate (HR) under simulated driving vibration conditions.

Paper ID: 3330

Title: Pulse control of actively Q-switched random fiber laser

Author(s): Ailing Zhang, Haozhe Chen and Ao Sun

Affiliation: Tianjin University of Technology

Abstract: This paper experimentally investigates the influence of pump power, injection power and modulation frequency on the pulse of an actively Q-modulated laser. The number of pulses increases with increasing pump power in both the presence and absence of injection. The pulse amplitude decreases as the injection power increases and pulse disappears when the injection power increases to 14dBm. As the modulation frequency decreases, the number of pulses increases. The number of pulses and the dark pulses can be adjusted by varying the pump power, the injection power and the modulation frequency, which has potential for applications in secure communications and remote sensing and ranging.

Paper ID: 5520

Title: Investigation on Conveyor Belt Materials for Real-time Terahertz Imaging Monitoring

Author(s): Changyong Tian, Yandong Gong, Chuanyang Zhou and Shujun Li

Affiliation: Technical Institute of Physics and Chemistry CAS; eijing Information Science & Technology University

Abstract: Terahertz (THz) imaging is a potential approach for real-time security and industry quality checking, here a conveyor design based on real-time THz imaging is presented. Five different types of conveyor belt materials have been tested, the results show that both PVC and PU are suitable as low loss belts materials, the thinner belt is preferred as long as it can support sufficient sample weight on it.

Paper ID: 6240

Title: Strip waveguides for SiO2-TiO2 photonic systems and optical methods of their verification

Author(s): Krzysztof Czyż, Jakub Pawłów, Kacper Prokop, Maria Zdończyk, Krzysztof Rola, Magdalena Zięba, Paweł Karasiński, Joanna Cybinska and Malgorzata Guzik

Affiliation: Łukasiewicz Research Network – PORT Polish Center for Technology Development, ul. Stabłowicka 147, 54-066 Wrocław

Abstract: The waveguide structures were fabricated based on the SiO2-TiO2 material platform. SiO2-TiO2 layers were prepared from sol-gel materials by dip-coating and high-temperature annealing (500 °C). In order to produce microstructures of strip waveguides in the above layers, photolithography processes were performed using masks containing patterns of appropriate photonic structures. Then, the samples produced in this way were subjected to ICP-RIE (Inductively Coupled Plasma - Reactive Ion Etching) plasma etching in CHF3/Ar plasma, with a controlled etching depth that defined the vertical dimensions of the thus formed SiO2-TiO2 fin waveguides (Fig. 1). These waveguides were later checked in a specially prepared system. The results will be presented during the presentation.

Acknowledgments

The research was co-financed by the Foundation for Polish Science from the European Regional Development Fund within the project POIR.04.04.00-00-14D6/18 "Hybrid sensor platforms for integrated photonic systems based on ceramic and polymer materials (HYPHa)"

Paper ID: 3316

Title: Investigation on Peak Wavelength Tracking in FBG Sensor

Author(s): Changyong Tian, Yandong Gong, Chuanyang Zhou and Shujun Li

Affiliation: Technical Institute of Physics and Chemistry CAS; eijing Information Science & Technology University

Abstract: Fiber Bragg Grating (FBG) is one kind of Optical fiber sensors which can be used for the applications of both strain and temperature monitoring in structural health monitoring. An FBG is actually an reflective narrow-band optical filter while FBG interrogator fastly scans the reflective FBG spectrum from distributed FBG sensors. FBG interrogator offers the shifted Bragg wavelength data of the FBG, and furthermore to determine and assess the physical performance of the external environment. Spectral resolution and noise mainly limit the accuracy of finding the peak wavelength of the FBG sensor when scanning a spectrum, Here we reviewed and discussed several algorithms for peak wavelength tracking, and our experiment verified that both Centroid and 2nd polynomial fitting methods are better for fast and accurate FBG interrogation.

Paper ID: 5868

Title: Flattened spectrum cavity soliton comb generation in a few-mode fiber resonator

Author(s): Tianye Huang, Shijie Feng, Jianxing Pan, Mingfeng Ge, Zhuo Cheng, Jie Yin, Wufeng Sun, Bao Huang, Chongwen He, Nan Zhang and Huang Yu

Affiliation: China University of Geosciences (Wuhan); Optics Valley Technology Stock Company; Wuhan Raycus Fiber Laser Technologies Co., Ltd.; Harbin Welding Laser Intelligent Equipment (Wuhan) Co., Ltd.; Shenzhen JPT Opto-Electronics Co., Ltd.; Fiberhome Fujikura Optics Technology Co., Ltd.

Abstract: Kerr cavity soliton is a spatial localized dissipative structure formed by the dual balance of nonlinearity and dispersion, gain and loss of pulsed light in the cavity, which has rich physical connotation and dynamic process. Without additional filtering, the reported spectral bandwidth and spectral flatness of cavity solitons are limited to the traditional sech2 shape. In this paper, we report on the generation of different cavity solitons in mode-exchange few-mode fiber resonators by simultaneously exciting the fundamental and higher-order modes with equal and opposite dispersion. To verify this concept, a numerical model of the few-mode fiber is designed to form the resonator, and vectorial cavity solitons with a wider and flatter spectrum than the traditional cavity soliton can be generated.

Video Session

The videos will be available from August 24-30, 2023 at official website: https://www.optoin.org/PGC/

Invited Speaker

Frédéric Grillot
Institut Polytechnique de Paris

Bio: Frédéric Grillot is currently a Full Professor at Télécom Paris (France) and a Research Professor at the University of New-Mexico (USA). His research interests include, but are not limited to, advanced quantum confined devices using III-V compound semiconductors, quantum dots quantum dashes, light-emitters based on intersubband transitions, non-classical light, nonlinear dynamics and optical chaos in semiconductor lasers systems as well as microwave and silicon photonics applications.

Title: Semiconductor Quantum Dots, why are they so quantum? Genesis, prospects & challenges

Abstract: Semiconductor nanostructures with low dimensionality like quantum dots are one the best attractive solutions for achieving high performance photonic devices. When one or more spatial dimensions of the nanocrystal approach the de Broglie wavelength, nanoscale size effects create a spatial quantization of carriers along with various other phenomena based on quantum mechanics. Thanks to their compactness, great thermal stability and large reflection immunity, semiconductor quantum dot lasers are very promising candidates for low energy consumption and isolation free photonic integrated circuits. When directly grown on silicon, they even show a four-wave mixing efficiency much superior compared to the conventional quantum well devices. This remarkable result paves the way for achieving high-efficiency frequency comb generation from a photonic chip. Quantum dot lasers also exhibit a strong potential for applications in optical routing and optical atomic clock.Last but not least, a quantum dot single photon source is a building block in secure communications, and therefore can be applied to quantum information processing for applications such as quantum computers. This lecture will review the recent findings and prospects on nanostructure based light emitters made with quantum-dot technology. Many applications ranging from silicon-based integrated solutions to quantum information systems will be presented. In addition, the lecture will highlight the importance of nanotechnologies on industry and society especially for shaping the future information and communication society.

Invited Speaker

Vuong Mai

Bradford-Renduchintala Centre for Space AI, University of Bradford

Bio: Vuong Mai is currently a Lecturer in Electronics and Communication Engineering at the Faculty of Engineering and Informatics, University of Bradford, UK. He is also a core team member of the Bradford-Renduchintala Centre for Space AI. Prior to joining Bradford, he was a Research Assistant Professor at the School of Electrical Engineering, KAIST, South Korea. He received his Ph.D. degree in Computer Science and Engineering from the University of Aizu, Japan. His areas of interest include optical wireless, free-space optics, B5G/6G, aerial communications, and space communications.

Title: Applications of Adaptive Beam Control Technique for Laser Satellite Communication Systems

Abstract: This paper presents our recent study on the adaptive beam control technique for intersatellite laser links. The objective of the study is to address the challenges posed by pointing errors and angular-of-arrival fluctuations. To mitigate the adverse effects of these factors, beam divergence and convergence angles are dynamically adjusted based on the transmission conditions.

Invited Speaker

Weiming Yao

Eindhoven University of Technology

Bio: Dr. Weiming Yao obtained a dual MSc degree in Photonic Networks Engineering from Aston University, UK, and Scuola Superiore Sant'Anna, Italy, in 2012. He obtained his PhD degree cum laude in 2017 from Eindhoven University of Technology (TU/e) after studying the density limits to photonic integrated circuit technology. Afterwards, he worked in the founding team of the Photonic Integration Technology Centre (PITC), a development centre aimed at increasing the TRL level of photonic circuit technology together with industry. Since 2020, he is Assistant Professor at TU/e, after receiving a NWO (Dutch Research Council) Veni grant to investigate photonic neural networks on chip, based on spiking lasers. His research interests include high-speed and neuromorphic photonic components and its connection to electronics for energy-efficient computing and data interconnection. He is currently leading the focus area on high-bandwidth and energy-efficient optical interconnects at the Eindhoven Hendrik Casimir Institute (EHCI).

Title: Bringing Photonics and Electronics Together for High-Speed, High-Density Signaling

Abstract: Photonic integrated circuit (PIC) technology has matured over the years, making it possible to integrate hundreds of optical components on a chip. Many applications, such as high-capacity transceivers are benefiting from high-density PICs. As operation speed and component density continue to increase, interconnection of photonics with electronics becomes increasingly more important. This talk discusses the need for close co-integration from a telecom and datacom perspective and outlines potential technological solutions including circuit level co-design, RF interconnects and wafer-level bonding approaches. Next to traditional telecom and datacom, we discuss how co-integration could benefit PICs for other applications such as neuromorphic or microwave photonics.

Invited Speaker

Qi Zhang

Shanghai University

Bio: Qi Zhang received the Ph.D. from Clemson University, United States, in 2020. He is currently working as an Assistant Professor at Shanghai Key Lab of Specialty Fiber Optics and Optical Access Network, School of Communication and Information Engineering, Shanghai University. His major research interests are specialty fiber devices, 3D printing and sensors and instrumentations.

Title: Fused silica 3D printing of photonics sensors

Abstract: We report our recent research progresses on design, fabrication and characterization of photonic sensors for harsh environment applications, with help of Integrated Additive and Subtractive Manufacturing system. Several photonic sensors are presented, including all-glass pressure sensor, information integrated glass module, microfluidic pressure sensor fabrication and bi-material structure for temperature sensing.

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