Pacific Rim Conference on Lasers and Electro-Optics (CLEO-PR) 2018
29 July–3 August, 2018
Hong Kong Convention and Exhibition Centre, Hong Kong

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Welcome to Hong Kong and to the Pacific Rim Conference on Lasers and Electro-Optics (CLEO-PR) 2018

It is our great pleasure to invite you to participate in the Pacific Rim Conference on Lasers and Electro-Optics (CLEO-PR) 2018 and share the latest discoveries and news in photonics science, technology and innovations from leading companies, universities and research laboratories throughout the world. CLEO-PR is now one of the largest conferences in the Asia-Pacific region on photonics and relevant technologies.

The CLEO-PR technical conference features a full suite of plenary, invited, and contributed talks given by international academic and industrial researchers who are leaders in their respective fields. The conference this year will feature the following topics: Solid State, Fiber, and Other Laser Sources; Ultrafast and Nonlinear Phenomena; Infrared and Terahertz Technologies and Applications; High Power, High Energy Lasers; Laser Processing and Innovative Applications; Optical Metrology; Quantum Optics, Atomic Physics and Quantum Information; Micro and Nanophotonics; Optical communication systems and networks; Optical Fiber and Waveguide Technologies; Semiconductor and Integrated Optical Devices; Silicon Photonics; Optical Signal Processing; Advanced 2D Materials for Photonics; Biophotonics and Applications; Plasmonics and Metamaterials; Optical Sensors and Systems; Imaging, Display and Storage Technologies; and Microwave Photonics.

With a conference program of broad scope and of the highest technical quality, CLEO-PR provides an ideal venue to keep up with new research directions and an opportunity to meet and interact with the researchers who are leading these advances. We have 792 papers scheduled, including 152 invited and 20 tutorial presentations made by many of the world's most prominent researchers from academia and industry. We thank all the contributors and authors for making CLEO-PR a truly unique, outstanding global event.

Our conference highlight is the Plenary Session scheduled on the morning of Tuesday, July 31. We will have four outstanding, distinguished speakers: Professor Kerry J. Vahala from California Institute of Technology, USA will present on High-Q Physics on-a-Chip for Integrated Optical Time Standards and Frequency Synthesizers; Professor Qihuang Gong from Peking University, China will give a talk on Light Manipulating and Detecting at Micro/Nano-Scale; Professor Bahram Jalali from University of California, Los Angeles, USA will present on Time Stretch and its Applications in Nonlinear Dynamics, Biomedicine, and Computational Imaging; Professor Susumu Noda from Kyoto University, Japan will discuss High-Power and High-Beam Quality Photonic-Crystal Lasers.

In addition to the regular technical sessions, twelve workshops will also be held on Monday, July 30. These workshops will be held free of charge to conference registrants. We would like to thank the workshop organizers and speakers for the excellent program.

Best Student Paper Awards sponsored by OSA will be given to students who are first authors and presenters of exceptional contributed talks. The selection will be made by the subcommittees during the conference. Awards will be presented during the Banquet on Wednesday, August 1. The poster-only session will also be held on 14:00 –15:30, Wednesday, August 1. This is a good chance for you to meet with the authors and discuss technical issues in-depth. Best poster awards sponsored by OSA and selected by conference delegates will be given as well.

In addition to the technical program, we have prepared a rich social program to facilitate meeting and networking with colleagues from all over the world. A conference reception will be held in the evening of Monday, July 30. In the evening of Wednesday, August 1, we will hold a Banquet for conference registrants in the Hong Kong Convention and Exhibition Centre. It is an enormous task to organize a conference and it is impossible to succeed without the dedicated efforts of many supporters and volunteers. We are indebted to the entire Technical Program Committee led by Hwa-Yaw Tam, Changyuan Yu and Feng Li from The Hong Kong Polytechnic University, and the Subcommittee co-chairs who have worked persistently throughout the whole year to invite speakers, solicit and review papers, organize the technical sessions which results in the excellent technical program. We also thank the local organizing committee led by Chao Lu and Alan Pak Tao Lau from The Hong Kong Polytechnic University, and the staffs and volunteers of the professional societies (especially OSA) organizing and sponsoring the event.

General Chairs

Ping-kong Alexander Wai
The Hong Kong Polytechnic University, Hong Kong

Limin Tong
Zhejiang University, China
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Perry Shum, Nanyang Technological Univ., Singapore

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Limin Tong, Zhejiang Univ., China

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Changyuanyu Yu, The Hong Kong Polytechnic Univ., Hong Kong SAR
Feng Li, The Hong Kong Polytechnic Univ., Hong Kong SAR

Technical Program Subcommittee Co-chairs and Members

C1. Solid State, Fiber, and Other Laser Sources
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Chengbo Mou, Shanghai Univ., China (co-chair)
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Zhipei Sun, Aalto Univ., Finland
Zheqian Luo, Xiamen Univ., China
Xiaoqi Zhang, Kmlabs Inc., USA
Guoqing Chang, DESY-CFEL, Germany
Meng Zhang, Beihang Univ., China
Jungwon Kim, Korea Advanced Inst. of Science and Technology (KAIST), South Korea
William Renninger, Univ. of Rochester, USA

C2. Ultrafast and Nonlinear Phenomena
Anna Peacock, Univ. of Southampton, UK (co-chair)
Jingzhen Li, Shenzhen Univ., China (co-chair)
Jinhui Yuan, Beijing Univ. of Posts and Telecommunications, China (co-chair)
Roberto Morandotti, INRC, Canada (co-chair)

Frederique Vanholsbeeck, Univ. of Auckland, New Zealand
Zhigang Chen, San Francisco State Univ., USA
Guenter Steinmeyer, Max-Born-Inst. for Nonlinear Optics and Short Pulse Spectroscopy, Germany
Michael Kues, Glasgow Univ., UK
Mercedes Khajavikhan, CREOL, Univ. of Central Florida, USA
Lin Zhang, Tianjin Univ., China
Miro Erkintalo, The Univ. of Auckland, New Zealand
Segei K. Turitsyn, Aston Univ., UK
Shixiang Xu, Shenzhen Univ., China
Peijun Yao, Univ. of Science and Technology of China, China

C3. Infrared and Terahertz Technologies and Applications
Qijie Wang, Nanyang Technological Univ., Singapore (co-chair)
Sai Tak Chu, City Univ. of Hong Kong, Hong Kong SAR (co-chair)
Mo Li, Univ. of Minnesota, USA (co-chair)
Stuart Jackson, Macquarie Univ., Australia (co-chair)
Marco Peccianti, Univ. of Sussex, UK
Matteo Clerici, Univ. of Glasgow, UK
Luca Razzari, Énergie Matériaux Télécommunications Research Centre, Canada
Juejun Hu, MIT, USA
Joey Talghader, Univ. of Minnesota, USA
Xianshu Luo, Inst. of Microelectronics, Singapore
Yu Luo, Nanyang Technological Univ., Singapore
Bin Zhang, Sun Yat-sen Univ., China

David Lancaster, Univ. of Southern Australia, Australia (co-chair)
Xia Yu, SIMTech, Singapore (co-chair)
Zhan Sui, Shanghai Inst. of Laser Plasma, CAEP, China (co-chair)
Wangguo Zheng, Laser Fusion Research Center China Academy of Engineering Physics, China
Yuxin Leng, State Key Laboratory of High Field Laser Physics in SION, China
Seongwoo Yoo, Nanyang Technological Univ., Singapore

Wenjing Lai, Tamasek Laboratory, Singapore
Rich Mildren, Macquarie Univ., Australia
Mark Dubinskiy, U.S. Army Research Laboratory, USA
Pu Wang, Beijing Univ. of Technology, China
Shibin Jiang, AdValue Photonics Inc., USA

C5. Laser Processing and Innovative Applications
Minghui Hong, National Univ. of Singapore, Singapore (co-chair)
Lei Su, Queen Mary Univ. of London, UK (co-chair)
Ming Tang, Huazhong Univ. of Science and Technology, China (co-chair)
Hongyu Zheng, SIMTech A*STAR, Singapore (co-chair)
Martin Wegener, Karlsruhe Inst. of Technology, Germany
Yongfeng Lu, Univ. of Nebraska-Lincoln, USA
Jeng Ywan Jeng, National Taiwan Univ. of Science and Technology, Taiwan
Xiangang Luo, Inst. of Optics and Electronics, Chinese Academy of Science, China
Yangchun Guan, Beihang Univ., China
Baohua Jia, Swinburne Univ. of Technology, Australia
Kan Wu, Shanghai Jiaotong Univ., China
Jiajing Tu, Univ. of Science and Technology Beijing, China

C6. Optical Metrology
Kenneth Kin-Yip Wong, The Univ. of Hong Kong, Hong Kong SAR (co-chair)
Xiaoxiao Xue, Tsinghua Univ., China (co-chair)
Xiaoguang Zhang, Beijing Univ. of Posts and Telecommunications, China (co-chair)
Chao Wang, Univ. of Kent, UK (co-chair)
Alessia Pasquaì, Univ. of Sussex, UK
Victor Torres-Company, Chalmers Univ., Sweden
Zheng Zheng, Beihang Univ., China
Ju Han Lee, Univ. of Seoul, South Korea
Periklis Petropoulos, Univ. of Southampton, UK
Richard Leach, Univ. of Nottingham, UK
Hongxiao Zhang, Tianjin Univ., China
Jinlong Yu, Tianjin Univ., China
Adonis Bogris, Technological Educational Inst. of Athens, Greece

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C7. Quantum Optics, Atomic Physics and Quantum Information
Nelson Sze Chun Chan, City Univ. of Hong Kong, Hong Kong SAR (co-chair)
Fangwen Sun, Univ. of Science and Technology of China, China (co-chair)
Yunfeng Xiao, Peking Univ., China (co-chair)
Christophe Couteau, Univ. of Technology of Troyes, France (co-chair)
Xiulai Xu, Inst. of Physics, CAS, China
Yong-Chun Liu, Tsinghua Univ., China
Jinshi Xu, Univ. of Science and Technology of China, China
Weibo Gao, Nanyang Technological Univ., Singapore
Lucia Caspani, Univ. of Strathclyde, UK
Guofeng Zhang, The Hong Kong Polytechnic Univ., Hong Kong SAR
David Wilkowski, Univ. of Nice - NTU Singapore, Singapore
Leong Chuang Kwek, National Univ. of Singapore, Singapore
Alberto Bramati, Laboratoire Kastler Brossel, France

C8. Micro and Nanophotonics
Andrew Wing-On Poon, The Hong Kong Univ. of Science and Technology, Hong Kong SAR (co-chair)
Xuming Zhang, The Hong Kong Polytechnic Univ., Hong Kong SAR (co-chair)
Xiangping Li, Jinan Univ., China (co-chair)
Xiaofeng Li, Soochow Univ., China (co-chair)
Dragomir Neshev, Australian National Univ., Australia
Vincenzo Giannini, Imperial College London, UK
Hui Liu, Nanjing Univ., China
Patrick Guo-Qiang Lo, IME A*STAR, Singapore
Joyce Poon, Univ. of Toronto, Canada
Tarik Bourouina, Université Paris-Sud, France
Yi Yang, Wuhan Univ., China
Ningmu Zou, AMD, USA

C9. Optical Communication Systems and Networks
Calvin Chun-Kit Chan, The Chinese Univ. of Hong Kong, Hong Kong SAR (co-chair)
Hoon Kim, KAIST, South Korea (co-chair)
Xian Zhou, Univ. of Science and Technology Beijing, China (co-chair)
Shanguo Huang, Beijing Univ. of Posts and Telecommunications, China (co-chair)
Min Zhang, Beijing Univ. of Posts and Telecom, China
Jian Zhao, National Tyndall Inst., Ireland
Hwan Seek Chung, Electronics and Telecommunications Research Inst. (ETRI), South Korea
Koji Igarashi, Osaka Univ., Japan
Gangxiang Shen, Soochow Univ., China
Kai Ming Feng, National Tsinghua Univ., Taiwan
Zhixin Liu, Univ. College London, UK
Elaine Wong, Univ. of Melbourne, Australia
Bingli Guo, Beijing Univ. of Posts and Telecom, China

C10. Optical Fiber and Waveguide Technologies
Kin-Seng Chiang, City Univ. of Hong Kong, Hong Kong SAR (co-chair)
Guiyao Zhou, South China Normal Univ., China (co-chair)
Lei Wei, Nanyang Technological Univ., Singapore (co-chair)
Zhaohui Li, Sun Yat-Sen Univ., China (co-chair)
Hung-Chun Chang, National Taiwan Univ., Taiwan
Qing Liu, Institute of Micerelectronics, A*STAR, Singapore
Simon Fleming, Univ. of Sydney, Australia
Morten Ibsen, Univ. of Southampton, UK
Tao Zhu, Chongqing Univ., China
Guangming Tao, Huazhong Univ. of Science and Technology, China
Yang Li, Nankai Univ., China
Xingwen Yi, Univ. of Electronic Science and Technology of China, China

C11. Semiconductor and Integrated Optical Devices
Kei May Lau, The Hong Kong Univ. of Science and Technology, Hong Kong SAR (co-chair)
Daohua Zhang, Nanyang Technological Univ., Singapore (co-chair)
Siuyun Yu, Sun Yat-sen Univ., China (co-chair)
Liang Wang, Univ. of Science and Technology of China, China (co-chair)
Marc Sorel, Glasgow Univ., UK
Yunjian Jin, A*STAR IMRE, Singapore
Guanshi Qin, Jinlin Univ., China
Kevin Williams, Eindhoven Technical Univ., Netherlands
Siming Chen, Univ. College London (UCL), UK
Xinlun Cai, Sun Yat-sen Univ., China
Dries Van Thourhout, Ghent Univ., Germany
Pengfei Wang, Shenzhen Univ., China
Tao Lu, Univ. of Victoria, Canada
Yiyang Xie, Beijing Univ. of Technology, China

C12. Silicon Photonics
Hon Ki Tsang, The Chinese Univ. of Hong Kong, Hong Kong (co-chair)
Minghao Qi, Purdue Univ., USA (co-chair)
Daxin Dai, Zhejiang Univ., China (co-chair)
Kensuke Ogawa, Fujikura, Japan (co-chair)
Di Liang, HP Lab, USA
Ke Xu, Harbin Institute of Technology (Shenzhen), China
Zongfu Yu, Univ. of Wisconsin, USA
Mingbin Yu, Shanghai Inst. of Microsystem and Information Technology, China
Ching Eng Png, Inst. of High Performance Computing, Singapore
Kangping Zhong, Macom Technology Solutions, China
Xingjun Wang, Peking Univ., China
Xuhan Guo, Shanghai Jiao Tong Univ., China
Andy Knights, McMaster Univ., Canada
William Whelan-Curtin, Univ. of St Andrews, Ireland
Harold Chong, Univ. of Southampton, UK

C13. Optical Signal Processing
Chester Shu, The Chinese Univ. of Hong Kong, Hong Kong SAR (co-chair)
Guifang Li, Univ. of Central Florida, USA (co-chair)
Lili Yi, Shanghai Jiao Tong Univ., China (co-chair)
Lawrence Chen, McGill Univ., Canada (co-chair)
Nan-Kuang Chen, National United Univ., Taiwan
Gabriella Cincotti, Roma Tre Univ., Italy
Bill Corcoran, Monash Univ., Australia
Giangtiero Contestabile, Scuola Superiore Sant’Anna, Italy
Xiaojie Guo, Jinan Univ., China
Yong Liu, Univ. of Electronic Science and Technology of China, China
Bob Norwood, Univ. of Arizona, USA
Francesca Parmigiani, Univ. of Southampton, UK
Paul Prucnal, Princeton Univ., USA
Thomas Schneider, TU Braunschweig, Germany
Jian Wang, Huazhong Univ. of Science and Technology, China
Lianshan Yan, Southwest Jiaotong Univ., China
Deepa Venkitkesh, Indian Inst. of Technology Madras, India
Qunbi Zhuge, Ciena Corp, Canada
C14. Advanced 2D Materials for Photonics
Dingyuan Tang, Nanyang Technological Univ., Singapore (co-chair)
Qiaoliang Bao, Monash Univ., Australia (co-chair)
Han Zhang, Shenzhen Univ., China (co-chair)
Yuen Hong Tsang, The Hong Kong Polytechnic Univ., Hong Kong SAR (co-chair)
Lain Jong Li, King Abdullah Univ. of Science and Technology, Saudi Arabia
Amos Martinez, Univ. of Tokyo, Japan
Grzegorz Sobon, Wroclaw Univ. of Technology, Poland
Kai Zhang, Sichuan Inst. of Nano-Tech and Nano-bionics (SINANO), CAS, China
Chao-kuie Lee, National Sun Yat-Sen Univ., Taiwan
Rainer Hillenbrand, CIC nanoGUNE and EHU/UPV, Spain
Jian-Bin Xu, The Chinese Univ. of Hong Kong, China
Nicolae C. Panoiu, Univ. College London, UK
Jianhua Hao, The Hong Kong Polytechnic Univ., Hong Kong SAR
Yang Chai, The Hong Kong Polytechnic Univ., Hong Kong SAR

C15. Biophotonics and Applications
Mike Somekh, The Hong Kong Polytechnic Univ., Hong Kong SAR (co-chair)
Yu Chen, Univ. of Maryland in College Park, USA (co-chair)
Tuan Guo, Jinan Univ., China (co-chair)
Nanguang Chen, National Univ. of Singapore, Singapore (co-chair)
Daqing Piao, Oklahoma State Univ., USA
Baozong Yuan, Univ. of Texas, USA
Chao Zhou, Lehigh Univ., USA
Jonathan Liu, Univ. of Washington, USA
Zhizhang Huang, National Univ. of Singapore, Singapore
Jacques Albert, Carleton Univ., Canada
Christophe Caucheteur, Univ. of Mons, Belgium
Xudong Fan, Univ. of Michigan, USA
Aaron H.P. Ho, The Chinese Univ. of Hong Kong, Hong Kong SAR

C16. Plasmonics and Metamaterials
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Yu Luo, Nanyang Technological Univ., Singapore (co-chair)
Pei Wang, Univ. of Science and Technology of China, China (co-chair)
Dangyuan Lei, The Hong Kong Polytechnic Univ., Hong Kong SAR (co-chair)
Tao Li, Nanjing Univ., China

Zheyu Fang, Peking University, China
Changjun Min, Shenzhen Univ., China
Guixin Li, Southern Univ. of Science and Technology, China
Cheng-Wei Qiu, National Univ. of Singapore, Singapore
Kannatassen Appavoo, The Univ. of Alabama at Birmingham, USA
Mohsen Rahmani, Australian National Univ., Australia
Valentina Krachmalnicoff, Institut Langevin, ESPCI Paris, CNRS, France

C17. Optical Sensors and Systems
Baiou Guan, Jinan Univ., China (co-chair)
Qiang Wu, Northumbria Univ., UK (co-chair)
Liang Wang, The Chinese Univ. of HK, Hong Kong SAR (co-chair)
Liang Shao, Southern Univ. of Science and Technology, China (co-chair)
Yongkang Dong, Harbin Inst. of Technology, China
Mable Fok, Univ. of Georgia, USA
Zhenzhong Cheng, Univ. of Tokyo, Japan
Xinyu Fan, Shanghai Jiaotong Univ., China
Fei Xu, Nanjing Univ., China
Tommy Chan, Queensland Univ. of Technology, Australia
Serhiy Korposh, Univ. of Nottingham, UK
Yiping Wang, Shenzhen Univ., China
Tomasz Nasilowski, InPhoTech, Poland
Xinyong Dong, China Jiliang Univ., China

C18. Imaging, Display and Storage Technologies
Kevin Tsia, The Hong Kong Univ., Hong Kong SAR (co-chair)
Wen Chen, The Hong Kong Polytechnic Univ., Hong Kong SAR (co-chair)
Xinzhu Sang, Beijing Univ. of Posts and Telecommunications, China (co-chair)
Lixin Xu, Univ. of Science and Technology of China, China (co-chair)
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Guotai S itu, Shanghai Inst. of Optics and Fine Mechanics, Chinese Academy of Sciences, China
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Kemao Qian, Nanyang Technological Univ., Singapore
Liangcai Cao, Tsinghua Univ., China
Hongwei Chen, Tsinghua Univ., China
YongKeun Park, Korea Advanced Inst. of Science and Technology (KAIST), South Korea
Quan Liu, Nanyang Technological Univ., Singapore

C19. Microwave Photonics
Shilong Pan, Nanjing Univ. of Aeronautics and Astronautics, China (co-chair)
Xinhuan Feng, Jinan Univ., China (co-chair)
Kun Xu, Beijing Univ. of Posts and Telecommunications, China (co-chair)
Yifei Li, Univ. of Massachusetts Dartmouth, USA (co-chair)
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Jianji Dong, Huazhong Univ. of Science and Technology, China
Xihua Zou, Southwest Jiaotong Univ., China
Jonathan Klaman, UCSB, ECE department, USA
Edward Ackerman, Photonic System Inc., USA
Yanne K. Chembo, FEMTO-ST Inst., France
Hossein-Zadeh Mani, Univ. of New Mexico, USA
Fabien Bretenaker, French National Centre for Scientific Research, France
Atsushi Kanno, NICT, Japan

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Aping Zhang, The Hong Kong Polytechnic Univ., Hong Kong SAR

Local Organizing Committee chairs
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Zhengyong Liu, Zhiyong Zhao, Chao Jin,
Kun Zhu, Fengze Tan, Biwei Wang,
Dongmei Huang, Xianting Zhang,
Zhiyong Zhao, Chao Jin,
Fengze Tan, Biwei Wang,
Xin Cheng, The Hong Kong Polytechnic Univ., Hong Kong SAR

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Akihiko Kasukawa, Furukawa Electric, Japan
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Gong-Ru Lin, National Taiwan Univ., Taiwan
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Chang Hee Nam, Gwangju Inst. of Science and Technology, South Korea
Takashige Omatsu, Chiba Univ., Japan
Perry Shum, Nanyang Technological Univ., Singapore
Jian-Jun He, Zhejiang Univ., China (Ex-Officio Member)
Hao-chung Kuo, National Chiao-Tung Univ., Taiwan (Ex-Officio Member)
General Information

Conference Venue: Hong Kong Convention and Exhibition Centre (HKCEC), Hong Kong
Address: No. 1 Expo Drive, Wanchai, Hong Kong

The conference will take place in the HKCEC which is a major landmark located in the heart of Hong Kong on Victoria Harbour. Its vast curtain of glass and 40,000 square-meter aluminum roof is sculpted to echo a seabird soaring in flight. The HKCEC has been awarded ‘Best Convention and Exhibition Centre in Asia’ 13 times by the industry-leading CEI Asia magazine.

Accessibility

The HKCEC is easily accessible from MTR (metro system in Hong Kong) Wanchai Station, or Wanchai Ferry Pier. It is about a 10-minute walk from the MTR station or ferry pier.

From Hong Kong International Airport to HKCEC

By Bus: Take bus at Airport Ground Transport Center by
(1) A12 --> [Immigration Tower] (Stop No. 7) --- walk ~10 mins --> HKCEC (~80 mins, HK$45);
(2) A11 --> [Fleming Road, Hennessy Road] (Stop No. 10) --- walk ~15 mins --> HKCEC (~90 mins, HK$40);

By MTR: By Airport Express line from Airport station to Hong Kong station and switch at Central station to Wanchai station (~40 mins, HK$115)
By Taxi: (~45 mins, ~40 km via Western Harbour Tunnel, ~HK$360 including WHT Toll)

From Lo Wu/Fu Tian Port of Shenzhen to HKCEC

By MTR: East Rail Line from Lo Wu/Lok Ma Chau to Kowloon Tong, change to Kwun Tong Line (Direction: Whampoa), then change to Tsuen Wan Line (Direction: Central) at Mong Kok, then change to Island Line (Direction: Chai Wan) at Admiralty to Wan Chai. (~70 mins, HK$51).

The HKCEC is directly connected to two world class hotels: The Grand Hyatt Hong Kong and the Renaissance Harbour View Hotel.

Registration

Registration Hours and Location:

<table>
<thead>
<tr>
<th>Time</th>
<th>Day</th>
<th>Room</th>
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<tr>
<td>14:00–17:00</td>
<td>Sunday, 29 July</td>
<td>Room AG206, The Hong Kong Polytechnic Univ.</td>
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<tr>
<td>08:00–18:00</td>
<td>Monday - Friday, 30 July - 3 August</td>
<td>S221 Foyer, HKCEC</td>
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Poster Session

Time: 14:00–15:30, Wednesday August 1
Venue: S421, HKCEC

Over 150 posters will be displayed during CLEO-PR 2018. The poster session is designed to provide an opportunity for selected papers to be presented in greater visual detail and facilitate vivid discussions with attendees. Authors are expected to remain in the vicinity of the bulletin board for the duration of the poster session to answer questions.

Poster Preparation

Authors should prepare their poster before the poster session starts. The poster must not exceed the boundaries of the display board and A0 size is recommended. Authors are required to be standing by their posters for the duration of poster session to answer questions and further discuss their work with attendees. No shows will be reported to Conference management and these papers will not be published.

Poster Board Size – 2.0m (Height) X 0.95m (Width) Set-up Time – 10:00 on Wednesday, 1 August
 Tear-down Time – 16:00 on Wednesday, 1 August

Exhibition

The CLEO PR Exhibition is open to all attendees. Location: S221, HKCEC

Exhibition Hours:

<table>
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<td>08:30–18:00</td>
<td>31 July – 2 August</td>
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Conference Materials

CLEO PR 2018 Technical Digest will be provided in a USB drive and not available in print form. The CLEO PR 2018 Technical Digest material is composed of the 2-page summaries of invited and accepted contributed papers. The Technical Digest material is included with a technical conference registration and can be found in your registration bag.

The Digest will be available on OSA Publishing’s Digital Library (https://www.osapublishing.org/) and IEEE Xplore Digital Library (http://www.ieee.org/web/publications/xplore/) after the conference. IEEE Xplore Digital Library and OSA Publishing’s Digital Library are archived and indexed by INSPEC and EI Compendex, where it will be available to the international research community.

Social Activities

Welcome Reception

The CLEO Pacific Rim 2018 welcome reception will be held on 30 July, 2018.

Location: Divino Patio, Shop 11, 1/F, Causeway Centre, No. 28 Harbour Road, Wanchai

Time: 18:30–20:00, Monday, 30 July, 2018

Conference Reception and Banquet

The CLEO Pacific Rim 2018 Banquet will be held in the Convention Hall of the Hong Kong Convention and Exhibition Centre on Wednesday August 1. The Best Paper Awards, OSA Best Student Paper Awards and Best Poster Awards will be presented at the banquet.

Location: Convention Hall, HKCEC

Time: 18:00–22:00, Wednesday, 1 August, 2018

Visit Program

Visit program will be organized to the Photonics Research Centre, The Hong Kong Polytechnic Univ. on both 29 July and 3 August, 2018

Gathering point: AG206, The Hong Kong Polytechnic Univ., Hung Hom, Kowloon

Time: 14:00–17:00, Sunday, 29 July, 2018

Gathering point: CD634, The Hong Kong Polytechnic Univ., Hung Hom, Kowloon

Time: 14:00–17:00, Friday, 3 August, 2018
Plenary Session
Time: 8:30–12:30, Tuesday, 31 July
Venue: Convention Hall, HKCEC

Topic: High-Q Physics on-a-Chip for Integrated Optical Time Standards and Frequency Synthesizers
08:55–09:40

Professor Kerry J. Vahala
California Inst. of Technology, USA

Biography:
Professor Kerry J. Vahala is the Jenkins Professor and Professor of Applied Physics at Caltech. He has pioneered the study of nonlinear optics in high-Q optical micro resonators. In the course of this work, his research group has invented optical resonators that hold the record for highest optical Q on a semiconductor chip. They have applied these devices to study a wide range of nonlinear phenomena including the first demonstration of parametric oscillation and cascaded four-wave mixing in a micro cavity - the central regeneration mechanisms for frequency micro combs. His research has also led to the demonstration of dynamic backaction, a long-anticipated interaction of mechanics and optics mediated by radiation pressure that is responsible for opto-mechanical cooling and recent realizations of mechanical amplification by stimulated phonon emission. Professor Vahala was involved in the early effort to develop quantum-well lasers for optical communications and received the IEEE Sarnoff Award for his research on quantum-well laser dynamics. He has also received an Alexander von Humboldt Award for his work on ultra-high-Q optical microcavities, a NASA achievement award for application of frequency combs to exoplanet detection and a fellow of the IREE, the IEEE Photons Society and the Optical Society of America.

Abstract:
Communication systems leverage the respective strengths of optics and electronics to convey high-bandwidth signals over great distances. These systems were enabled by a revolution in low-optical-loss dielectric fiber, complex integrated circuits as well as devices that link together the optical and electrical worlds. Today, another revolution is leveraging the advantages of optics and electronics in new ways. At its center is the laser frequency comb which provides a coherent link between these two worlds. Significantly, because the link is also bidirectional, performance attributes previously unique to electronics and optics can be shared. The end result has been transformative for time keeping, frequency metrology, precision spectroscopy, microwave-generation, ranging and other technologies. Even more recently, low-optical-loss dielectrics, now in the form of high-Q optical resonators, are enabling the miniaturization of frequency combs. These new ‘microcombs’ can be integrated with electronics and other optical components to potentially create systems on-a-chip. I will briefly overview the history and elements of frequency combs as well as the physics of the new microcombs. Application of the microcombs for spectroscopy and LIDAR will be discussed. Finally, efforts underway to develop integrated optical clocks and integrated optical frequency synthesizers using the microcomb element are described.

Topic: Light Manipulating and Detecting at Micro/Nano-Scale
09:40–10:25

Professor Qihuang Gong
Peking Univ., China

Biography:
Professor Qihuang Gong is the Academician of Chinese Academy of Science and member of the world academy of sciences. He is the Founding Director of the Inst. of Modern Optics, Peking Univ.. He also serves as the Vice President of Peking Univ.. In addition, Prof. Gong serves as Director of Academic committee of the State Key Laboratory for Artificial Microstructure and Mesoscopic Physics. His current research interests are in ultrafast optics and spectroscopy, nonlinear optics, and mesoscopic optical devices for applications in optical information processing and communication. Prof. Gong has received numerous awards, including The State Natural Science Award (2nd-Class), the Beijing City Science and Technology Award (1st-Class), the Science and Technology Award (1st-Class) of Ministry of Education. He serves as the President of the Chinese Optical Society, Vice President of the Chinese Physical Society. He is the Standing Committee member of China Association for Science and Technology. Prof. Gong is the vice chair for ICO (International Commission for Optics) and vice chair for IUPAP C17.

Abstract:
Micro/nano scale light manipulating can be realized by using nano/mico photonic structures. Using photonic crystal made of the composite materials with large and fast third-order optical nonlinearity, ultrafast and low threshold all-optical switching was demonstrated. Based on tunable Fano resonance or PIT of metallic nanostructures, ultrafast modulations on light transmission were also demonstrated. Moreover, highly sensitive optical sensor were experimentally demonstrated using microcavity and SPP devices.

Topic: Time Stretch and its Applications in Nonlinear Dynamics, Biomedicine, and Computational Imaging
11:00–11:45

Professor Bahram Jalali
Univ. of California, Los Angeles, USA

Biography:
Bahram Jalali is the Director of the Photonics Laboratory, the Northrop-Grumman Endowed Chair and Professor of Electrical and Computer Engineering at UCLA with joint appointments in Bio-medical Engineering, California Nano-Systems Inst. (CNSI) and Department of Surgery at the UCLA School of Medicine. He received his Ph.D. in Applied Physics from Columbia Univ. in 1989 and was with the Physics Research Division of Bell Laboratories in Murray Hill, New Jersey until 1992 before joining UCLA. He is a Fellow of IEEE, the Optical Society of America (OSA), the American Physical Society (APS), American Inst. for Medical and Biological Engineering (AIMBE), and SPIE.
He is the recipient of the R.W. Wood Prize from OSA, Aaron Kressel Award from IEEE, and IET Achievement Medal, and the Pioneer in Technology Award from the Society of Brain Mapping & Therapeutics. He was the Founder and CEO of Cognet Microsystems, a company acquired by Intel in 2001. He was elected into the Scientific American Top 50 and MIT Technology Review Magazine Top 10 in 2005.

Abstract:
Measurements of non-repetitive and rare signals that occur on short timescales require fast real-time measurements that exceed the speed, precision, and record length of digitizers. Time-stretch is an optical hardware accelerator that overcomes the speed limitations of photodetectors and electronic digitizers and enables ultrafast single-shot spectroscopy, imaging and other measurements at refresh rates reaching billions of frames per second with continuous recording spanning trillions of consecutive frames. The technology has opened a new frontier in measurement science and has led to discovery of several new scientific phenomena in nonlinear optics, laser dynamics and diagnostics of relativistic electron beams. It has also created a new class of instruments that have been integrated with artificial intelligence for sensing and biomedical diagnostics. We review the fundamental principles and applications of time stretch including a spin-off technology known as the phase stretch transform, a new computational imaging algorithm that is emerging as the best edge and texture feature extractor for digital images.

**Topic: High-Power and High-Beam Quality Photonic-Crystal Lasers**

11:45–12:30

**Professor Susumu Noda**
Kyoto Univ., Japan

**Biograph:**
Susumu Noda received B.S., M.S., and Ph.D. degrees from Kyoto Univ., Kyoto, Japan, in 1982, 1984, and 1991, respectively, all in electronics. In 2006, he received an honorary degree from Gent Univ., Gent, Belgium. Currently he is a full Professor with the Department of Electronic Science and Engineering and a director of Photonics and Electronics Science and Engineering Center (PESEC), Kyoto Univ.. His research interest covers physics and applications of photonic nanostructures based on photonic crystals. He received various awards, including the IBM Science Award (2000), the Japan Society of Applied Physics Achievement Award on Quantum Electronics (2005), Optical Society of America Joseph Fraunhofer Award/Robert M. Burley Prize (2006), 1st the Japan Society of Applied Physics Fellow (2007), The Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology (2009), the IEEE Nanotechnology Pioneer Award (2009), The Reo-ESaki Award (2009), Medal with Purple Ribbon (2014), and the Japan Society of Applied Physics Outstanding Achievement Award (2015). Abstract:
Achieving high-power and high-beam-quality (namely, high-brightness) semiconductor lasers is important for various applications including direct-laser processing and light detection and ranging (LiDAR) for next-generation smart production and mobility. Although semiconductor lasers with various kinds of resonators have been developed, the usefulness of these lasers has been limited by their low brightness, which is more than one order of magnitude smaller than those of existing gas and fiber/disk lasers. The key challenge in realizing high brightness is to increase the output power while maintaining a good beam quality indicated by a low $M^2$ value. Here, we describe photonic crystal lasers have a potential to enable such a high-brightness operation. Very recently, 10W output power with $M^2\sim2$ has been successfully achieved. We believe that these photonic-crystal lasers will allow compact, affordable semiconductor lasers to rival large-scale gas and fiber/disk ones in the future.

OSA Best Student Paper Awards
CLEO-PR 2018 is pleased to announce that this year’s Best Student Paper Awards will be sponsored by OSA. There will be 5 recipients.

To be eligible for the award, a student must be the first author of the paper and declare his/her student candidature during online submission; and the student must give the presentation at the conference by himself/herself. The selection will be made by the subcommittees during the conference. The prize will be awarded at the conference banquet at Wednesday August 1.

Best Paper Awards
The selection will be made by the TPC chairs and sub-committee chairs during the conference. The awards will be granted at the conference banquet in the evening of Wednesday August 1.

YSL Photonics Best Poster Awards
CLEO-PR 2018 is pleased to announce that the best poster awards will be sponsored by YSL Photonics. The selection will be based on the voting of conference delegates. The prize will be awarded at the Conference Banquet at Wednesday August 1.
Workshops

Workshop 1: Artificial Intelligence in Photonics
Time: 08:30–12:35, 30 July
Venue: Room S223, HKCEC
Organizers:

Invited Speakers:
08:30–08:55 Aydogan Ozcan, University of California, Los Angeles, USA
Topic: Machine Learning Enabled Computational Imaging and Sensing for Point-of-Care Medicine and Global Health

08:55–09:20 Andrew Laine, Columbia University, USA
Topic: Quantitative imaging in classification of lung disease

09:20–09:45 Lei Zhang, The Hong Kong Polytechnic University, Hong Kong SAR
Topic: Super-Resolution of Nano-scale Particles with A Single Frame Wide-Field Microscopy

09:45–10:10 Robert Huber, Universität zu Lübeck / Institut für Biomedizinische Optik, Germany
Topic: Towards artificial intelligence for bionic imaging in advanced endo-microscopy

10:30–10:55 David Brady, Duke University, USA
Topic: Compressive Sampling and Artificial Neural Networks for Array Cameras

10:55–11:20 Yongkeun Park, Korea Advanced Institute of Science and Technology, South Korea
Topic: Rapid and label-free detection of anthrax spores using quantitative phase imaging and deep learning

11:20–11:45 Alan Pak Tao Lau, The Hong Kong Polytechnic University, Hong Kong SAR, China
Topic: Machine Learning Techniques for Optical Communications and Networks

11:45–12:10 Muneeb Khalid, Alazar Technologies Inc., Canada
Topic: Data acquisition and direct graphic memory access for high throughput GPU-based processing

12:10–12:35 Sifeng He, University of California, Los Angeles, USA
Topic: Computationally-efficient and Hallucination-free Medical Image Super Resolution

Workshop 2: Optical Microscopy and Super-Resolution Imaging
Time: 08:30–12:15, 30 July
Venue: Room S224, HKCEC
Organizers:

Invited Speakers:
08:30–08:55 Peter So, Massachusetts Institute of Technology, USA
Topic: High Throughput, High Content Neurobiological Imaging

08:55–09:20 Guoan Zheng, University of Connecticut, USA
Topic: Fourier Psychographic Imaging and a Machine-learning Approach

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Workshop 3: Advanced Laser Micro-Nanofabrication for Photonics
Time: 14:00–18:00, 30 July
Venue: Room S222, HKCEC
Organizers:

Hong-Bo Sun
Tsinghua University

Saulius Juodkazis
Swinburne University of Technology

A. Ping Zhang
The Hong Kong Polytechnic University

Invited Speakers:
14:00–14:25 Andrei Rode, Australian National University, Australia
Topic: Material modification at Megabar pressures with ultrashort microjoule pulses

14:25–14:50 Kwang-Sup Lee, Hannam University, South Korea
Topic: Diverse applications of 3D nano/micro-structures fabricated by two-photon photolithography

14:50–15:15 Feng Chen, Shandong University, China
Topic: Femtosecond laser writing of nonlinear optical waveguides

15:15–15:40 Yoshiaki Nishijima, Yokohama National University, Japan

16:00–16:25 David Moss, Swinburne University of Technology, Australia
Topic: Microcombs for photonic microwave and RF devices

16:25–16:50 Vygantas Mizeikis, Shizuoka University, Japan
Topic: Fabrication of optical field concentrator structures using direct laser write technique

16:50–17:15 Qi-Dai Chen, Jilin University, China
Topic: Ultrafast laser-controlled, nonlinear feedback-driven self-organization of nanostructures

17:40–18:00 Panel discussion

Workshop 4: Advanced THz Devices and Systems
Time: 08:30–12:30, 30 July
Venue: Room S225, HKCEC
Organizers:

Yukio Kawano
Tokyo Institute of Technology

Shinichi Watanabe
Keio University

Invited Speakers:
08:30–09:00 Christoph Lange, University of Regensburg, Germany
Topic: Nonlinear subcycle THz quantum dynamics of electronic charges and spins

09:00–09:30 Hyunsoo Yang, National University of Singapore, Singapore
Topic: Advancing terahertz technology using spintronics

09:30–10:00 Manfred Helm, Helmholtz-Zentrum Dresden-Rossendorf, Germany
Topic: THz relaxation dynamics and nonlinear optics in graphene

10:30–11:00 Jérôme Faist, ETH Zurich, Switzerland
Topic: Terahertz Quantum Cascade Lasers: single mode operation and frequency combs

11:00–11:30 Takayuki Watanabe, Tohoku University, Japan
Topic: Broadband terahertz light emission and lasing operation in current-injection distributed-feedback dual-gate graphene-channel field-effect transistor

11:30–12:00 Ya Zhang, The University of Tokyo, Japan
Topic: Novel thermomechanical terahertz detection by using fundamental and coupled modes in doubly clamped MEMS beam resonators

12:00–12:30 Panel discussion

Workshop 5: Photonic Quantum Computing
Time: 08:30–12:30, 30 July
Venue: Room S226, HKCEC
Organizers:

Chao-Yang Lu
University of Science and Technology of China

Sven Hoefling
University of Wurzburg

Invited Speakers:
08:30–08:55 Satoshi Iwamoto, The University of Tokyo, Japan
Topic: Advances in quantum dot cavity quantum electrodynamics using photonic crystal nanocavities
08:55–09:20 **Niels Gregersen**, Technical University of Denmark, Denmark
Topic: Designing single-photon sources: towards unity
09:20–09:45 **Fabio Sciarrino**, Sapienza Università di Roma, Italy
Topic: Machine learning for processing and certification of photonic quantum information
09:45–10:10 **Anthony Laing**, University of Bristol, UK
Topic: Photonic simulations of molecular quantum dynamics
10:30–10:55 **Leonardo Midolo**, University of Copenhagen, Denmark
Topic: Quantum photonic circuits with semiconductor quantum dots
10:55–11:20 **Wenfu Zhang**, Xi’an Institute of Optics and Precision Mechanics, CAS, China
Topic: Silicon-based high-index-contrast waveguides for nonlinear optics and quantum photonics
11:20–11:45 **Daniel Riedel**, University of Basel, Switzerland
Topic: Deterministic enhancement of coherent photon generation from a nitrogen-vacancy centre in ultrapure diamond
11:45–12:10 **John O’Hara**, University of Sheffield, UK
Topic: High Purcell factor generation of indistinguishable on-chip single photons
12:10–12:30 **Yuanzhao Yao**, National Institute for Materials Science, Japan
Topic: Excitonic aharonov-bohm effect in ring-shaped semiconductor nanostructures

**Workshop 6: Topology and Novel Symmetry in Optics**
Time: 08:30–12:15, 30 July
Venue: Room S227, HKCEC

**Organizers:**

- **Jensen T. H. Li**
The Hong Kong University of Science and Technology
- **Dangyuan Lei**
The Hong Kong Polytechnic University

**Invited Speakers:**

08:30–08:55 **Nicholas X. Fang**, Massachusetts Institute of Technology, USA
Topic: Collective Behaviors of 2D Plasmon-Polaritons: From Topological States to Emission Engineering

08:55–09:20 **Yidong Chong**, Nanyang Technological University, Singapore
Topic: Magneto-optical Dirac cones

09:20–09:45 **Namkyoo Park**, Seoul National University, Korea
Topic: Symmetries in Optical Hamiltonians for Isospectrality

09:45–10:10 **Jianwen Dong**, Sun Yat-Sen University, China
Topic: All-dielectric valley photonic crystals: Paving the way to topological nanophotonics

10:30–10:55 **Baile Zhang**, Nanyang Technological University, Singapore
Topic: Spin-valley locking and topological phase transition in photonic crystals

10:55–11:20 **Qinghai Song**, Harbin Institute of Technology, China
Topic: Microlasers around exceptional points and their applications

11:20–11:45 **Haitao Jiang**, Tongji University, China
Topic: Experimental demonstration of the robust edge states in a split-ring-resonator chain

11:45–12:15 **Panel discussion**

**Workshop 7: Optical Resonators: Fundamentals and Applications**
Time: 14:00–17:45, 30 July
Venue: Room S223, HKCEC

**Organizers:**

- **Lan Yang**
- **Sile Nic Chormaic**

**Invited Speakers:**

14:00–14:25 **Kyungwon An**, Seoul National University, South Korea
Topic: Coherent thresholdless lasing by single-atom superradiance

14:25–14:50 **Tal Carmon**, Technion – Israel Institute of Technology, Israel
Topic: Flying nano-couplers make an irreversible index of refraction

14:50–15:15 **Chunhua Dong**, University of Science and Technology of China, China
Topic: Optomechanically induced non-reciprocity

15:15–15:40 **Pascal Del’Haye**, National Physical Laboratory in Teddington, UK
Topic: Spontaneous symmetry breaking and optically induced nonreciprocity of counter propagating light in microresonators
16:00–16:25 Takasumi Tanabe, Keio University, Japan
Topic: Brillouin lasing in a coupled toroid microcavities system

16:25–16:50 Yun-Feng Xiao, Peking University, China
Topic: Ultra-high-Q asymmetric microcavity optics and photonics

16:50–17:15 Andrew Poon, The Hong Kong University of Science and Technology, Hong Kong SAR
Topic: Integrated microdisk lasers and nonlinear light sources on a silicon chip

17:15–17:45 Panel discussion

Workshop 8: Microstructured Optical Fibers and Applications
Time: 14:00–18:00, 30 July
Venue: Room S224, HKCEC
Organizers:

Wei Jin
The Hong Kong Polytechnic University

Yingying Wang
Beijing University of Technology

Invited Speakers:
14:00–14:25 Jonathan Knight, University of Bath, UK
Topic: Hollow optical fibres: What do we add by taking away the core?

14:25–14:50 Xin Jiang, Max Planck Institute for the Science of Light, Germany
Topic: Soft-glass micro-/nano-structured fibres

14:50–15:15 Wei Ding, Institute of Physics, CAS, China
Topic: Confinement loss in hollow-core negative curvature fiber

15:15–15:40 Tristan Kremp, OFS laboratory, USA
Topic: Improved Design and Fabrication of Low Loss Single Mode Photonic Bandgap Hollow Core Fibers

16:00–16:25 Markus Schmidt, Leibniz Institute of Photonic Technology, Germany
Topic: Optofluidic microstructured fibers: a tool to detect freely diffusing nanoobjects

16:25–16:50 John Travers, Heriot-watt university, UK
Topic: Nonlinear optics in gas-filled microstructured fibres

16:50–17:15 Tijmen G. Euser, University of Cambridge, UK
Topic: Optofluidic hollow-core photonic crystal fiber

17:15–17:40 Wei Jin, The Hong Kong Polytechnic University, Hong Kong SAR
Topic: Photonic crystal fiber gas sensors

17:40–18:00 Panel discussion

Workshop 9: Tailored Complex Optical Fields: from Twisted Light to Structured Light
Time: 08:30–18:00, 30 July
Venue: Room S228, HKCEC
Organizers:

Jian Wang
Huazhong University of Science and Technology

Andrew Forbes
University of the Witwatersrand

Invited Speakers:
08:30–09:00 Federico Capasso, Harvard University, USA
Topic: J-plates for spin to total angular momentum conversion and complex structured light generation

09:00–09:30 Siddharth Ramachandran, Boston University, USA
Topic: Opto-mechanical interactions with OAM states

09:30–10:00 Andrew Forbes, University of the Witwatersrand, South Africa
Topic: Ghost imaging with structured photons

10:30–11:00 Cornelia Denz, University of Muenster, Germany
Topic: Tailored vectorial light landscapes pioneer applications in nanophotonics and quantum optics

11:00–11:30 Yangjian Cai, Soochow University, China
Topic: Manipulating the spatial coherence of vortex beam and orbital angular momentum measurement

11:30–12:00 Takashige Omatsu, Chiba University, Japan
Topic: Wavelength-versatile vortex parametric sources

12:00–12:30 Mo Mojahedi, University of Toronto, Canada
Topic: Longitudinally structured light and its applications

14:00–14:30 Qiwen Zhan, University of Shanghai for Science and Technology, China; University of Dayton, USA
Topic: Complex optical fields: recent advances and future perspectives

14:30–15:00 Filippo Romanato, University of Padova, Italy
Topic: iMux: integrated device for orbital angular momentum mode division multiplexing

15:00–15:30 Bora Ung, Université du Québec, Canada
Topic: Annular beams: their generation and transmission in optical fibers

16:00–16:30 Xiaocong Yuan, Shenzhen University, China
Topic: Singular optical beam multiplexing communication for next generation high performance computing

16:30–17:00 Alan Willner, University of Southern California, USA
Topic: Some practical issues with free-space OAM-based optical communications
17:00–17:30 Jian Wang, Huazhong University of Science and Technology, China
Topic: Structured light communications: advances and perspectives
17:30–18:00 Panel discussion

Workshop 10: Visible Light Communications
Time: 14:00–17:20, 30 July
Venue: Room S225, HKCEC
Organizers:

17:00–17:30
Jian Wang, Huazhong University of Science and Technology, China
Topic: Structured light communications: advances and perspectives

17:30–18:00 Panel discussion

Tutorial Speaker:
14:00–14:45 Boon S. Ooi, King Abdullah University of Science and Technology, Saudi Arabia
Topic: Visible Light Communication: Devices and Systems

Invited Speakers:
14:45–15:15 Takaya YAMAZATO, Nagoya University, Japan
Topic: Overview of image-sensor communication
15:15–15:45 Gong-Ru Lin, National Taiwan University, Taiwan, R.O.C.
Topic: Visible Light Communication for White-Light and Underwater Applications
16:00–16:20 Anthony E. Kelly, University of Glasgow, UK
Topic: InGaN/GaN Laser Diodes for Visible Light Communications and Beyond
16:20–16:40 Jaafar M. H. Elmirghani, University of Leeds, UK
Topic: VLC Systems with CGHs
16:40–17:00 Jin Xu, Zhejiang University, China
Topic: Practical Considerations on Underwater Wireless Optical Communication
17:00–17:20 Panel discussion

Workshop 11: Advanced Laser Display
Time: 14:00–18:00, 30 July
Venue: Room S226, HKCEC
Organizers:

Tutorial Speaker:
14:00–14:30 Yong Bi, Technical Institute of Physics and Chemistry, CAS
Topic: High Efficiency and Compact Lasers Modules for Laser

Invited Speakers:
14:30–15:00 Degang Zhao, Institute of Semiconductors, CAS, China
Topic: Performance improvement of GaN-based laser diodes by considering the residual carbon impurities and modulating the device structure
15:00–15:30 Fushan Li, Fuzhou University, China
Topic: Quantum dot light-emitting display technology
16:00–16:30 Lixin Xu, University of Science and Technology of China, China
Topic: Laser display: theory and technology
16:30–17:00 Wenjiang Shen, Suzhou Institute of Nano-tech and Nano-bionics, CAS, China
Topic: MEMS 2D scanning micromirror for Laser Display
17:00–17:30 Zhaomin Tong, Shanxi University, China
Topic: Methods for Laser Speckle Reduction in Projection Displays
17:30–18:00 Panel discussion

**Workshop 12: Solar Energy Materials and Devices**
**Time:** 14:00–18:00, 30 July
**Venue:** Room S227, HKCEC

**Organizers:**
![Feng Yan](image)
Feng Yan
*The Hong Kong Polytechnic University*

![Gang Li](image)
Gang Li
*The Hong Kong Polytechnic University*

**Invited Speakers:**
14:00–14:30 Peng Wang, Zhejiang University, China
Topic: Organic dye-sensitized solar cells
14:30–15:00 Baoquan Sun, Soochow University, China
Topic: Nanostructured silicon used for integrating energy harvesting device
15:00–15:30 Tae-Dong Kim, Hannam University, Republic of Korea
Topic: Enhanced photovoltaic performance of polymeric solar cells through side-chain engineering
16:00–16:30 Jun Liu, Changchun Institute of Applied Chemistry, CAS, China
Topic: n-Type polymer semiconductors containing boron-nitrogen coordination bond and their application in all polymer solar cells
16:30–17:00 Guojia Fang, Wuhan University, China
Topic: Enhanced performance of perovskite solar cells with electron transport layer of SnO2 quantum dots
17:00–17:30 Xuming Zhang, The Hong Kong Polytechnic University, Hong Kong SAR
Topic: Microfluidics for photoenzymatic CO2 conversion using solar energy
17:30–18:00 Panel discussion
Conference Directory

Campus Map

Room AG206, 29 July, 14:00-17:00, Registration and Lab Tour
Room CD634, 3 August, 14:00-17:00, Lab Tour
Conference Directory

S221 Foyer - Registration
S221 - Exhibition
S22 - S23 - Workshop and Technical Sessions

Convention Hall - Opening and Plenary Session, Conference Banquet

S421 - Poster Session and PDP Session
S423 - S428 - Technical Sessions

Poster Session and PDP Session

30 July - 3 August

CLEO Pacific Rim • 29 July–3 August 2018
Conference Directory

DiVino Patio - Conference Reception
Shop 11, 1/F, Causeway Centre, No. 28 Harbour Road, Wanchai

DiVino Patio

Google Maps

30 July

CLEO Pacific Rim • 29 July–3 August 2018
Conference Directory

Meeting Rooms S421-S430

CLEO Pacific Rim • 29 July–3 August 2018
Explanation of Session Codes

The first letter of the code designates the day of the week (Tu = Tuesday, W = Wednesday, Th = Thursday, F = Friday). The second element indicates the session series in that day (for instance, 1 would denote the first parallel sessions in that day). The third element continues alphabetically through a series of parallel sessions. The lettering then restarts with each new series. The number on the end of the code (separated from the session code with a period) signals the position of the talk within the session (first, second, third, etc.). For example, a presentation coded W3C.4 indicates that this paper is being presented on Wednesday (W) in the third series of sessions (3), and is the third parallel session (C) in that series and the fourth paper (4) presented in that session.

Invited papers are noted with Invited
Plenary papers are noted with Plenary
Tutorial papers are noted with Tutorial
### Agenda of Sessions — Sunday, 29 July

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<td>14:00–18:00</td>
<td>Registration, AG206 of The Hong Kong Polytechnic University</td>
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**Monday, 30 July**

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<tr>
<td>08:00–18:00</td>
<td>Workshop 1: Artificial Intelligence in Photonics Session I</td>
<td>Workshop 2: Optical Microscopy and Super-Resolution Imaging Session I</td>
<td>Workshop 4: Advanced THz Devices and Systems Session I</td>
<td>Workshop 5: Photonic Quantum Computing Session I</td>
<td>Workshop 6: Topology and Novel Symmetry in Optics Session I</td>
<td>Workshop 9: Tailored Complex Optical Fields: From Twisted Light to Structured Light Session I</td>
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<tr>
<td>08:30–10:00</td>
<td>Workshop 1: Artificial Intelligence in Photonics Session II</td>
<td>Workshop 2: Optical Microscopy and Super-Resolution Imaging Session II</td>
<td>Workshop 4: Advanced THz Devices and Systems Session II</td>
<td>Workshop 5: Photonic Quantum Computing Session II</td>
<td>Workshop 6: Topology and Novel Symmetry in Optics Session II</td>
<td>Workshop 9: Tailored Complex Optical Fields: From Twisted Light to Structured Light Session II</td>
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<td>10:00–10:30</td>
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<td>12:30–14:00</td>
<td>Lunch</td>
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<td>15:30–16:00</td>
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<td>18:30–20:00</td>
<td>Welcome Reception, Divino Patio, Shop 11, 1/F, Causeway Centre, No. 28 Harbour Road, Wanchai</td>
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## Agenda of Sessions — Tuesday, 31 July

<table>
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<tr>
<th>Time</th>
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<tr>
<td>14:00–15:30</td>
<td>Tu2A • Light Sources and Optical Fields</td>
<td>Tu2B • Mode-locked and Ultrafast Lasers</td>
<td>Tu2C • Infrared and Terahertz Metamaterials and Detectors</td>
<td>Tu2D • Time-frequency Signal Analysis and Processing</td>
<td>Tu2E • Special Fibers I</td>
<td>Tu2F • Novel Measurement Methods I</td>
<td>Tu2G • Quantum Optomechanics</td>
<td>Tu2H • Optical Filtering</td>
<td>Tu2I • High-Speed Optical Transmission</td>
<td>Tu2J • Advances in Plasmonics and Metamaterials</td>
<td>Tu2K • Biophotonics and Applications I</td>
<td>Tu2L • Fiber Devices &amp; Sensing I</td>
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<td>15:30–16:00</td>
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<tr>
<td>16:00–18:00</td>
<td>Tu3A • Ultrafast Fiber Laser Sources</td>
<td>Tu3B • Nonlinear Optical Sources</td>
<td>Tu3C • Infrared and Terahertz Microscopy and Nanoscopy and Their Applications</td>
<td>Tu3D • Nonlinear Wave Mixing and Applications</td>
<td>Tu3E • Waveguide Devices I</td>
<td>Tu3F • Novel Measurement Methods II</td>
<td>Tu3G • Atom-photon Interaction</td>
<td>Tu3H • Optical Microcavities</td>
<td>Tu3I • Fiber Technologies and Applications</td>
<td>Tu3J • Nonlinear Plasmonics and Metamaterials</td>
<td>Tu3K • Biophotonics and Applications II</td>
<td>Tu3L • Laser Applications and Technologies</td>
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## Agenda of Sessions — Wednesday, 1 August

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<tr>
<td>08:30–10:00</td>
<td>W1A • Power Scaling of Lasers</td>
<td>W1B • Nonlinear Optics in Microresonators</td>
<td>W1C • Infrared Fibers &amp; Materials and Their Applications (ends at 09:45)</td>
<td>W1D • Machine Learning and Neural Networks in Photonics</td>
<td>W1E • Laser Additive Manufacturing</td>
<td>W1F • Silicon Hybrid Integration</td>
<td>W1G • High Power Fiber Laser</td>
<td>W1H • Optical Metasurfaces I</td>
<td>W1I • Advanced Signal Modulation</td>
<td>W1J • Integrated Sources I</td>
<td>W1K • Biophotonics and Applications III</td>
<td>W1L • Integrated Microwave Photonics I</td>
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<td>10:30–12:30</td>
<td>W2A • Advanced Laser Sources I</td>
<td>W2B • Nonlinear Dynamics in Waveguides and Harmonic Generation</td>
<td>W2C • Infrared Ultrafast Subcycle Subwavelength Photonics</td>
<td>W2D • Optical Signal Processing Based on Integrated Devices</td>
<td>W2E • Optical Devices for Precision Measurements</td>
<td>W2F • Quantum Information Processing I</td>
<td>W2G • Optical Metasurfaces II</td>
<td>W2H • Fiber-Wireless Systems and PONs</td>
<td>W2J • Integrated Sources II</td>
<td>W2K • Biophotonics and Applications IV</td>
<td>W2L • Interferometers &amp; Applications</td>
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<td>12:30–14:00</td>
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<td>14:00–15:30</td>
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<td>15:30–16:00</td>
<td>Coffee Break 16:00–18:00</td>
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<td>18:00–22:00</td>
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CLEO Pacific Rim • 29 July–3 August 2018
## Agenda of Sessions — Thursday, 2 August

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<td>08:30–10:00</td>
<td>Th1A • Novel Laser Sources I</td>
<td>Th1B • Nonlinear Spectroscopy and Imaging</td>
<td>Th1C • Frequency Control and Measurement for Optical Metrology</td>
<td>Th1D • Quantum Information Processing II</td>
<td>Th1E • Fiber Devices II</td>
<td>Th1F • Metamaterials and Meta-devices</td>
<td>Th1G • 2D Nonlinear Materials</td>
<td>Th1H • Nanostructures for Optoelectronic Applications</td>
<td>Th1I • Probabilistic Signal Shaping</td>
<td>Th1J • Silicon Photonics Devices</td>
<td>Th1K • Display Technologies</td>
<td>Th1L • Waveguides and Sensors</td>
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<tr>
<td>10:30–12:30</td>
<td>Th2A • Novel Laser Sources II</td>
<td>Th2B • Solitons and Temporal Wave Guiding, and Frequency Comb</td>
<td>Th2C • Integrated Optical Devices for Switching Multiplexing and Signal Processing</td>
<td>Th2D • High Energy Laser</td>
<td>Th2E • Special Fibers II</td>
<td>Th2F • Plasmonics Metasurfaces (ends at 13:15)</td>
<td>Th2G • 2D Materials for Mode Locking and Nonlinear Photonics</td>
<td>Th2H • Light-matter Interactions in Micro/nano-structures</td>
<td>Th2I • Polarization Effects and Optical Networking</td>
<td>Th2J • Advanced Modulators</td>
<td>Th2K • Imaging Technologies</td>
<td>Th2L • Distributed Fiber Sensing</td>
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<td>14:00–15:30</td>
<td>Th3A • Vectorial Light Sources</td>
<td>Th3B • High-field Technologies</td>
<td>Th3C • Germinium Modulators and Ge Photonics</td>
<td>Th3D • Power Scaling and Nonlinear Optics</td>
<td>Th3E • Waveguide Devices II</td>
<td>Th3F • Integrated Microwave Photonics II</td>
<td>Th3G • Structured 2D Surfaces</td>
<td>Th3H • Entanglement and Squeezed States I</td>
<td>Th3I • Signal Processing for Optical Transmission</td>
<td>Th3J • 2D and Metamaterial</td>
<td>Th3K • Microscopy</td>
<td>Th3L • Novel Fiber Structures</td>
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<td>16:00–18:00</td>
<td>Th4A • Characteristics of shortpulse lasers</td>
<td>Th4B • Nonlinear Optical Technologies</td>
<td>Th4C • Novel Laser System and its Applications</td>
<td>Th4D • High Power CW Lasers and Coherent Combining</td>
<td>Th4E • Plasmon-enhanced Spectroscopies and Imaging</td>
<td>Th4F • Radio Over Fiber and Optical Wireless Communication</td>
<td>Th4G • 2D Photonics Devices</td>
<td>Th4H • Novel Photonic Structures</td>
<td>Th4I • Optical Access Technologies</td>
<td>Th4J • Entanglement and Squeezed States II</td>
<td>Th4K • Imaging and Applications</td>
<td>Th4L • Optical Fiber Gratings, Sensors &amp; Technology</td>
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<td>18:30–20:30</td>
<td>Post Deadline Papers, S421, HKCEC</td>
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## Agenda of Sessions — Friday, 3 August

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<td>08:30–10:00</td>
<td>F1A • Mid infrared lightsource</td>
<td>F1B • Fiber Devices III</td>
<td>F1C • Emerging Technologies in Microwave Photonics</td>
<td>F1D • Entanglement and Squeezed States III</td>
<td>F1E • Plasmonics, Microfluidics &amp; Sensing</td>
<td>F1F • Related Technologies and Applications for Imaging, Display and Storage</td>
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<td>10:30–12:30</td>
<td>F2A • Laser Comb Technologies</td>
<td>F2B • Novel Plasmonics Nanostructures and Phenomena</td>
<td>F2C • Photonic Microwave Generation, Processing and Measurement</td>
<td>F2D • Optical Technologies for Communications</td>
<td>F2E • Laser Dynamics</td>
<td>F2F • Technologies and Approaches for Optical Transmission and Processing</td>
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Light-manipulating and detecting at micro/nano-scale, Qiang Gong1,2; Peking University, China. Micro/nano scale light-manipulating can be realized by using nano/micro photonic structures. Using photonic crystal made of the composite materials with large and fast third-order optical nonlinearity, ultrfast and low-threshold all-optical switching was demonstrated.

Time-Stretch and its Applications in Nonlinear Dynamics, Biomedicine, and Computational Imaging, Bahram Jalali1; University of California, Los Angeles, USA. Measurements of non-repetitive and rare signals that occur on short timescales require fast real-time measurements that exceed the speed, precision, and record length of digitizers. Time-stretch is an optical hardware accelerator that overcomes the speed limitations of photodetectors and electronic digitizers and enables ultrafast single-shot spectroscopy, imaging and other measurements at refresh rates reaching billions of frames per second with continuous recording spanning trillions of consecutive frames. The technology has opened a new frontier in measurement science and has led to discovery of several new scientific phenomena in nonlinear optics, laser dynamics and diagnostics of relativistic electron beams. It has also created a new class of instruments that have been integrated with artificial intelligence for sensing and biomedical imaging. We review the fundamental principles and applications of time-stretch including a spin-off technology known as the phase stretch transform, a new computational imaging algorithm that is emerging as the best edge and texture feature extractor for digital images.

High-Power and High-Beam-Quality Photonic-Crystal Lasers, Susumu Noda1,2; Kyoto University, Japan. I would like to describe coherent lasing oscillation of photonic-crystal lasers with advanced double-hole structures over areas of 300-1000μm diameters and the formation of high-quality beams (M2<2) whose output power exceeds 10W at room temperature. These results promise to bring the benefits of semiconductor lasers to high-power applications including material processing and laser ranging (i.e., LiDAR et al).

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
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<td><strong>Tu2G • Quantum Optomechanics</strong></td>
<td><strong>Tu2H • Optical Filtering</strong></td>
<td><strong>Tu2I • High-Speed Optical Transmi ssion</strong></td>
<td><strong>Tu2J • Advances in Plasmonics and Metamaterials</strong></td>
<td><strong>Tu2K • Biophotonics and Applications I</strong></td>
<td><strong>Tu2L • Fiber Devices &amp; Sensing I</strong></td>
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<td>President: Guofeng Zhang; The Hong Kong Polytechnic Univ., Hong Kong</td>
<td>President: Qijie Wang; Nanyang Technological Univ., Singapore</td>
<td>President: Calvin Chun-Kit Chan; The Chinese University of Hong Kong, Hong Kong</td>
<td>President: Dangyuan Lei; The Hong Kong Polytechnic Univ., Hong Kong</td>
<td>President: Tian Guo; Jinan Univ., China</td>
<td>President: Zhenzhou Cheng; The Univ. of Tokyo, Japan</td>
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<td>Tu2G.1 • 14:00</td>
<td>Tu2H.1 • 14:00</td>
<td>Tu2I.1 • 14:00</td>
<td>Tu2J.1 • 14:00</td>
<td>Tu2K.1 • 14:00</td>
<td>Tu2L.1 • 14:00</td>
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<td><strong>Tutorial</strong></td>
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<td><strong>Silicon-based on-chip Hybrid (de)multiplexing (MDM), polarization-division-multiplexing (PDM), and mode-division-multiplexing (MDM).</strong></td>
<td><strong>Is Kramers-Kronig Receiver Suitable for Direct-detected Systems?</strong></td>
<td><strong>Ultrarelat Control of Light Polarisation in Non-linear Metamaterials,</strong></td>
<td><strong>Functional Imaging &amp; Monitoring of Brain &amp; Breast with Diffuse Light,</strong></td>
<td><strong>Prospects in power scaling of fiber lasers and amplifiers,</strong></td>
<td><strong>Invited</strong></td>
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<td>Recent progress of silicon-based on-chip hybrid multiplexers is reviewed as a key element enabling more than one (de)multiplexing techniques simultaneously, including wavelength-division-multiplexing (WDM), polarization-division-multiplexing (PDM), and mode-division-multiplexing (MDM).</td>
<td>William Shieh; Qiang Jiang; Huisheng Sun; Di Chi, Electrical and Electronic Engineering Dept., The Univ. of Auckland, Australia; School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. We compare the performance of Kramers-Kronig (KK) receiver with conventional iterative cancellation (IC) receiver. We also show the impact of the receiver response imperfection on the ‘quasi-coherent’ receivers such as KK and IC receivers.</td>
<td>Anotoly Zayats; Kings College London, UK. Plasmonic and dielectric metamaterials allow designing not only linear but also nonlinear optical response. We discuss applications of anisotropic metamaterials and metasurfaces in controlling polarisation state of transmitted and reflected light on ultrashort timescales.</td>
<td>Arjun G. Yodh; Stanford University. Diffused optical spectroscopy and tomography of tissue is finding unique clinical niches. I will describe representative brain and breast functional imaging and monitoring results to illustrate the workings of these new tissue diagnostics.</td>
<td>Andreas Tünnermann; 1Inst. of Applied Physics, Friedrich-Schiller-Univ., Germany; 2Inst. of Applied Physics, Friedrich-Schiller-Univ., Germany. The state of the art of science and technology in fiber lasers and amplifiers is reviewed. Prospects for future power scaling using advanced fiber designs in combination with modern laser and amplifier architectures are discussed.</td>
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**Notes**

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<tr>
<td>Tu2B.2</td>
<td>14:30 Passive mode-locking of a diode-pumped Nd laser based on cascaded second-order nonlinearity, How-Wei Liu, Shou-Tai Lin, Chun-Hsi Huang, Feng-Chia Univ.</td>
<td>Taiwan A diode-pumped mode-locking Nd:YVO₄ laser via positive cascaded second-order Kerr lens effects at 1064 nm was demonstrated. The measured average power, pulse repetition rate and pulse duration are 1.3 W, 186 MHz and 2.8 ns, respectively.</td>
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<tr>
<td>Tu2C.2</td>
<td>14:30 Metamaterials and Metallic Hole Arrays Coupled to Short Wave Infrared Intersub-band Transitions in the GaN/AlN Based Quantum Cascade Structures, Gad Bafri, Dept. of Electrical Engineering, Technion-Israel Inst. of Technology, Israel.</td>
<td>We present the design, realization and characterization of optical coupling between intersubband transitions within a GaN/AlN based quantum cascade detector structure and planar metamaterials nano-antennas or metal hole arrays (MHA) in the near-infrared spectral range.</td>
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<tr>
<td>Tu2C.4</td>
<td>14:45 Real-time spectral analysis based on time-lens enhanced dispersive Fourier transform, Yuan Wei, Bowen Li, Pingping Feng, Kenneth Kin-Yip Wong, Univ. of Hong Kong, Hong Kong.</td>
<td>Time-lens enhanced dispersive Fourier transform (TE-DFT) is demonstrated for real-time spectral analysis in the continuous-wave regime. Flexible frame rate, 0.03-nm resolution and -32.2-dBm detection sensitivity can be achieved across 36-nm range limited only by amplifier.</td>
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<tr>
<td>Tu2D.2</td>
<td>14:15 Temporal differential manipulation of optical frequency chirp, Le Zhang, Xin Dong, Liao Chen, Xi Zhou, Chi Zhang, Xinliang Zhang, Wuhan National Lab for Optoelectronics, China.</td>
<td>We propose and demonstrate the temporal differential manipulation of optical frequency chirp based on interference and cross-phase modulation. It realizes the dispersion order reduction, and enhances the flexibility of the dispersive time-stretch technique.</td>
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<td>Tu2D.3</td>
<td>14:30 Temporal Shack-Hartman wavefront sensor for large temporal phase dynamics recovery, Chen Zhang, Liao Chen, Xi Zhou, Le Zhang, Xinliang Zhang, Wuhan National Lab for Optoelectronics, China.</td>
<td>We propose and simulate a temporal Shack-Hartman wavefront sensor based on time-lens array, which is capable of retrieving the temporal phase information with large dynamics. It is a complementary scheme for the coherent detection technique.</td>
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<td>Tu2E.2</td>
<td>14:15 Direct spatially resolved snapshot polarimetric phase extraction by using an imaging PolarCam, Dahi Abdelsalam1,2, Yamara Dimbool1, Inho Choi1, Madhan P. Jayakumar1, Sukhyun Choi1, Junho Kim2, Daesuk Kim2.</td>
<td>National Inst. of Standards, Egypt; 'Optical Engineering, Division of Mechanical System Engineering, Chonbuk National Univ., Korea. We extract Stokes vectors and 3D phase of a transmissive anisotropic object by a novel polar interferometric system. PolarCam employing a micro-polarizer array is used to capture four line interferograms in single shot.</td>
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<td>Tu2E.3</td>
<td>14:45 A frequency to voltage converter with ultra-low residual phase noise, Lulu Yan1,2, Yanyan Zhang1, Zhaoyang Tai1,2, Pan Zhang1, Ru Yuan1, Shougang Zhang2, Daesuk Kim2, Daesuk Kim2, Univ. of Hong Kong, Hong Kong.</td>
<td>We report the process of residual noise suppression in a frequency to voltage converter based on a frequency difference multiplication method, for measuring frequency noise of ultra-stable laser. The double sideband frequency noise is lower than -40 dB Hz/Hz in a bandwidth from 3 Hz to 100 kHz.</td>
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These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

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<td>Tu2G • Quantum Optomechanics—Continued</td>
<td>Tu2H • Optical Filtering—Continued</td>
<td>Tu2I • High-Speed Optical Transmission—Continued</td>
<td>Tu2J • Advances in Plasmonics and Metamaterials—Continued</td>
<td>Tu2K • Biophotonics and Applications I—Continued</td>
<td>Tu2L • Fiber Devices &amp; Sensing I—Continued</td>
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**Tu2H.2 • 14:30**
**High-Extinction-Ratio Optical Filters Based on High-Order Silicon Microring Resonators,** Renyou Ge¹, Xinlun Cai¹;¹Sun Yat-sen Univ., China. We designed and fabricated coupled-resonator optical waveguide filters on silicon platform with insertion loss ~ 1.5 dB, and obtained extinction ratio of > 70 dB for 7th filters thermally tuning resonances of each ring.

**Tu2I.2 • 14:30**
**On the Hardware Complexity of Kramers-Kronig Receiver,** Tianwai Bo¹, Rui Deng², Jing He¹, Hoon Kim¹;¹KAIST, Hong Kong;²College of Computer Science and Electronic Engineering, Hunan Univ., China. The analysis on the hardware complexity of Kramers-Kronig (KK) receiver shows that, compared with the conventional KK receiver, the recently proposed receiver without digital upsampling saves the number of adders, multipliers, and memory by 80%.

**Tu2L.2 • 14:30**
**Enhanced Sensitivity of Hetero-core Structure SPR Temperature Sensor Based on Local Microstructures,** Wenjie Zhu¹, Qing Huang¹, Yong Wang¹, Elfed Lewis², Minghong Yang¹;¹National Engineering Laboratory for Fiber-Optics Sensing Technology, Wuhan Univ. of Technology, China;²Optical Fibre Sensors Research Centre, Univ. of Limerick, Ireland. Femtosecond laser micromachining system was used to manufacture microstructures on hetero-core structure SPR sensor to enhance the temperature sensitivity of the conventional one. The temperature sensitivity of the proposed sensor has increased 30.2%.

**Tu2L.3 • 14:45**
**Fiber optic plasmonic sensor utilizing carbon nanotubes based surface imprinted matrix for the sensing of dopamine,** Anisha Pathak¹, Banshi D. Gupta¹;¹IIT Delhi, India. A fiber optic dopamine sensor is realized utilizing surface imprinted carbon nanotube platform and surface plasmon resonance technique. The sensor possesses dynamic range of 0-150 µM and detection limit of 2.1 µM.

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**Tu2L.3 • 14:45**
**Comparison for 100 Gb/s PDM-DD Short Reach Optical Communication System Transmission Performance with PM4, CAP16 and DMT,** Jiahao Huo¹,², Xian Zhou¹,², Kangping Zhong¹, Jiajing Tu¹,², Wei Huangfu¹, Jinhui Yuan¹, Keqiong Long¹, Changyuan Yi¹, Alan Lau¹, Chao Lu²;¹Beijing Engineering and Technology Research Center for Convergence Networks and Ubiquitous Services, Univ. of Science and Technology Beijing, China;²Dept. of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., Hong Kong. A promising way to significantly meet the demands of short reach systems is polarization division multiplexing with direct detection (PDM-DD). In this paper, we compare three advanced modulation formats performance on PDM-DD system.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
Tu2G • Quantum Optomechanics—Continued

Tu2H.4 • 15:00 Temperature and optical feedback sensitiv-ity of the relative intensity noise of epitaxial quantum dot lasers on Ga, Yue-Guang Zhou, Chun-Fang Cao, Jin-Yi Fan, Qian Gong, Cheng Wang, ShanghaiTech Univ, China; *Shanghai Inst. of Microsystem and Information Technology, China. This work demonstrates that the relative intensity noise of Ga-based epitaxial InAs quantum dot lasers are weakly sensitive to the temperature, while it is more sensitive to the optical feedback at higher bias currents.

Tu2H.5 • 15:15 Design of GaAlAs/InP membrane p-i-n photodiode with back-end distributed-Bragg-reflector(DBR), Xu Zheng, Zhichen Gu, Tomohiro Amemiya, Nobuaki Nishiyama, Shigebara Arai, *Tokyo Inst. of Technology, Japan. A GaAlAs/InP membrane p-i-n photodiode integrated with a back end DBR was investigated under the back reflection of ~30dB. As the result, it was found that the J0 bandwidth of 17GHz can be obtained with the device length of ~12µm. These are approximately 3 times faster and 13 times smaller than those of a similar PD without the back end DBR.

Tu2H.6 • 15:30 Longest-ever unscrambled transmission over 713.2km of 2.5 Gb/s with a span loss in ex-cess of 111dB, Jan Xu, Jieku Yu, Qianggao Hu, Hongyan Zhou, Ming Liu, Lijun Huang, Fusheng Zheng, Weihua Li, Li Deng, Lei Zhang, Honghai Wang, Je Luo, Tao Zeng, Lingheng Meng, *Accelelit Technologies Co. Ltd, China; *State Grid Information and Telecommunication Branch, China; *State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; *Yangzte Optical Fiber and Cable Company, China; *State Key Laboratory of Optical Communication Technologies and Networks, China. A GaAlAs/InP membrane p-i-n photodiode integrated with a back end DBR was investigated under the back reflection of ~30dB. As the result, it was found that the J0 bandwidth of 17GHz can be obtained with the device length of ~12µm. These are approximately 3 times faster and 13 times smaller than those of a similar PD without the back end DBR.

Tu2H.4 • 15:00 1000Gb/s C&K Optical Fiber Transmission Based on High Speed DAC in SiGe Technology, Weizhong Li1, Lei Zhu1, Ming Liu1, Daqiong Xue1, Xiang Li2, *State Key Laboratory of Optical Communication Technologies and Networks, Wuhan Research Inst. of Posts & Telecommunications, China; *Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; *Institut de Microelectronique of Chinese Academy of Science, China. This paper presents multi-level pulse amplitude modulation (PAM) optical fiber transmission based on 32-GB/s 4-bit digital to analog converter fabricated by 0.18um SiGe technology. The 32GBd PAM-4/8/16 signals are successfully transmitted over 2km fiber.

Tu2H.5 • 15:15 Longest-ever unscrambled transmission over 713.2km of 2.5 Gb/s with a span loss in excess of 111dB, Jan Xu, Jieku Yu, Qianggao Hu, Hongyan Zhou, Ming Liu, Lijun Huang, Fusheng Zheng, Weihua Li, Li Deng, Lei Zhang, Honghai Wang, Je Luo, Tao Zeng, Lingheng Meng, *Accelelit Technologies Co. Ltd, China; *State Grid Information and Telecommunication Branch, China; *State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; *Yangzte Optical Fiber and Cable Company, China; *State Key Laboratory of Optical Communication Technologies and Networks, China. A GaAlAs/InP membrane p-i-n photodiode integrated with a back end DBR was investigated under the back reflection of ~30dB. As the result, it was found that the J0 bandwidth of 17GHz can be obtained with the device length of ~12µm. These are approximately 3 times faster and 13 times smaller than those of a similar PD without the back end DBR.

Tu2H.6 • 15:30 Longest-ever unscrambled transmission over 713.2km of 2.5 Gb/s with a span loss in excess of 111dB, Jan Xu, Jieku Yu, Qianggao Hu, Hongyan Zhou, Ming Liu, Lijun Huang, Fusheng Zheng, Weihua Li, Li Deng, Lei Zhang, Honghai Wang, Je Luo, Tao Zeng, Lingheng Meng, *Accelelit Technologies Co. Ltd, China; *State Grid Information and Telecommunication Branch, China; *State Key Laboratory of Optical Fiber and Cable Manufacture Technology, China; *Yangzte Optical Fiber and Cable Company, China; *State Key Laboratory of Optical Communication Technologies and Networks, China. A GaAlAs/InP membrane p-i-n photodiode integrated with a back end DBR was investigated under the back reflection of ~30dB. As the result, it was found that the J0 bandwidth of 17GHz can be obtained with the device length of ~12µm. These are approximately 3 times faster and 13 times smaller than those of a similar PD without the back end DBR.

Tu2L • Fiber Devices & Sensing I—Continued

Tu2L.4 • 15:00 Refractive index measurement based on disturbance to RF conversion function in a fiber OFC cavity, Ryo Ota1,2, Kosuke Naga1, Takeo Minamikawa1,2, Shuji Tane1, Hideki Fuji-kawa1, Yoshiaki Nakajima1,2, Kaoru Minoshima3, Takeshi Yasu1,2, Tokushima Univ., Japan; JST, ERATO MINOSHIMA IOS, Japan; Okiyama Univ., Japan; Univ Electro-Comm, Japan. We demonstrate refractive index (RI) measurement of water/ethanol mixture based on disturbance to RF conversion in fiber comb cavity including multi-mode interference fiber sensor. We attached RI resolution of 4.3*10^-4 and RI accuracy of 5*10^-4.

Tu2L.5 • 15:15 Static and dynamic strain sensing over 3.5 kHz with fiber-based optical frequency comb cavity, Takao Minamikawa1,2, Takashi Masuoka1, Takashi Ogura1, Kyuki Shibuya1, Yoshiaki Nakajima1,2, Yoshihisa Yamaoka1, Kaoru Minoshima3, Takeki Yasu1,2, Tokushima Univ., Japan; ERATO Intelligent Optical Synthesizer Project, Japan; *The Univ. of Electro-Communications, Japan; *Saga Univ, Japan. We proposed a novel static and dynamic strain sensor employing an optical-frequency-comb. We realized strain sensing from 0.7 Hz to 500 µHz over the strain frequencies of 3.5 kHz.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
Tu3G • Multi-photon Boson-sampling Machines
Chaoyang Lu1; Zhenyu Yin1; Zhongwen Li1; Zhiyuan Xu1; Chenglong Qi1; Kai Lu1; Cheng Li1; Qiang Li1; Pengju Zhou1; Xiangyu Zhang1; Hong Kong China, 1Univ. of Science & Technology of China. We develop a novel multi-photon Boson-sampling machine with the ability to race against classical computers.

Tu3G.1 • 16:00
Multi-photon Quantum Boson-sampling Machines, Chaoyang Lu; Zhenyu Yin; Zhongwen Li; Zhiyuan Xu; Chenglong Qi; Kai Lu; Cheng Li; Qiang Li; Pengju Zhou; Xiangyu Zhang; Hong Kong China, 1Univ. of Science & Technology of China. We develop a novel multi-photon Boson-sampling machine with the ability to race against classical computers.

Tu3G.2 • 16:30
Invited: Chaoyang Lu, Hong Kong China, 1Univ. of Science & Technology of China. We develop a novel multi-photon Boson-sampling machine with the ability to race against classical computers.

Tu3H • Optical Microcavities
Tu3H.1 • 16:00
Invited: Optimalization of Micro-sources in Optics, Frank Vollmer; Univ. of Exeter. My laboratory is developing a new class of nanophotonic architectures by combining optically resonant dielectric microcavities with plasmonically resonant metal nanostructures to enable detection at the nanoscale with extraordinary sensitivity.

Tu3H.2 • 16:30
Selective nano-CARS microscopy with dual-wavelength nanofocused ultrafast plasmon pulses, Keita Tomita; Fumihiko Kannari; Keio Univ., Japan. We demonstrate selective CARS measurements of a monolayer graphene and multi-walled carbon nanotubes (MWCNT) at the D-, G-, and 2D-bands with nanofocused SPP pulses at 800 and 440 nm using an aluminum tapered tip.

Tu3I • Fiber Technologies and Applications
Tu3I.1 • 16:00
Invited: Hollow Core Fibers: Technology and Emerging Applications, David J. Richardson; Univ. of Southampton, UK. We describe the unique properties and latest advances in the design and fabrication of hollow core optical fibers. We then review use of the technology in important application areas including power delivery, sensing and communications.

Tu3I.2 • 16:30
Invited: High Spatial Resolution Fiber Optic Sensors and Their Impact in Biomedical Measurement, Salvatore Sales; Nazarbayev Univ., Kazakhstan; Laboratory of Biosensors and Bioinstrumentation, National Laboratory Astana, Kazakhstan; University Campus Bio-Medico di Roma, Italy; Politecnico di Torino, Italy; Panthepheo Univ., Italy; Universidad Politecnica de Valencia, Spain. This work presents the recent developments in fiber optic sensing technologies having narrow spatial resolution, 0.1 mm to 10 mm. Sensors are finding emerging application in real-time monitoring of therapies and diagnostic.

Tu3J • Nonlinear Plasmonics
Tu3J.1 • 16:00
Gap-enhanced Raman Tags for Superstable and High-Speed Imaging, Jian Ye; School of Biomedical Engineering, Shanghai Jiao Tong Univ., China. Gap-enhanced Raman tags (GERTs) are favorable for off-resonance near-infrared laser excitation with reduced photothermal effect, leading to superphotostable and high-speed cell and tumor imaging. GERTs have demonstrated for intraoperative imaging of the sentinel lymph nodes and elimination of microscopic and residual tumors.

Tu3J.2 • 16:30
Selective nano-CARS microscopy with dual-wavelength nanofocused ultrafast plasmon pulses, Keita Tomita; Fumihiko Kannari; Keio Univ., Japan. We demonstrate selective CARS measurements of a monolayer graphene and multi-walled carbon nanotubes (MWCNT) at the D-, G-, and 2D-bands with nanofocused SPP pulses at 800 and 440 nm using an aluminum tapered tip.

Tu3K • Biophotonics and Metamaterials
Tu3K.1 • 16:00
Invited: Ultrason+ Detection and Imaging Using Microring Resonators and Laser Generated Focused Ultrasound, L. Jay Guo; Univ. of Michigan, USA. Optical detection of ultrasound is based on the interaction of strain field and optical field in an optical resonator for sensitive detection. Special optical transmitters generate and focus ultrasound, targeting high-amplitude focused ultrasound for imaging and therapeutic applications.

Tu3K.2 • 16:30
Invited: Nanosecond and Femtosecond Laser Induced Breakdown Spectroscopic Studies of Coal and Ash, Hamidali K.; Amapa N.; N.J. Vlas; S Seshadri; Engineering Design, Indian Inst. of technology madras, India; Applied Mechanics, Indian Inst. of technology madras, India Nanosecond and femtosecond laser Induced Breakdown Spectroscopy (ns- and fs-LIBS) were used for elemental analysis of Indian coal and ash. Emissions from C, Na, K, Al, Fe, Ca and molecular CN were identified and analyzed.

Tu3L • Laser Applications and Technologies
Tu3L.1 • 16:00
Invited: Superfluorescent Fiber Source with Ultra-low Thermal Coefficient Operating in the Conventional Band, Heng Wang; Yong-Hong Li; Tsung-Yu Lu; Ren-Yong Liu; Shen-Rui Liu; Taiwan Tech, Taiwan; National Space Organization NSPO, Taiwan. An Erbium-doped fiber-based, optical DBP pumping broadband superfluorescent fiber source is proposed and demonstrated. By using temperature compensation, the mean wavelength stability of SFS is as small as 0.67 ppm/°C over the temperature range of -26 to 65°C. The output power, 3 dB bandwidth is 9 dBm and 16.5 nm, respectively.

Tu3L.2 • 16:15
Invited: Optical Fluorescence Microscopy for Marine Phytoplankton Count, Jun Ho Lee; Konju National Univ., Korea. We propose the use of through-focus scanning fluorescence microscopy for marine phytoplankton count. We built a prototype and it was demonstrated to count the phytoplankton within 1cc seawater with 10 µm resolution in one second.

Tu3L.3 • 16:30
Invited: Nanosecond and Femtosecond Laser Induced Breakdown Spectroscopic Studies of Coal and Ash, Hamidali K.; Amapa N.; N.J. Vlas; S Seshadri; Engineering Design, Indian Inst. of technology madras, India; Applied Mechanics, Indian Inst. of technology madras, India Nanosecond and femtosecond laser Induced Breakdown Spectroscopy (ns- and fs-LIBS) were used for elemental analysis of Indian coal and ash. Emissions from C, Na, K, Al, Fe, Ca and molecular CN were identified and analyzed.

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
Tu3A.3 • 16:45 Broadband coherence of bidirectional mode-locked Er fiber laser with two saturable absorber mirrors, Yoshiaki Nakajima1, Yuuki Hata1, Kazuo Minoshima1,1, Univ. of Electro-Communications, Japan, 1JST ERATO MINOSHIMA JOS Project, Japan. We evaluate broadband coherence of bidirectional mode-locked Er fiber laser with two saturable absorber mirrors. Signal-to-noise ratio of 35-dB at 100-kHz resolution bandwidth in beat notes between narrow linewidth single frequency laser and the output is obtained.

Tu3A.4 • 17:00 High average and peak power laser based on Yb:YAG amplifiers of advanced geometries for OPCPA pumping. Ivan Kuznetsov1, Ivan Mukhin1, Evgeny Pavlenevtsev1, Mikhail Volkov1, Oleg Pakhalov1, Inst. of Applied Physics of the RAS, Russia. High-power picosecond laser for OPCPA pumping is under development. It is composed of ytterbium fiber oscillator, Yb:YAG thin-rod preamplifiers and Yb:YAG thin-disk amplifier. 120W average power, 10µJ pulse energy with diffraction-limited beam quality is achieved.

Tu3A.5 • 17:15 Picosecond Yb-doped Alumino-phosphosilicate Fiber MOPA with >35W Peak Power, Arndam Halder1, Sri Lini1, Anshu Umarikar1, N. J. Ramirez-Martinez2, Martin Miguel1, Pranesh Banay2, Shailul Alam1, Jayanta K. Sahu1, Univ. of Southampton, UK. We report a picosecond Yb:SiO2 fiber MOPA using an efficient ytterbium-doped fiber core with an embedded polymer waveguide. Using a 10-ps Yb fiber laser source, to the detection of water content and plant health status.

Tu3B.2 • 17:00 100-as-level synchronized two-color source based on SPM-enabled spectral selection, Y. Hu1, Gengi Zhou1, Wei Liu1, Ming K. Xin1, Franz X. Kärner1, Guoyang Chang1, DESY Germany. We demonstrate that SPM-enabled spectral selection (SES) pulses exhibit 100-as-level relative timing jitter with respect to excited pulse, which is 10 times lower than the Raman soliton pulses derived from the same source laser.

Tu3B.3 • 17:00 Immune assay using a micro-flow channels detected by a terahertz chemical microscopy, Tatsuki Kamiya1, Masahiro Iida1, Kenji Sakai1, Toshihiko Kato1, Kenji Tsuchida1, Graduate school of natural science and technology, Okayama Univ., Japan. We have developed a terahertz chemical microscopy (TCM) to visualize various types of chemical reactions. Here, a micro-flow channels were fabricated on a sensing plate, and measured time evolution of immune reactions using the TCM.

Tu3C.3 • 17:00 Ultra-fast and Ultra-broadband Nonlinear Optical Signal Processing, Leif K. Oxenlowe1, X. Kärtner1, Guoqing Chang1, Invited. Nonlinear optical effects are useful to control and manipulate large numbers of parallel optical data signals, enabling flexible networks with high spectral and energy efficiency. This talk will describe recent advances in optical signal processing.

Tu3D.3 • 17:00 Determination of plant water status using the Sfendla1, Warwick P. Bowen1; 2Technical Univ. of Munich, Germany. We demonstrate that SPM-enabled spectral selection (SES) pulses exhibit 100-as-level relative timing jitter with respect to excited pulse, which is 10 times lower than the Raman soliton pulses derived from the same source laser.

Tu3E.3 • 17:00 Novel Measurement Methods II—Continued

Tu3E.4 • 17:15 Theory of Inelastic Optical Wave Mixing Magnetometry, Lu Deng1, Chengjie Zhu1, Edward W. Hagley1; National Inst. of Standards & Technology, USA; 2MOE Key Lab of Advanced Micro-Structured Materials, Tongji Univ., China. We show the presence of an energy symmetry-based nonlinear propagation blockage on magneto-optical rotation in the widely used single-beam three-state scheme and an inelastic wavemixing scheme that removes this detrimental blockade.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

Tu3G.3 • 17:00 Deterministic Creation and Spins in Quantum Emitters in Atomiically Thin Semiconductors, Alejandro Montblanch1, Dhiren Kara1, Carmen Palacios-Berraquero1, Matteo Barbone1, Pawel Latawiec2, Marko Loncar2, Andrea Ferrari1, Mete Ataturk1; 1Univ. of Cambridge, UK; 2Hannard Univ., USA. We report the deterministic generation of novel single-photon emitters (SPEs) in monolayers of transition metal dichalcogenides (TMDs) by using patterned substrates, and current efforts to generate charged TMD-SPEs through electrical gating to act as qubits.

Tu3G.4 • 17:15 Synthetic spin-orbit coupling for ultracold fermions in optical lattices, Bo Song1, Cheng-dang He1, Zipeng Li1, Ehur Hayer1, Qianhong Cai1, Guo-Biang Jia1; 1The Hong Kong Univ. of Science and Technology, Hong Kong. We experimentally implement synthetic spin-orbit coupling in optical lattices with ultracold 133Rb fermions. We engineer band topology in one- and two-dimensional lattices and investigate topological states such as symmetry-protected topological phases in this spin-orbit-coupled system.

Tu3H.2 • 17:00 Exceptional Points in a Specialty-Microcavity: Interplay between State-Conversion and Cavity Control Parameters, Aman Ishaq1, Abhijit Biswas1, Sayan Bhattacharjee1, A. K. Vaidhey1, Somath Ghosh1; 1Indian inst. of Technology, India; 2Inst. of Radio Physics and Electronics, India. Exploring scattering matrix in a gain-loss assisted optical-microcavity, interplay between asymmetric state-conversion and cavity-control parameters around exceptional points is analyzed; where occupying a least area by coupled states during switching, maximum conversion efficiency with minimal asymmetry is achieved.

Tu3H.3 • 17:15 Raman Laser in a silica microdisk resonator, Xin Yu Cheng1, Jiaxi Gu1, Longlu Xiao1, Guanyu Li1, Xiaofeng Jiang1, Min Xiao1; 1Haining Univ., China. We have demonstrated a chip-based Raman laser by using a silica microdisk resonator with an intrinsic optical-Q factor of 1.5×10^7. The achieved lasing threshold is as low as 3.9 mw with a conversion efficiency of 7.5%.

Tu3H.4 • 17:15 Highly Capacity SDM Transmission and Multi-granular Optical Switching Network Technologies, Naoya Wada1, Benjamin Puttnam1, Jin Liu1, Tsz Wing Lo1, Meng Qiu1, Hideaki Furukawa1; 1Univ. of California Los Angeles, USA. We provide a simple method to observe the interference signal of an interferometer, and identify superior device designs in which an increased overlap of the field with the gain compensates for higher losses.

Tu3H.5 • 17:15 Brightening of Dark Excitons in Monolayer WS2, Sandwiched in a Metal-film-coupled Nanocavity, Jin Lu1, Ya Wang1, Meng Qiu1, Chi-hang Lam1, Dan Yuan Le1; 1Applied Physics, Hong Kong Polytechnic Univ., Hong Kong. We provide a simple method to observe the effects of dark excitons from room temperature in monolayer WS2, by using a metal-film-coupled nanocavity.

Tu3J.3 • 16:45 Plasmonic waveguides for nano-lasing and four-wave mixing, C. Martín de Sterke1, Guangyuan Li1, Stefano Palmia1, Univ. of Sydney, Australia. We present a systematic procedure for designing plasmonic waveguides for nano-lasing and for nonlinear optics. We identify superior device designs in which an increased overlap of the field with the gain compensates for higher losses.

Tu3L.4 • 16:45 Supercontinuum Laser Based Photoacoustic Approach for Acetylene Gas Sensing, Ramya Selvaraj1, N. J. Vasta1, Shiv N. 5 N; 1Indian inst. of Technology, Madras, India. A broadband photoacoustic gas sensor with solid station using supercontinuum laser for acetylene monitoring was characterized. The acetylene concentration was determined to be 330 pptv at a data acquisition time of 10 ms.
Tu3A • Ultrafast Fiber Laser Sources—Continued

Tu3A.6 • 17:30
Hybrid fiber MOPA-bulk amplifier system, Kota Masuda1, Dashi Fuji1, Yuki1, Katou1, Shota Matsuo1, Kikko Harada1, Ayumu Matumura1, Kayu Akai1, Kasukuki Tei1, Shigens Yamada1, Tokai Univ., Japan. We report on a hybrid fiber MOPA + solid-state amplifier. The maximum average power from a solid-state amplifier was 10.9 W, and the maximum peak power was 1.0 MW with the spectral width of 0.07 nm.

Tu3A.4 • 17:30
Hollow-core laser based mid-IR gas Raman laser with high peak power, Shoufei Gao1,2, Liwei Song1,3, Fabian Scheiba2,1, Xiaoyang Cao1, Hongbo Duan1,2, and Yunan Zou1,2,3, Data Storage Inst., Singapore; 2Nanyang Technological University, Singapore. A hollow-core laser in a methane-filled hollow-core negative-curvature fiber with average power of 113 mW, pulse energy of 113 μJ and estimated peak power of 9.5 MW.

Tu3A.7 • 17:45
Passively mode-locked Erbium-doped fiber laser using PbS quantum dots deposited on microfiber, Liyuan Liu1, Xiaolan Sun1, Wei Zhao1, Chuanhang Zou1, Qianqian Huang1, Zhao1, Chengbo Mou1, Tingyun Wang1; 2State Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China; 3BS Quantum Dots (QDs) deposited on microfiber as a new type of saturable absorber is demonstrated in an erbium-doped fiber laser. Successfully mode locked pulses with 51.56 dB signal to noise ratio was achieved.

Tu3B • Nonlinear Optical Sources—Continued

Tu3B.4 • 17:30
Evaluation of penetration of cosmetic liquid with Terahertz time-of-flight method, Taka Morimoto1, Takei Kuoda1, Kenji Sakai1, Yoshihiro Kawai1, Taiji Tsukada1, Okayama Univ., Japan. A terahertz time-of-flight method has been developed to evaluate penetration of cosmetic liquid. By using a face mask as the reservoir of the cosmetic liquid, the evaluation from the horny layers could be realized.

Tu3B.3 • 17:30
Pump correlation requirements for four wave mixing-based phase quantization schemes, Ananth Sobhanan1, Arjun N. Iyer1, Arvind P. Ananth1,1,2, Liwei Song1,3, Fabian Scheiba2,1,2, Data Storage Inst., Singapore; 2Nanyang Technological University, Singapore. We demonstrate the experimental results of phase noise measurements on the coherent addition of signal and conjugate in a four wave mixing-based two-level phase quantizer and illustrate the requirement of the anti-correlation between the pumps.

Tu3D • Nonlinear Wave Mixing and Applications—Continued

Tu3D.4 • 17:45
Polarization Insensitive Phase Conjugation Using Single-pump Four Wave Mixing in SOA, Ananth Sobhanan1, Lakshmi Narayanan Venkatakrishnan2, R. David Kolbjörns2, Deepak Venkitesh3, Indian Inst. of Technology Madras, India; 2Indian Inst. of Technology Madras, India. We experimentally demonstrate the generation of polarization insensitive phase conjugate of PM-QPSK signal in both input and output ports of SOA using partially de-generate four wave mixing with pump power of only 4 dBm.

Tu3D.3 • 17:30
Broadband filtering of the fundamental mode of a few-mode waveguide using a phase-shifted long-period grating, Quandong Huang1, Wei Wang1, Wei Jiang1, Kin S. Chang1, Aneesh Sobhanan1,2, Liwei Song1,3, Fabian Scheiba2,1,2, Data Storage Inst., Singapore; 2Nanyang Technological University, Singapore. We report a 2.8 μm gas Raman laser in a methane-filled hollow-core negative-curvature fiber with average power of 113 mW, pulse energy of 113 μJ and estimated peak power of 9.5 MW.

Tu3C • Infrared and Terahertz Microscopy and Nanoscopy—Continued

Tu3C.6 • 17:45
Development of in situ methods for battery using a THz chemical microscope, Kentaro Fujiwara1,2, Takeshi Kito1,2,3,4, Hiromasa Watanabe1,2,3,4, Wei Chen5, and Takahiko Imaishi1,2,3,4,1,2, Deutsche Elektronen-Synchrotron DESY, Germany; 2The Hamburg Centre for Ultrafast Imaging CUI, Univ. of Hamburg, Germany; 3State Key Laboratory of High Field Laser Physics, Shanghai Inst. of Optics and Fine Mechanics, China. We present a new scheme of two-color-field driven hollow-core fiber compression, whose ~1 μJ output covers 300 nm to 950 nm supporting sub-cycle pulses of ~2 fs duration. The spectral phase is characterized with two-dimensional spectral shearing interferometry.

Tu3C.5 • 17:30
Two-color-field Driven Hollow-core Fiber Compressor with Robust Inline Scheme, Yudong Yang1,2, Liwei Song1,3, Fabian Scheiba2,1, Giulio Maria Rossi1,2, Roland E. Mainz1, Shoufei Gao1,2, Liwei Song1,3, Fabian Scheiba2,1,2, Data Storage Inst., Singapore; 2Nanyang Technological University, Singapore. We report a 2.8 μm gas Raman laser in a methane-filled hollow-core negative-curvature fiber with average power of 113 mW, pulse energy of 113 μJ and estimated peak power of 9.5 MW.

Tu3F • Novel Measurement Methods II—Continued

Tu3F.6 • 17:30
Optical interferometry with transmitted Hadinger fringes through a plane parallel plate, Choonghean Lee1, Ju Eun Park2, Haejo Choi1, Jung Kim1, Myounguk Cha1, Jonghan Jin1,.PageSize National Univ., Korea; 2Korea Research Inst. of Standards and Science, Korea. Hadinger fringes can be observed when a quasi-monochromatic extended source is viewed through a plane parallel plate. We present two applications of Hadinger fringes, measurements of the thickness profiles of glass plates and laser wavelengths.
We present recent work on the integration of ultrathin optical fibers into a cold $^{87}$Sr system, the Zeeman shift of the $^{87}$Sr atom, Ultrathin Optical Fibers for Probing and Manipulating Neutral Atoms, Thomas Nieddu, Shun Fujii, Ryo Suzuki, Minoru Hasegawa, Takasumi Tanabe, Keio University, Japan. We experimentally and numerically investigated Kerr comb generation under a weak dispersion regime in high-Q silica microtoroids. Higher-order dispersion dominates the Kerr comb at near zero dispersion wavelengths and potentially provides broadband frequency conversion.
in the context of phase control for coherent light, we discuss potential advantages and disadvantages compared to conventional methods.

Reinforcement learning has been shown to be effective in various fields such as computer vision and robotics. In the context of laser systems, reinforcement learning can be used to achieve a new generation of nonlinear optical systems enabling unconventional control of light flow. This is particularly important for the development of coherent beam combination, where the interplay of non-linear thermal and optical effects, open promising avenues of investigation.

We will present the basic concept, operational principle and experimental performance of a novel computing machine with the network operating at the Quantum Limit - Coherent Ising Machine - Optical Neural Network. The developed machine has 2048 qubits with all-to-all connections. We will show how controlling the fluid dynamics of glasses and polymers can result in the scalable fabrication of optical metasurfaces and multi-modal fibers enabling the manufacture of intractable, refractory metal or metal matrix composite components.

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

**08:00–18:00 Registration, S221 Foyer of HKCEC**

**W1A • Power Scaling of Lasers**

**Presider:** Anting Wang; Univ. of Sci & Tech of China, China

**08:30–10:00**

**W1A.1 • 08:30**

Coherent Beam Combining of Fiber Lasers, Amo Klenke1, Michael Müller1, Hanning Stark1, Andreas Tünnermann1, Jens Leipert2, Friedrich-Schiller-Univ. Jena, Germany, Helmholtz-Institut Jena, Germany, Fraunhofer Institut für Angewandte PhotonenTechnologie, Germany. Germany.

Coherent beam combination has been established as a performance scaling concept for laser systems to overcome limitations of a single emitter. Today, the most powerful coherent beam systems do not yet reach the performance level of high-power laser systems. They can be used to achieve a new generation of nonlinear optical systems enabling unconventional control of light flow.

**W1B • Nonlinear Optics in Microresonators**

**Presider:** Kuijuan Jin; Chinese Academy of Sciences, China

**08:30–10:00**

**W1B.1 • 08:30**

Whispering-gallery-mode Resonators and The Applications for Nonlinear Optics, Lin Shi1,2, Martin Richardson1,2, Alex Sinclair1,2, Don Qin1,2, Justin Cook1,2, Joshua Bradford1,2, Nathan Bodnar1,2, Univ. of Central Florida, Orlando, USA. I will discuss the fundamental physics, such as party-time symmetry and exceptional points, in whispering-gallery-mode resonators, which can be used to achieve a new generation of nonlinear optical systems enabling unconventional control of light flow.

**W1C • Infrared Fibers & Materials and Their Applications**

**Presider:** Cheng Wang; Harvard Univ., USA

**08:30–10:00**

**W1C.1 • 08:30**

Thulium fiber lasers – The Modulation Instability and future high power scaling, Martin Richardson1,2, Alex Sinclair1,2, Don Qin1,2, Justin Cook1,2, Joshua Bradford1,2, Nathan Bodnar1,2, Univ. of Central Florida, Orlando, USA. We will discuss the fundamental physics, such as party-time symmetry and exceptional points, in whispering-gallery-mode resonators, which can be used to achieve a new generation of nonlinear optical systems enabling unconventional control of light flow.

The developed machine has 2048 qubits with all-to-all connections. We will present the basic concept, operational principle and experimental performance of a novel computing machine with the network operating at the Quantum Limit - Coherent Ising Machine - Optical Neural Network. The developed machine has 2048 qubits with all-to-all connections. We will present the basic concept, operational principle and experimental performance of a novel computing machine with the network operating at the Quantum Limit - Coherent Ising Machine - Optical Neural Network. The developed machine has 2048 qubits with all-to-all connections.
08:30–10:00
W1G • High Power Fiber Laser
President: Pu Zhou; National Univ. of Defense Tech., China

08:30–10:00
W1H • Optical Metasurfaces I
President: Xiangping Li; Jinan Univ., China

08:30–10:00
W1I • Advanced Signal Modulation
President: Xian Zhou; Univ. of Science and Technology Beijing, China

08:30–10:00
W1J • Integrated Sources I
President: T. Wang; Univ. of Sheffield, UK

08:30–10:00
W1K • Biophotonics and Applications III
President: Tian Guo; Jinan Univ., China

08:30–10:00
W1L • Integrated Microwave Photonics I
President: Ming Li; Inst. of Semiconductor, CAS, China

Room S423
Room S424
Room S425
Room S426
Room S427
Room S428

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
Wednesday, 1 August

W1A.3 • 09:15
High power single-frequency VECSEL platform for AMO physics, Ussia-Pekka Penttinen1, Shaun C. Burd2, Sanna Ranta1, David T. Allcock3, Mika Mäki2, Emmi Kantola1, Dietrich Leibfried1, Mireoja Gunia2,3, Optoelectronics Research Centre, Tampere Univ. of Technology, Finland; 2Nexum Ltd, Finland; 3Time and Frequency Division, Ion Storage Group, National Inst. of Standards and Technology, USA. We report high power single-frequency vertical external-cavity surface-emitting lasers (VECSELs) for applications in atomic, molecular and optical (AMO) physics. The laser platform is wavelength versatile, delivering watt-level output between 920 nm to 1260 nm in single-mode.

W1A.4 • 09:30
2.5 kW narrow linewidth fiber amplifier with white noise signal phase modulated seed, Chu Q. Chu1,2, Yi Shi1, Jing Wen1, Lie Ouyang1, Le Zhai1, Jianjun Wang1, Honghuan Li1, Feng Jing2, 1Academy of Sciences, China; 2Engineering Physics, Tsinghua Univ., China. A fiber laser system with white noise signal phase modulated seed is optimized. Based on the theoretical results, a fiber laser with 54 GHz linewidth, 2.5 kW output power and near-diffraction-limited beam quality is obtained.

W1B.1 • 09:15
Inter-mode breather solitons in optical microresonators, Harun Guo1, Enwan Lucia2, Martin H. Pfefferl3, Maxim Karl1, Tobias J. Kippenberg4, École polytechnique fédérale de Lausanne, Switzerland. We demonstrate a novel type of breather solitons triggered by avoided mode crossings that are ubiquitous phenomena in multi-mode optical microresonators, which was termed as intermode breather soliton.

W1B.2 • 09:30
Low EML, large effective area, and high power fraction performance in THz propagation through porous core POFs, Li Xia1, Udaya S. Rahulbhadra2, Nihan Wu1, School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. We designed a porous core POF with tetroxide hole for THz with specific modp model and improved essential performance parameters. The fiber is feasible to build with aid of prevailing state of the art fabrication.

W1B.3 • 09:45
Soliton trapping in a Kerr microresonator with orthogonally polarized dual-pumping, Ryo Suzuki1, Shun Fujii1, Atsushi Horit2, Takasumi Tanabe1, Keio Univ., Japan. We study soliton trapping between orthogonally polarized solitons inside a microresonator by using dimensionless coupled LDEs. We reveal the trapping conditions, which depend on the FSR difference, second order dispersion, and input field.

W1B.4 • 09:45
Withdrawn.

W1C.3 • 09:30
Predicton Performance of Reservoir Computing Using a Semiconductor Laser with Double Optical Feedback, Guang-Qiong Xia1, Yu-Shuang Hou1, Zhen-Mao Wu1, Southwest Univ., China. A reservoir computing system is proposed, and its prediction performance is investigated numerically. The results indicate that, through optimizing parameters, predication with GB's rate and normalized mean square error below 5% can be realized.

Coffee Break

10:00-10:30

W1D.3 • 09:15
Chemical Advances for 3D Laser Nano-Printing, Christopher Barnier-Kowalik1,2, School of Chemistry, Queens Univ. of Technology, Australia; 1Inst. for Polymer Chemistry, Karlsruhe Inst. of Technology, Germany. The lecture will highlight the most recent chemical advances in 3D laser lithography including aspects of super resolution lithography, subtractive lithography and multi-material printing.

W1E.3 • 09:15
Invited
Double Optical Feedback, Christopher Barnier-Kowalik1,2, School of Chemistry, Queens Univ. of Technology, Australia; 1Inst. for Polymer Chemistry, Karlsruhe Inst. of Technology, Germany. The lecture will highlight the most recent chemical advances in 3D laser lithography including aspects of super resolution lithography, subtractive lithography and multi-material printing.

W1E.4 • 09:45
Performance improvement and add-on functionalities to conventional lateral-flow devices using a laser direct-write patterning technique, Colin L. Sones1, Pejun He2, Ioannis N. Katr1, Robert W. Eason3, Optoelectronic Research Center, UK. We report the use of a laser direct-write technique for modification of a conventional lateral-flow device that not only enhances sensitivity and limit of detection, but also allows multiplexing detection within a single device.
Wednesday, 1 August

10:00–10:30 Coffee Break

CLEO Pacific Rim • 29 July–3 August 2018

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
We show that soliton dynamics scale to multijoule energies in simple hollow capillary fibers. We numerically model sub-femtosecond pulse self-compression, and experimentally demonstrate high-brightness multiple-μJ-scale ultraviolet (115-330 nm) pulse generation.
Seeing a Single Atom Where It Is Not, and
Evaluating It

Presider: Shengwang Du; Imperial National Univ., Australia.

Invited: Wojciech Wasilewski1; Institute of Theoretical Solid State Physics, Karl-Pertsch1, Isabelle Staude1; Inst. of Technology, Germany.

We experimentally realize various optical metasurfaces with tailored rotational and positional disorder, and demonstrate their ability to support pure circular dichroism and to tune the intensity of the transmitted light almost independently from its phase.

Demonstration of Real-time 100Gb/s Multi-lane-based PON System with Low Latency DBA

Presider: Yung-Zhen Huang; Chinese Academy of Sciences, China.

Invited: Bo Dong1; and its Application in Fiber Sensor, An Hanyang Univ., Korea.

Investigation on Temperature Sensitivities of Dual Cladding Modes Fiber Interferometer and its Application in Fiber Sensor, Bo Dong; X’ian Inst. of Optics and Precision Mechanics, CAS, China. Dual cladding modes fiber interferometer is based on the Interferences between the core mod and two cladding modes. Here its principle and application for dual parameters measurement are presented.

Low-latency Optical Networks for 5G Wire-
less

Presider: Tianwai Bo; KAIST, Korea.

Invited: Hanyoung Lee1, SeungHwan Kim1, Hwan Seok HanHyub Lee1, SeungHwan Kim1, Hwan Seok Han

Korea

LANes: Dennis Amler1, Stefan Fasold1, Aso Mahmud Tawfiq1, Olaf Brez1, Pietro Della Casa1, Andrea Knigge1, Markus Pertsch1, Isabelle Staude1; The Australian National Univ., Australia; 3Nonlinear Physics Centre, The Australian National Univ., Australia; 4Centre for Quantum Computation and Engineering and Applied Sciences, USA; 3Dept. of Physics, Harvard Univ., USA. We study ultra-confined polaritonic modes supported by thin- micro- and nano-devices made of hexagonal boron nitride flakes. We image these modes using new optical scanning probes microscopy techniques. These results open new avenues for nano-photonics as a way to achieve extreme light confinement at the nanoscale.

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
Passively mode-locked erbium-doped fiber laser with PbS colloidal quantum dots as saturable absorber, Wei Zhao1, Xiaolan Sun1, Bin Zhou1, Qianglan Huang1, Chuanhang Zou1, Tianxing Wang2, Chengbo Mou2, Tingyun Wang2, Alan Kost1; Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China; 1Optical Sciences Center, Univ. of Arizona, USA. We have demonstrated a passively mode-locked erbium-doped fiber laser using colloidal PbS quantum dots (QDs) thin film as saturable absorbers (SAs). As the pump power up to 34.1 mW, we can observe the mode-locked pulse with the duration of 2.86 ns.

W2A.3 • 11:15
Passively mode-locked erbium-doped fiber laser with PbS colloidal quantum dots as saturable absorber, Wei Zhao1, Xiaolan Sun1, Bin Zhou1, Qianglan Huang1, Chuanhang Zou1, Tianxing Wang2, Chengbo Mou2, Tingyun Wang2, Alan Kost1; Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China; 1Optical Sciences Center, Univ. of Arizona, USA. We have demonstrated a passively mode-locked erbium-doped fiber laser using colloidal PbS quantum dots (QDs) thin film as saturable absorbers (SAs). As the pump power up to 34.1 mW, we can observe the mode-locked pulse with the duration of 2.86 ns.

W2A.4 • 11:30
870 fs pulses from an all-PM Yb-doped fiber laser with a nonlinear amplifying loop mirror, Guanyu Liu1, Aimin Wang1, Zhangiang Zhang1; Peking Univ., China. We demonstrate a mode locked all-optical polarization maintaining fiber laser with a nonlinear amplifying loop mirror (NALM). 870 fs pulse is obtained at the repetition rate of 448 kHz.

W2A.5 • 11:45
LD pumped Nd:GdNbO3 crystal laser operating at 926 nm, Jing Gao1, Changli Li1, Wenming Yao2; 1Chinese Academy of Sciences, China; 2Univ of Science & Technology of China, China. We present a 926 nm laser based on quasi-three-level transition of a novel Nd:GdNbO3 crystal. The slope efficiency with respect to absorbed pump power is estimated to be 47.7%.

W2A.6 • 11:50
926 nm laser for silicon photonics, Xiaolan Sun1, Wei Zhao2, Qianglan Huang1, Chuanhang Zou1, Tianxing Wang2, Chengbo Mou2, Tingyun Wang2, Alan Kost1; Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China; 1Optical Sciences Center, Univ. of Arizona, USA. We have demonstrated a passively mode-locked erbium-doped fiber laser using colloidal PbS quantum dots (QDs) thin film as saturable absorbers (SAs). As the pump power up to 34.1 mW, we can observe the mode-locked pulse with the duration of 2.86 ns.

W2A.7 • 11:55
Enhanced Third Harmonic Generation in A Silicon Photonic Crystal Slab, Guoxun Ban1, Chaozhi Zhou1, Shiyu Li1, Yi Wang1, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China. Applying the Fano resonance in a 5 photonics crystal slab, enhanced third harmonic generation (THG) has been experimentally demonstrated and the conversion efficiency is about 160 times larger than that of bulk silicon.
Han2, Sung Moon2, Yoon-Ho Kim1, Young-Wook Cho2; nitrogen-vacancy centers in diamond based quantum memory, estimated to be sufficient for connecting quantum memories over large distances (e.g., 637.2 nm to the telecommunication wavelength and back). Signal-to-noise ratio is estimated to be sufficient for connecting nitrogen-vacancy centers in diamond based quantum repeater.

Tamura1, Nobuyuki Matsuda1, Toshimori Honjo1, Hiroki Takesue1; 1NTT Basic Research Laboratories, Japan; 2Kanagawa Univ., Japan. We demonstrate a controlled-phase (C-Phase) gate for the time-bin qubits using an optical interferometer. We confirmed that independent time-bin qubits were entangled through the beam splitter. We demonstrated a controlled-phase (C-Phase) gate for the time-bin qubits using an optical interferometer. We confirmed that independent time-bin qubits were entangled through the beam splitter.

Horikiri1, Hideo Kosaka1; 1Academia Sinica, Taiwan. Meta-surfaces composed of artificial nano-structures attract huge interests due to their ability on controlling the electromagnetic phase and amplitude at subwavelength scale. Several meta-surfaces based novel components for photonic applications are included in this talk.

Yosep Kim2, Yong-Su Kim 2, Sang-Yun Lee 2, Sang-Wook Kim1, Ping P. Tsai1; 1Univ. of Sci and Tech of China, Beijing, China; 2National Taipei Univ. of Technology, Taiwan, We demonstrated measurement of the sequential weak value of two incompatible observables by making use of two-photon quantum interference. We also demonstrate direct quantum process tomography of a qubit channel using a superconducting qubit after metasurface.
Wednesday, 1 August

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

Room S223

W2A • Advanced Laser Sources I—Continued

W2A.6 • 12:00
Different Lasing Modes from H⁺-Implantation-Defined Coherently Coupled VCSEL Arrays, Guanhong Pan¹, Chen Xu¹, Yiyang Yao¹, Yibo Dong¹, Hongda Chen¹; ¹Beijing Univ. of Technology, China; ²Inst. of Semiconductor, Chinese Academy of Sciences, China. Different lasing modes including in-phase modes, out-of-phase modes and special mixture modes are obtained from H⁺-implantation-defined coherently coupled VCSEL arrays by engineering the interelement spacings between elements. The simulated far-field patterns match the experiments well.

Room S224

W2B • Nonlinear Dynamics in Waveguides and Harmonic Generation—Continued

W2B.6 • 12:00
Enhanced third harmonic generation in organic multilayers, Myungha Cha¹, Jung Kim¹, Pavan Kumar¹, Heejo Choi¹, Kyungjo Kim¹, Nasser Peyghambarian²; ¹Pusan National Univ., Korea; ²Univ. of Arizona, USA. We demonstrate quasi-phase-matched third harmonic generation in organic multilayer films. The phase shift between the fundamental and the generated third harmonic light was compensated by alternatingly coated layers of a passive UV curable polymer material.

Room S225

W2C • Infrared Ultrafast Subcycle Subwavelength Photonics—Continued

W2C.3 • 12:00
Terahertz Generation in PPLN by Pulse Recycling with Quartz Out-coupler, Lu Wang¹, Ayya Fallahi¹, Koutubuddin Ravi¹, Franz Kaertner², CTI - DSH, Germany; ²Hamburg Univ., Germany. Research Laboratory of Electronics and the Dept. of Electrical Engineering and Computer Science, Massachusetts Inst. of Technology (MIT), USA. Multi-cycle terahertz generation using two consecutive PPLN crystals with designed quartz coupler is proposed. Our simulation suggests that pulse pulse recycling with dispersion compensation can lead to higher terahertz conversion efficiency.

Room S226

W2D • Optical Signal Processing Based on Integrated Devices—Continued

W2D.4 • 12:00
Four channel 48Gbps Multicasting in a Coupled SI Ring Resonator with Tunable Channel Spacing, Aamish Pandey¹, Shankar K. Girish¹, Pavan Kumar¹, Heejo Choi¹, Kyungjo Kim¹, Nasser Peyghambarian²; ¹Pusan National Univ., Korea; ²Univ. of Arizona, USA. We demonstrate quasi-phase-matched third harmonic generation in organic multilayer films. The phase shift between the fundamental and the generated third harmonic light was compensated by alternatingly coated layers of a passive UV curable polymer material.

Room S227

W2E • Ultra-fast Laser Machining and Processing—Continued

W2E.4 • 12:00
Microengineering of nonlinear photonic crystals with ultra-short laser pulses, Yan Sheng¹, Xin Chen¹, Shan Liu¹, Krzysztof Switkowski², Wieslaw Kowalski²,³; ²Australian National Univ., Australia; ³Texas A&M Univ. at Qatar, Qatar; ³Faculty of Physics, Warsaw Univ. of Technology, Poland. Femtosecond pulses are employed to introduce periodic modulation of quadratic nonlinearity in femtosecond. This optical approach allows us to create any desired nonlinearity patterns including 3-D structures, independent of the crystallographic orientation.

Room S228

W2F • Optical Devices for Precision Measurements—Continued

W2F.5 • 12:00
Simple method to lock an optical frequency comb to an ultra-stable laser without an RF signal generator, Kenya Hitomi¹, Atsushi Ishizaka¹, Kenichi Hidaka¹, Tadashi Nishikawa², Hiroki Gotou¹, Tetsumi Soga², Kazutaka Hara¹; ¹Tokyo Denki Univ., Japan; ²NTT Basic Research Laboratories, Japan. We achieved a simple method for stabilizing an optical frequency comb (OFC). The OFC with our method is very stable and its stability does not depend on the stability of RF signal generators.

Room S224

W2A.7 • 12:15
A Tunable Single-longitudinal-mode Fiber Laser based on erbium-doped, pentahedron fiber structure interferometer, Minliang Du¹; ¹Nanyang Univ. of Post & Telecommunication, China. We propose a fiber laser using erbium-doped fiber-pentahedron fiber structure interferometer as the mode-selector for achieving single-longitudinal-mode and wavelength tunable operation. The fiber laser has a 3 dB bandwidth of about 0.015 nm.

Room S225

W2B.7 • 12:15
Phase control of high-order harmonics (HHG) in noble gas mixture by phase matching and interference effects, Lileng Wang¹, Weiming Zhu¹, Guangdong Ran¹, Hao Li¹, Yerg Zhang¹; ¹SIMTech, Singapore. We experimentally observe strong modulation of HHG spectrum in gas mixture. Calculation results show the phase of harmonics are contributed by phase-matching and interference effects, resulting in strong spectrum modulation and may benefit tunable XUV generation.

Room S226

W2C.4 • 12:15
Direct Measurement of the Phase Coherence of Comb Sources, Luca Consolino¹, Saviero Bertoni¹,²; ¹CNR - INO, Italy; ²ppqSense Srl, Italy. We report on a novel method capable of measuring the coherence and the time evolution of the phases of laser comb modes. Applications to Na-IR, Mba-IR and Fan-IR (THz) comb sources are presented.

Room S227

W2D.5 • 12:15
Tunable and Selective Wavelength Converter for 40Gbit/s Signals Employing Cascaded Second-Order Nonlinearity in Quasi-Phase Matched Lithium Niobate, Yutaka Fukuchi¹; ¹Dept. of Electrical Engineering, Tokyo Univ. of Science, Japan. We report a tunable and selective wavelength converter using a 5cm-long quasi-phase-matched lithium niobate waveguide. The conversion efficiency is ~10dB. The device is attractive for channel-by-channel wavelength conversion in 100GHz-spaced 40Gbit/s dense wavelength-division multiplexed systems.

Room S228

W2E.4 • 12:15
Fabrication of Carbide Nanoparticles by Femtosecond Laser Ablation of Silicon and Molybdenum in Hexane, Shunsuke Terakawa¹, Toru Asaka¹, Fumihiro Itoigawa¹, XI YU², Ma-saiku Sudo³, Shingo Ono³; ²Nagoya Inst. of Technology, Japan; ³IBM America Inc., Japan. Carbide nanoparticles are used in various applications. However, conventional fabrication methods are tend to be complicated and several steps are needed until fabrication. In this work, we report a simple method to fabricate carbide nanoparticles by femtosecond laser ablation in hexane.

Room S223

W2A.5 • 12:15
Quasi-phase-matched third harmonic generation in organic multilayer films with designed quartz coupler, Lu Wang¹, Ayya Fallahi¹, Koutubuddin Ravi¹, Franz Kaertner²; ¹Hamburg Univ., Germany; ²CTI - DSH, Germany. Research Laboratory of Electronics and the Dept. of Electrical Engineering and Computer Science, Massachusetts Inst. of Technology (MIT), USA. Multi-cycle terahertz generation using two consecutive PPLN crystals with designed quartz coupler is proposed. Our simulation suggests that pulse pulse recycling with dispersion compensation can lead to higher terahertz conversion efficiency.

Room S224

W2B.5 • 12:15
Enhanced third harmonic generation in organic multilayer films with designed quartz coupler, Lu Wang¹, Ayya Fallahi¹, Koutubuddin Ravi¹, Franz Kaertner²; ¹Hamburg Univ., Germany; ²CTI - DSH, Germany. Research Laboratory of Electronics and the Dept. of Electrical Engineering and Computer Science, Massachusetts Inst. of Technology (MIT), USA. Multi-cycle terahertz generation using two consecutive PPLN crystals with designed quartz coupler is proposed. Our simulation suggests that pulse pulse recycling with dispersion compensation can lead to higher terahertz conversion efficiency.

Room S225

W2C.2 • 12:15
Terahertz Generation in PPLN by Pulse Recycling with Quartz Out-coupler, Lu Wang¹, Ayya Fallahi¹, Koutubuddin Ravi¹, Franz Kaertner²; ¹Hamburg Univ., Germany; ²CTI - DSH, Germany. Research Laboratory of Electronics and the Dept. of Electrical Engineering and Computer Science, Massachusetts Inst. of Technology (MIT), USA. Multi-cycle terahertz generation using two consecutive PPLN crystals with designed quartz coupler is proposed. Our simulation suggests that pulse pulse recycling with dispersion compensation can lead to higher terahertz conversion efficiency.

Room S226

W2D.3 • 12:15
Four channel 48Gbps Multicasting in a Coupled SI Ring Resonator with Tunable Channel Spacing, Aamish Pandey¹, Shankar K. Girish¹, Pavan Kumar¹, Heejo Choi¹, Kyungjo Kim¹, Nasser Peyghambarian²; ¹Pusan National Univ., Korea; ²Univ. of Arizona, USA. We demonstrate quasi-phase-matched third harmonic generation in organic multilayer films. The phase shift between the fundamental and the generated third harmonic light was compensated by alternatingly coated layers of a passive UV curable polymer material.
Zwiller2, Xiaolong Hu1; signal-to-noise ratio of detectors’ outputs. as low-noise pre-amplifiers to increase the integrated with current reservoirs that function conducting nanowire single-photon detectors.

Cheng1, Xiaoming Chi1, Chao Gu 1, Kai Zou1, W2G.6 • 12:00

dep times based on single-mode-fiber-multimode-fiber single-mode-fiber (SMF) with core-offset splicing is demonstrated and experimentally validated. Both the inhalation and exhalation activities can be detected within a wide respiratory frequency range.

Liu Shi 1, Junhong Deng2, Guixin Zha1, Xiangping Li 1; 2Dept. of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., China. A real-time non-wearable respiratory monitoring system based on single-mode-fiber-multimode-fiber single-mode-fiber (SMF) with core-offset splicing is demonstrated and experimentally validated. Both the inhalation and exhalation activities can be detected within a wide respiratory frequency range.

Yinan Zhang1, Shouyi Xie 2, Yudong Lu 1, Dejiao Hu 1, Zilan Deng1, Xiangping Li 1; 2Dept. of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., China. A real-time non-wearable respiratory monitoring system based on single-mode-fiber-multimode-fiber single-mode-fiber (SMF) with core-offset splicing is demonstrated and experimentally validated. Both the inhalation and exhalation activities can be detected within a wide respiratory frequency range.

We propose a cost-effective and imbalance-insensitive 40-Gbit/s/wave-length-long-reach PON, Jinnan Zhang, Xin Chen, Jian-Jin He; Centre for Integrated Optoelectronics, State Key Laboratory of Modern Optical Instrumentation, College of Optical Science and Engineering, Zhejiang Univ., China. We present a new circumferential scan endoscopic OCT probe by circular arrayed six MEMS mirrors and collimators with a diameter of 12 mm and a length of 25 mm.

A Cost-effective and Imbalance-insensitive 40-Gbit/s/wave-length-long-reach PON, Jinnan Zhang, Xin Chen, Jian-Jin He; Centre for Integrated Optoelectronics, State Key Laboratory of Modern Optical Instrumentation, College of Optical Science and Engineering, Zhejiang Univ., China. We present a new circumferential scan endoscopic OCT probe by circular arrayed six MEMS mirrors and collimators with a diameter of 12 mm and a length of 25 mm.

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We propose a cost-effective and imbalance-insensitive 40-Gbit/s/wave-length-long-reach PON, Jinnan Zhang, Xin Chen, Jian-Jin He; Centre for Integrated Optoelectronics, State Key Laboratory of Modern Optical Instrumentation, College of Optical Science and Engineering, Zhejiang Univ., China. We present a new circumferential scan endoscopic OCT probe by circular arrayed six MEMS mirrors and collimators with a diameter of 12 mm and a length of 25 mm.

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W3A.1 Nonlinear Reflectance of Planar Plasmonic Nanostructure, Rui Xu1, Zhonghua Nie2, Shuqiao Qin1, Yao Li1, Shining Zhu1, Fengguo Wang1, ‘School of Electronic Science and Engineering, Nanjing Univ., China;’ School of Physics, Nanjing Univ., China. We reveal nonlinear response of a planar plasmonic film with nanoparticle arrays. We further demonstrate that the nonlinear response of these nanostructures can be effectively controlled by structural parameters.

W3A.2 Hybrid Quantum Dots /Photonic Crystal Color Tunable Light Emitting Diodes, Chrinejy Krishna1, Thomas Mercier1, Zeeshan Ahmed1, Kang-yeon Lee2, Jih-Kai Huang3, Chung-Huang Lin4, Martin Charlton1. ‘Univ. of Southampton, UK; LutskIT, Taiwan. We demonstrate spectrally tunable hybrid plasmonic quantum dot/photonic crystal (QD/QC) LEDs. QDs are embedded into photonic crystals of GaN/InGaN LED for efficient color conversion. Color-tunable LED has individually addressable LED module.

W3A.3 Optomechanical oscillation in the lithium niobate photonic crystal nanocavity, Haizee Jiang1, Hanxiao Liang2, Rui Lou1, Xianting Chen1, Qingqian Gao2, Chang Ling1, Shanghao Jiao Tong Univ., China; ‘Univ. of Rochester, USA. Optomechanical oscillations are observed in the lithium niobate photonic crystal nanocavity. High harmonic oscillations up to 14th order are achieved, which may function as a mechanical frequency comb.

W3A.4 Strong MoS2 Photoluminescence on Graphene for Coupling with Silica Microcavity, Rammaru Ishida1, Sakaumi Ishida1, Takanori Tanabe1, Koki Xu. ‘Univ. of Tokyo, Japan. We transferred monolayer MoS2 to various substrates and evaluated its optical property by photoluminescence intensity. The study revealed that a graphene substrate is adequate when using MoS2 as a cavity-QED material.

W3A.5 A single GaAs nanowire self-powered photodetector with Au-graphene Schottky electrodes, Yanbin Liu1, Xin Yang1, Zai Yao2, Lu Li3, Bang Qiao4, Xiaoxian Ren5, Yaru Yang1, ‘Beijing Univ. of Posts and Telecom, China. A single GaAs nanowire self-powered photodetector with Au-graphene Schottky electrodes is demonstrated. The device exhibits excellent photodiode properties, showing a strong possibility for future integrated nano-electronic systems.

W3A.6 Multipolar properties of guide resonances, Yi Xu1, Yuan He1, Tianhua Feng1, Andrey E. Miroshnichenko1, ‘Jinan Univ., China; ‘Univ. of New South Wales, Univ. of New South Wales, Australia. We study the multipolar nature of guide resonance in photonic crystal waveguide which is consisted of period-hetero type resonators. By reconstructed the guide resonance utilizing the induced multipole moments in one unit cell, we reveal the important roles of multipole modes play in the high-Q resonator.

W3A.7 Optical Pumping Lasing in Ceasium Lead Bromide Perovskite Square-shaped Microplates, Zi-Wie Huang1, Li-Juan Lin2, Mei-Lin Chen1, Hui-Cheng Hsu1, ‘Dept. of Photonics, NTU, Taiwan. Single-crystal we used CVD method to synthesis all-nanophase CaCIPbI3 perovskite microplates were fabricated to realize lasing at room temperature on mica substrate. Upon optical excitation, whispering-gallery-mode (WGM) lasing is achieved at RT with low threshold (~2.8 mW) and high-quality factor (~3000).

W3A.8 On chip quantum dot based phosphor for efficient and tunable color conversion, Thomas M. Mercer1, Chrinejy Krishna1, Martin Charlton1, ‘Univ. of Southampton, UK; ‘Can.3,pk@tamu.edu quantum dots were used in combination with band-pass filters to convert blue light emitted from InGaN/GaN LEDs to different wavelengths. We present results to show this approach is a promising way of achieving tunable color conversion.

W3A.9 Excitation Cessel basis designs for high resolution and wide-field live imaging, Jing Wen1, ShiLiang Liu1, Binbin Yu1, DaWei Zhang1, ‘Engineering Research Center of Optical Instrumentation and System, Ministry of Education and Shanghai Key Lab of Modern Optical System, Univ. of Shanghai for Science and Technology, China. We explore generating subwavelength non-decaying Cessel basis beams with long focal lengths by means of custom-designed meta-surfaces. The excitation approach can achieve live imaging with a high axial resolution and an ultra-wide field of view.

W3A.10 Imaging Theory of Vectorial Optical Near Field Based on Reciprocity of Electromagnetics, Lin Sun1, Bernting Bai1, Tong Cui1, ‘Jiang Wang1, ‘Dept. of Precision Instrument, Suzhou Univ., China. We use by multipolar decompositions in the reciprocity of electromagnetic for near-field optics, a novel multipolar Hamiltonian model is developed to guide the design of functional nearfield probes and analyze the probe-field interaction.

W3A.11 Optical Power Amplification via TE Resonant Optical Tunneling in Asymmetric, Metal-Dielectric, Single Barrier Potential System, Yin-Jung Chang1, Yu-Huan Chen1, ‘National Central Univ., Taiwan; ‘Taiwan Semiconductor Manufacturing Company Limited, Taiwan. We show that, when properly configured, it is possible to have field and power amplification via unbound-state enabled TE resonant optical tunneling through a two-dimensional, symmetric, single-barrier potential system with metal.

W3A.12 Single-mode VCSEL for Nearly 100-Gb/s 4QAM-OFDM transmission over 100 m OM3 multimode fiber, Hsin-Yun Kao1, Chuang Huang1, Chun-Yen Peng1, Cheng-Ting Tsai1, Hui-Tung Wang1, Shan-Fong Leong1, ‘National Taiwan Univ., Taiwan; ‘National Chiao Tung Univ., Taiwan. A 530-mm single-mode VCSEL with 3 dB-bandwidth of 22 GHz enables 16-QAM OFDM transmission at nearly 100 Gb/s over 100-m-long OM3 MMF link is demodulated and 100-Gb/s-long OM4 MMF with BER of 3 × 10-12.

W3A.13 Direct Detection for Polarization Multiplexing 100-Gb/s Signal Based on 7.04 Fiber Transmission, Xu Zhang1, Cai Li1, Xiang Li1, ‘Wuhan National Laboratory for Optoelectronics, China; ‘Wuhan Research Inst. of Posts and Telecom, China. We demonstrated a novel direct detection system for polarization multiplexing signal receiving based on 7.04-core fiber transmission. A 100-Gb/s signal transmission over 100-km SMF28 with 1.6 dB OSNR penalty compared with conventional coherent detection.

W3A.14 Simultaneous Measurement of Mode Dependent Loss and Differential Modal Group Delay in FMFs with OTDR, Fen Liu1, Gujin Jian2, Cung-Ju Chang1, Wei-Cheng Chen1, Cong dong Song1, ‘Jilin Univ., China. A new method for measuring mode dependent loss and modal group delay in FMFs is proposed and experimentally demonstrated that uses OTDR technique. This technique allows simultaneous measurement of MLD and MGD within a 9.8 km-long FMF.

W3A.15 Polarization tracking for Stokes-vector modulation formats using Kalman filter, Qian Yang1, Yan Yu1, Juntics Cao1, Qin Zhang1, Yong Yao1, ‘Harbin Inst. of Technology, China. A novel polarization tracking algorithm based on Kalman filter for Stokes-vector modulation formats are proposed. Compared with reported algorithms, the proposed scheme with optimal Q value shows fast polarization tracking capability and quick convergence.

W3A.16 Analytical fiber transfer function with XPM-induced process in N-channel coherent WDM transmission systems, Wataru Imajuku1, Kunihiko Mori1, Mitsuhiro Fukutoku1, ‘Kio University, Japan; ‘NITT Network Innovation Labs, Japan. This paper derives analytical fiber transfer function of XPM-induced optical noise in N-channel coherent WDM transmission systems by small signal approximation. The results provide analytical conditions to avoid the XPM-induced modulation instability for the first time.

W3A.17 XPM-induced phase noise mitigation by gain saturated parametric amplifiers, Wataru Imajuku1, Kunihiko Mori1, Mitsuhiro Fukutoku1, ‘Kio University, Japan; ‘NITT Network Innovation Labs, Japan. This paper proposes the improve-ment of signal-to-noise ratio by gain saturated PPA in n-channel coherent WDM transmission systems. For this purpose, we develop semi-analytical scheme to estimate the signal-to-noise ratio including the XPM induced phase noise.

W3A.18 Nonlinear Spurs Caused by EDFA in Analog Photonic Links, Sh Beng Guan1, Yitang Dar1, Guanqian Chen2, Felix Yi3, Kun Xu1, ‘Beijing Univ. of Posts and Telecommunication, China. In analog photonic links, we find the nonlinearity caused by input power fluctuations in EDFA. We theoretically analyze the characteristics of the nonlinear spur and experimentally demonstrated that these characteristics are consistent with the theory.

W3A.19 Multipolar properties of guide resonances, Yi Xu1, Yuan He1, Tianhua Feng1, Andrey E. Miroshnichenko1, ‘Jinan Univ., China; ‘Univ. of Rochester, USA. We study the multipolar nature of guide resonance in photonic crystal waveguide which is consisted of period-hetero type resonators. By reconstructed the guide resonance utilizing the induced multipole moments in one unit cell, we reveal the important roles of multipole modes play in the high-Q resonator.

W3A.20 Multipolar Imaging Theory of Vectorial Optical Near Field Based on Reciprocity of Electromagnetics, Lin Sun1, Bernting Bai1, Tong Cui1, ‘Jiang Wang1, ‘Dept. of Precision Instrument, Suzhou Univ., China. We use by multipolar decompositions in the reciprocity of electromagnetic for near-field optics, a novel multipolar Hamiltonian model is developed to guide the design of functional nearfield probes and analyze the probe-field interaction.

W3A.21 Accurate Channel Approximation Using Perspective Projection for a CamCom Link, Muhammad Asim Atta1, Aimee Birkett2, ‘HUST, Hong Kong, ‘College of Science and Optoelectronics, China; ‘Wuhan National Laboratory for Optoelectronics, China. This work presents channel approximation for a camera communication (CamCom) link using perspective projection model with complete intrinsic parameterization. The accuracy of the model is demonstrated by exploiting spatial separation characteristics of the output image.

W3A.22 Investigation of power allocation in ADO-OFDM based visible light communication system, Wei Liu1, Haizhe Chen1, Junjie Ding1, Hui Wu2, Mingui Yang1, Shihang Bian1, ‘Xiang Li1, ‘Wuhan National Laboratory for Optoelectronics, China; ‘Wuhan Research Inst. of Posts and Telecom, China. We theoretically analyze the characteristics of the nonlinear spur and experimentally demonstrated that these characteristics are consistent with the theory.

W3A.23 Compact Modeling of Laser Diode for Visible Laser Light Communication (VLLC) Systems, Can S. Wang1, Bing Wang1, Chao Wang1, Ching Yip1, ‘Hong Kong Univ. of Sci. & Tech, Hong Kong, China. A compact behavior model of a commercial 1550 nm 300 mW laser diode is presented for VLLC systems. The model exhibits good agreements with the measurement results for both NRZ and PMASK modulation.

W3A.24 Security-Enhanced Chaos Communication with Optical Spectrum Expansion, Ning Jiang1, Xiang Wang1, Xianbo Zhao1, Jie Zhang1, Hu Wang1, Kun Gu1, ‘Univ. of Electronic Science & Tech China, China; ‘Westone Information Industry INC, 30th Inst. of CETC, China. We propose a chaos communication scheme by transforming the modulated chaotic carrier as a wideband packets into the optical spectrum expansion module. It is demonstrated that the message-security is greatly enhanced with respect to conventional cases.
W3A.25 2 μm long period fiber grating fabricated by CO2 laser, Liu Lu, Li-Ming Wang, Xiaoming Wu, Zefeng Wang, ‘National Univ of Defense Technology, China. Doping CO2 laser, 2 μm long period fiber gratings (LPGs) are fabricated here for the first time. The transmission spectrum changing with the period, effective index modulation and grating length is investigated.

W3A.26 Withdrawn.

W3A.27 All-Optical Clock Recovery from 10 Gbps NRZ OOK and BPSK Data through Injection-Locking of Fiber Laser, Manas Sivasastava, Babu Srinivasan, Deepesh Venkatesh, ‘Indian Inst. of Technology, Madras, India. We demonstrate all-optical clock recovery from 10 Gbps NRZ-OOK and NRZ-BPSK data through injection-locking of Erbium-doped fiber (EDF) laser after enhancement of clock tones using the lately developed NRZ OOK and BPSK Data through Injection-Locking of Fiber Laser, W3A.26

W3A.28 Adaptive fringe projection technique for phase error compensation, Han Xun Tu, Su-Chia Hsu, ‘Dept. of Electrical Engineering, Chinese Culture Univ., Taiwan; Dept. of Electrical Engineering, Chinese Culture University, Taiwan. The non-sinusoidal problems of fringe projection lead to phase errors for three-dimensional shape measurement. For reducing phase measurement errors effectively and without time-consuming photometric calibration, the adaptive fringe projection technique is proposed in this work.

W3A.29 A new Pattern Recognition System Using Photonic Nonlinear Phenomena in Polarization-Sensitive Materials, Barbara N. Kilsani- der, George Kakauridze, Irina Kobulashvili, ‘Georgian Technical Univ., Georgia. Objects recognition method is suggested based on determining parameters of the integral ellipse in the Fraunhofer diffraction region by the photonicstereo copy of the object image which is illuminated with noninvasive circularly polarized light.

W3A.30 Supercontinuum Generation in an All-Normal Dispersion Tellurite Photonic Crystal Fiber, Feng Xu, Chao Mei, Jinhu Yuan, Feng Li2, Zhe Kang1, Binbin Yan1, Kuru Wang1, Xinhua Sang1, Xiang Wang1, Chonggui Zheng1, Xingyi Gu1, Beijiang of Posts & Telecommunications, China; 2The Hong Kong Polytechnic Univ., Hong Kong. We design a tellurite photonic crystal fiber with all-normal dispersion profile for generating supercontinuum (SC). The octave-spanning SC can be generated when the pump is with different widths, peak powers, and center wavelengths are used.

W3A.31 Chaotic pulse dynamics and synchronizations in Q-switched optical vortex pulses in an azimuthal symmetry breaking laser resonator, Jih-Hue He1, Shun-Liang Ying, Chun-Po Tang1, LunNational Sun Yat-Sen Univ., Taiwan. Chaotic dynamics and chaotic pulse synchronization are observed in optical vortex generated from a passive Q-switched laser resonator with broken an azimuthal symmetry when it was pumped by diode laser without critical beam shaping.

W3A.32 Passive mode-locking of a fiber optical parametric oscillator with optical time-stretch, Josephine Y. Qi1, Xiaoming Wei1, Shouxing Du2, Kenneth Kin-Yip Wong1, Kevin K. Tsoi1, Xin Xu1, Huaqiao Univ., China; Dept of EEE, The Univ. of Hong Kong, China; College of SEE, Zhejiang Univ., China. With the assistance of optical time stretch using the lately developed free-space angular-chirp-enhanced delay cavity, we demonstrate the short pulse generation numerically with passively mode-locking a fiber optical parametric oscillator pumped by a quasi-CW pump.

W3A.33 Mid-Infrared Spectral Compression of Parabolic Pulses in a Chalcogenide Ridge Waveguide, Zai Li, Jinhu Yuan1, Feng Li2, Zhe Kang1, Banban Yan1, Kuru Wang1, Xinhua Sang1, Chonggui Zheng1, Beijiang of Posts & Telecommunications, China; 2The Hong Kong Polytechnic Univ., Hong Kong. We design a dispersion-engineered chalcogenide (As2S3) ridge waveguide to achieve the mid-infrared spectral compression of chirped parabolic pulses. Simulation results show that the compression factor can be up to 27 in a 6.6 mm long waveguide.

W3A.34 Period-timing Bifurcation of the Pulse Train in an Actively Q-switched Fiber Laser, Chang Ma1, Ju Wu, Tianyan Xi, Yang Yu, Tianyu Li1, Shuishen Wang1, Jiong Yu1, Yang Jiang1, Tianjun Yuan1, Guangying Liu1, China. Period-doubling bifurcation, period-trebling bifurcation and period-quadrupling bifurcation of the pulse train in an actively Q-switched fiber laser is experimentally observed in this paper.

W3A.35 Mid infrared self-similar picosecond pulse compression in a suspended inverted tapered silicon strip waveguide, Xuan Cheng1, Chao Mei1, Jinhu Yuan1, Feng Li2, Zhe Kang1, Xiangting Zhang1, Xin Xu1, Binbin Yan1, Kuru Wang1, Xinhua Sang1, XiaoouChou1, Chonggui Zheng1, Beijiang of Posts & Telecommunications, China; Electronic and Information Engineering, The Hong Kong Polytechnic Univ., Hong Kong. We design a suspended inverted tapered silicon strip waveguide for high degree self-similar picosecond pulse compression. A 1.5 ps input pulse at wavelength 2450 nm is compressed to 46.73 fs in a 2.79 mm long waveguide taper.

W3A.36 Optical burst pulse generation from a gain-switched diode through CW laser light injection, Xiuling Huang, Hua Chen, Kazi Sato1, Hirohito Yamada1, Lung-Hang Peng1, Hiroaki Yokosaka1, Tohoku Univ., Japan; National Inst. of Technology, Taiwan. A novel method for producing optical burst pulses is demonstrated. Optical pulses having a several tens of picosecond duration, and a 100-200 ps period are generated from a gain-switched diode under CW laser light injection.

W3A.37 Wavelength-Dependent Angular Distributions of Low-Energy Electrons in Mid-Infrared Strong Field Ionization, Zhiyan Li1, Huaqiao Univ., China. The experimentally observed pronounced mid-infrared wavelength-dependent angular distributions (ADs) of low-energy electrons is attributed to the non-adiabatic effect by restoring to an improved semi-classical model via mode-matching manipulation. Spatial broadening is observed by launching ultrafast pulses into an adiabatically tapered fiber piece.

W3A.38 Polarization coherence deterioration of conventional soliton in amplification, Yuha Li1, Lei Gao1, Tiao Zhu1, Yulong Cao1, Changying Liu1, Opto-Electronics, Military Univ. of Technology, Poland. An all-fiber fast gain-switched and mode-locked (GS-ML) thulium-doped fiber laser (TDFL) is reported. The system delivers regular 2μm mode-locked subpulses with duration <10ps recorded within one gain-switched pulse envelope.

W3A.41 Enhanced nonlinearity in a tapered PCF with a central void core, Huai-Fu1, Jiong Ma1, Xiang Jiang1, Yu Zheng1, National Engineering Laboratory for Fiber Optic Sensing Technology, Wuhan Univ. of Technology, China. We report the fabrication of a photonic crystal fiber with a central void, with enhanced nonlinearity via mode-matching manipulation. Spectroscopic broadening is observed by launching ultrafast pulses into an adiabatically tapered fiber piece.

W3A.42 Supercontinuum Generation in an Amorphous Silicon Strip-Loaded Dielectric Waveguide, Yuhua Li1, Jiangao Zhou1, Rongbiao Deng1, A. Shapolov1, Matyas Kiss1, Balazs Fekete1, Xianping Xiong2, Jiaxin Song1, Xiaolin Li1, Shuaishuai Wang1, Jinlong Yu1, Yang Jiang2, Tianyuan Xie1, Yang Yu1, Tianyu Xu2, Chongxiu Zeng1, Xian Zhou2, Chongxiu Zeng1, Juan Du1, and Telecommunications, China; 2The Hong Kong Polytechnic Univ., Shenzhen Research Inst., China; 3Photonics Research and Information Engineering, The Hong Kong Polytechnic Univ., China. Using a CO2 laser, 2 μm long 27 in a 6.6-mm long waveguide.

W3A.43 PolarizationSensitive Femtosecond Mid-Infrared Spectrometer Using Chirped-Pulse Upconversion, Ryosuke Nakamura1, Kazutaka Inagaki1, Nobuhiko Umemura1, Tomosumi Kamura1, Osaka Univ., Japan; Osaka Inst. of Technology, Japan; Chuo Univ. Inst. of Science and Technology, Japan. Polarization sensitive femtosecond mid-infrared spectrometer is developed based on chirped-pulse upconversion. A small signal from a Raman-active mode that couples to an infrared-active mode due to a slight decrease in the molecular symmetry is detected.

W3A.44 24 W Tm-doped silica-fiber laser at 2153 nm, Kuang Lin1, Xiongbiao Deng1, Xian Zhou2, Chongxiu Zeng2, Xian Zhou1, and Telecommunications, China; 2The Hong Kong Polytechnic Univ., China. We demonstrated a 24 W Tm-doped silica-fiber laser at 2153 nm, which is the highest output power of 100W and pulse duration of 8ps.

W3A.45 The realization of a topological insulator saturable absorber-based mode-locked solid state laser, Ju C. Lan1, Yi-Ran Wang1, Chao-Lee Lai1, Wei-Heng Song1, Photons, National Sun Yat-sen Univ., Taiwan; State Key Laboratory of Crystal Materials, Inst. of Crystal Materials, China. In this paper, using the prepared topological insulator saturable absorber mirror, a GHz, mode-locked Nd:YVO4 bulk laser is realized for the first time with the output power of 180mW and pulse duration of 8ps.
W3A.51 CW Tunable 3 µm Fiber Gas Laser Source, Deyue Zhou1, Na Tang2, Zhivan U1, Wei Huang1, Yuling Cui1, Zefeng Wang1, “West China University of Defense Technology, China. We demonstrate a tunable 3 µm fiber laser source using a cavity-ended, hollow-core fiber-based laser with a tunable range of >6 NM and a maximum output power of >10W.

W3A.52 Difference-frequency Generation at 9.2 & 4.6 µm in LiGaS2, Pumped by a 20-picosecond Nd:YAG/CaCO3 Raman Fiber Laser, Mikael Jaklev1, Aloksy Kunus1, Lyudmila Isaenko1, Sergei Smetanin1, Dmitriy Tereoshchikhov1, Vodak Kubatski1, “Czech Technical University in Prague, Czechia; 2Laser Materials and Technology Research Center, AM Prokhorov General Physics Institute of RAS, Russia; 3Inst. for Single Crystals, National Academy of Sciences of Ukraine, Ukraine. The influence of the difference-frequency generation in a LiGaS2 crystal is presented.

W3A.53 Development of coherent pulse combining module, Jinhui Yuan1, Zhe Kang1, Ping Kong A. Wai1,2, “The Hong Kong Polytechnic Univ., Shenzhen, China. We propose a compact coherent pulse amplification (CPA) system, which consists of a pulse divider and combiner in the time domain (T-DPA) and space domain (S-DPA) by a multi-path interferometric structure.

W3A.54 Extra-cavity Parametric Raman Crystalline Anti-Stokes Laser at 954 nm with Collinear Orthogonally Polarized Beam Interaction at Tangential Phase Matching, Michal Jaklev1, Sergei Smetanin1, Dmitriy Tereoshchikhov1, Vodak Kubatski1, “Czech Technical University in Prague, Czechia; 2Prokhorov General Physics Institute, Russian Academy of Sciences, Russia; 3Inst. for Single Crystals, National Academy of Sciences of Ukraine, Ukraine. The temperature-dependent spectroscopic and laser properties of novel Fe:ZnMnSe crystal with high manganese concentration of 0.4% were investigated. The laser central wavelength varied from 5 μm at 78 K up to 5.8 μm at 300 K without any intracavity-wave-selective element.

W3A.55 Fe:ZnMnSe 5% Spectroscopic Properties and Laser Generation at 5.0 – 5.8 µm in the Temperature Range of 78 – 300 K, Helena Jelinke1, Maxim E. Doroshchikov1, Vjekoslav Oskar2, Maxim Jaklev1, Jan Šulc1, David Výhlidal1, Nazar O. Kovalenko1, Andrei Gerasimenko3, “Czech Technical University in Prague, Czechia; 4AM Prokhorov General Physics Institute, Russian Academy of Sciences, Russia; 5Inst. for Single Crystals, National Academy of Sciences of Ukraine, Ukraine. The temperature-dependent spectroscopic and laser properties of novel Fe:ZnMnSe crystal with high manganese concentration of 0.4% were investigated. The laser central wavelength varied from 5 μm at 78 K up to 5.8 μm at 300 K without any intracavity-wave-selective element.

W3A.56 Fe:ZnMnSe 5% Spectroscopic Properties and Laser Generation at 5.0 – 5.8 µm in the Temperature Range of 78 – 300 K, Helena Jelinke1, Maxim E. Doroshchikov1, Vjekoslav Oskar2, Maxim Jaklev1, Jan Šulc1, David Výhlidal1, Nazar O. Kovalenko1, Andrei Gerasimenko3, “Czech Technical University in Prague, Czechia; 4AM Prokhorov General Physics Institute, Russian Academy of Sciences, Russia; 5Inst. for Single Crystals, National Academy of Sciences of Ukraine, Ukraine. The temperature-dependent spectroscopic and laser properties of novel Fe:ZnMnSe crystal with high manganese concentration of 0.4% were investigated. The laser central wavelength varied from 5 μm at 78 K up to 5.8 μm at 300 K without any intracavity-wave-selective element.

W3A.57 A 698 nm Hertz-Linewidth ultradiode laser, Jinhui Yuan1, Zhe Kang1, Ping Kong A. Wai1,2, Guangjun Xu1, Jun Liu1, Tai Su1, Shougang Zhang1, “National Technical Service Centre, Chinese Academy of Sciences, China; 2University of Chinese Academy of Sciences, China. Two external cavity diode lasers are frequency-stabilized to ultra-high finesse optical resonant cavities with PDH method. The linewidth of each ECDL is measured to be 1 μHz by their beating and the frequency stability below 2 × 10−10 between 1s to 100 averaging times.

W3A.58 Wavelength tunable bidirectional Q-switched fiber laser based on carbon nanotube saturable absorber, Chuanhang Zou1, Qianqian Xu1, Jun Liu1, Tao Liu1, Shougang Zhang1, “Huazhong University of Science and Technology, China. The diode laser is pumped by a 976-nm laser. A Drude-Lorentz fitting model was used to analyze the absorption of the carbon nanotube sample. The carbon nanotube was pumped by a 976-nm laser. The laser was successfully operated in a Q-switched mode with a repetition rate of 5 MHz and a pulse width of 50 ns.

W3A.59 Spectrally resolved shot-to-shot intensity instability and coherence characteristics of solid-state fiber laser in normal dispersion single-mode fiber, Zujun Yao1, Jie Chen1, Ting Li1, Yu Zhang1, Xin Zhao1, Zheng Zhang1, School of Electrical Engineering and Information Engineering, Beihang Univ, China; Beijing Advanced Innovation Center for Big Data-based Precision Medicine, China. Spectral intensity noise distribution of pulses after spectral broadening in single-mode fiber with normal dispersion is experimentally investigated, and vastly different noise magnitudes and some low noise regions far away from the pump wavelength are observed.

W3A.60 Generation of vector beams from wave-length-mismatched vortex plates, Jongsuck Bae1,2,3, Jan Šulc1, Helena Jelínková1, Maxim E. Doroshchikov1, “Czech Technical University in Prague, Czechia; 2Laser Materials and Technology Research Center, AM Prokhorov General Physics Institute of RAS, Russia; 3Inst. for Single Crystals, National Academy of Sciences of Ukraine, Ukraine. The vector beams were generated by using wave-length-mismatched vortex plates, which were fabricated from the high-contrast gratings on Fe:ZnMnSe crystal in a tangential phase-matched configuration. The laser output powers for the vector beams were measured to be 6 nm and 4 nm at 1064 nm and 532 nm, respectively.

W3A.61 Determination of the dioptric power of a thin-disk laser based on the translation of the stability zone, Dang Cao1, Guanghui Hong1, Jiao Gu1, Xiao Zhu1, Wengang Zhai1, Hailin Wang1, “Huzhou University of Science and Technology, China. The dioptric power of a thin-disk laser is determined by the method of equivalent translation of stability zone with constant shape. The experiments show that the method can determine the dioptric power effectively and precisely.

W3A.62 All polarization-maintaining ultra-wideband and flat-topped spectrum Er-doped femtosecond fiber laser, Le Huang1, Ting-Hua Li1, “Taiwan Normal University, Taiwan. The laser beam can be generated by using wave-length-mismatched vortex plates, which were fabricated from the high-contrast gratings on Fe:ZnMnSe crystal in a tangential phase-matched configuration. The laser output powers for the vector beams were measured to be 6 nm and 4 nm at 1064 nm and 532 nm, respectively.

W3A.63 Efficient suppression of high-order Stokes waves in high power linearly polarized Raman fiber laser using a novel flexible filter, Jianxiong Song1, Hanyang Xu1, Kaow Jin1, Hanwei Zhang1, Jangming Xu1, Pu Zhu1, “National Univ. of Defense Technology, China. A novel all-fiber spectral-agile filter was designed and fabricated with the method of suppressing high-order Stokes waves in high power linearly polarized Raman fiber laser. The maximum output power was increased by 24.2%.

W3A.64 Transformation From Dissipative Solitons to Noise-Like Pulses in a Mode-Locked Yb-Doped Fiber Laser, Cailian Li1, Qing Yang1, “Beijing Advanced Innovation Center for Big Data-based Precision Medicine, China. The noise-like pulses were generated by increasing the pump power in a nonlinear polarization rotation mode-locked Yb-doped fiber laser.

W3A.65 Compact Time Spectrometer Based on Varying Illumination on a Semicondutor Surface, Tao Yang1, Jia-cheng Gu1, Hua-qi Fan1, Wei Huang1, “Nanyang Univ. of Posts & Telecomm., China. “Nanyang Univ. of Posts & Telecommunications,” The Chinese Univ. of Hong Kong, Hong Kong, “National Laboratory of Solid State Microstructures, Nanyang Univ., China. The terahertz spectrometer consists of three components, which are used for dispersion, modulation and detection respectively. With a calibration measurement procedure, one can reconstruct the terahertz spectra by solving a system of simultaneous linear equations.

W3A.66 Terahertz Antireflective Structures Fabricated via Femtosecond Laser Ablation, Xin Li1, Makoto Okano1, Shinichi Watanabe1,2, “Keio Univ., Japan; 2IMRA America, Inc., Japan. Terahertz antireflective structures on Si substrates are fabricated by femtosecond laser ablation. The structure is constituted by periodic grooves and some low-noise regions farther away from the pump wavelength are observed.

W3A.67 Terahertz Wave Amplification in Stacked Graphene Layers, Montse Gaseyral1, Albu Dhabi Univ., United Arab Emirates. We propose a novel technique for terahertz amplification in optically pumped stacked graphene layers. The terahertz amplification is achieved through a down conversion process, which is enabled by generating a backward terahertz wave.

W3A.68 Electric-Field Vector Imaging of Terertzter Surface Waves on an Indium tin Oxide Thin Film, Kenta Suzuki1, Kenji Oguchi1, Makoto Okano1, Shinichi Watanabe1,2, “Keio Univ., Japan. We present a novel method for imaging terahertz electric-field vector using a rotating polarization technique. We investigate the polarization-dependent propagation of terahertz surface waves on an indium tin oxide metal film.

W3A.69 Explanation for the discontinuous tunability of KTiOPo4 terahertz parametric oscillator, Dong Wu1, Xingyu Zhang1, Zhenhua Cong1, Zeyang Zhong1, Haiyang Xu1, Xiaoxi Jin1, Hanwei Huang1, “Shanghai Univ., China; 2IMRA America, Inc., Japan. KTiOPo4 crystal is an interesting nonlinear optical material which can be parametrically oscillated in the terahertz range. The crystal shows a discontinuous tunability of the terahertz spectral range. The diffraction efficiency is almost decreased to 0 and antireflection band was widened by improving aspect ratio of grooves.

W3A.70 Multi-Position UV-Monitoring Sensor Based on FBG Coated with Photo-Responsive Polymer Material, Geongsoo Seo1, Hee-Taek Cho2, Dong-Rok Lim1, Tian-Jung Ahn1, Chosun Univ., Korea. We proposed an ultraviolet light sensor based on a fiber Bragg grating in combination with a photo-responsive polymer material. The sensor can be utilized to monitor UV lights in multiple positions.

Room S421

14:00–15:30

W3A • Poster Session
We performed spatially-resolved laser absorption spectroscopy, We observed retinal cell lay- ers using a reflective differential interference contrast (DIC) microscopy. This technique allows non-stained, transparent retinal cells to be possibly imaged in a three-dimensional view. We calculated practical doping concentration in anticipation of use as a phosphor. We fabricated a novel high-quality laser with high frequency doubling efficiency. The process experiment results showed that a greatly improved weld quality and splatter free micro weld of the dissimilar metals has been achieved. 

Room S421
14:00–15:30
W3A • Poster Session

W3A.71 Helical Long-period Grating Inscription in Tellurite Glass Fiber for Temperature Sensing, Zuo Li1, Yuni Li1, Chengbo Mou1, Songtian Fu1, Shanghai Univ., China; 1North Univ. of Science and Technology, China. We experimentally demonstrate the fabrication of helical long-period grating (HLPG) in graded-index few-mode fiber by CO2 laser. The fabricated HLPG is found to be sensitive to temperature with a high sensitivity up to 244 °C.

W3A.72 A Long-Distance Fiber-Optic Arc-Flash Sensing System, Pu Wei1, Lu Deng1, Hui Huang1, Nanjing Inst. Technology, China; 2Nari Group Corp., State Grid Electric Power Research Inst., China; 2Global Energy Interconnection Research Inst., State Grid Corporation of China, China. We propose and experimentally demonstrate a long-distance fiber-optic arc-flashing sensing system. Using an optical electronic VOA, the arc-flash signal can be transmitted by 4-km optical fiber, which meets the demand of the power industry.

W3A.73 Visualization of a periodic structure in arcjet energized VOA, the arc-flash signal can be monitored using an optical reflection spectrum analysis. Herein, copper corrosion measurement method using optical reflection spectrum analysis. The interferometer self-mixing interferometer was proposed by combining multiple reflection technique with spectrum analysis algorithm. The interferometer structure can measure nanoscale amplitude and the experiments show good agreement with the theory.

W3A.83 A Surface Plasmon Resonance based Phased Array Fiber Optic Sensing Probe for Biological Applications, Atsuko Kaneko1, Yuko Rakuten 1, Yoshinori Iwata1, Shinya Iwata1, University of Tokyo, Japan. We observed retinal cell layers using a reflective differential interference contrast (DIC) microscopy. This technique allows non-stained, transparent retinal cells to be possibly imaged in a three-dimensional view.

W3A.84 Nanoscale self-imaging interferometer based on multiple reflection spectrum analysis, Yangting Zhang1, Ru Wang1, Zheng Wei1, Xiulin Wang2, Wencai Huang1, Nanjing Univ., China; 2Jimei Univ., China. An improved pressure-assisted arc-discharge technology was utilized to fabricate the thin-film silica microbubble-based fiber-tip temperature sensor. Then, it was coated with metal film before immersed with oil for ten times of sensitivity enhancement.

W3A.86 Reflective Differential Interference Contrast Microscopy for Retinal Cell Layer Imaging, Suseen Park1, Jyeong Oh1, Yu Kim1, Hong-jik Kim1, Seoul National Univ., Korea; 2Dept. of Communications Engineering, Kyung Hee Univ., South Korea. A reflective differential interference contrast (DIC) microscopy technique was used to non-stained, transparent retinal cells to be possibly imaged in a three-dimensional view.

W3A.91 Joule level long pulse green laser and its application for the micro welding of copper and aluminum, Zhiquang Fang1, Baizhu Zhu1, Xueying Li1, Sanqiang Liu1, Min Wang1, Institute of Laser Source for welding, Precision Welding Division, Hans Laser Technology Co. Ltd, China; 1North Univ. of Science and Technology Co. Ltd, China. To solve the poor weldability of copper and aluminum, Hans Laser has developed a joule level long pulse green laser with high frequency doubling efficiency. The process experiment results showed that a greatly improved weld quality and splatter free micro weld of the dissimilar metals has been achieved.

W3A.92 Fabrication and Evaluation of Ce3+ Doped CaF2, Thin Film Phosphor, Masato Hishiki1, Nagoya Inst. of Technology, Japan; We fabricated CaF2 film with different doping concentration in anticipation of use as a phosphor. We calculated practical doping concentration from lifetime data and evaluated the optimized doping concentration for high efficiency light emission.

W3A.93 Patterning Oxidation via Femtosecond Laser Irradiation on Copper Substrate, Yuki Maasaki1, Fumihiko Itagawa1, Shingo Ono1, Nagoya Inst. of Technology, Japan; 2MRM America, Inc., Japan. Patterning oxidation was performed by irradiating femtosecond laser pulses to surface of oxygen-free copper substrate. Conglomeration less than 1 μm were observed on irradiated are by SEM. The oxidation reaction rate were observed by CLSM. Results of EDX, Raman microscopy and XRD suggested that the irradiated area was Oxidized.

W3A.94 Direct bonding TCA and PA plastics by a nanosecond laser lap joining technology, Zhifang Fang1, Longjie Chen1, Yinhong G. Chien1, School of Mechanical Engineering and Automation, Beihang Univ., China; 2School of Energy and Power Engineering, Beihang Univ., China; 3School of Advanced Engineering, Hainan Univ., China. We used simple optical setup behind an opaque diffuser. A linear model is deduced and we get the experimental results consistent with it.

W3A.95 An improved pressure-assisted arc-discharge technology was utilized to fabricate the thin-film silica microbubble-based fiber-tip temperature sensor. Then, it was coated with metal film before immersed with oil for ten times of sensitivity enhancement.

W3A.97 Reflective Differential Interference Contrast Microscopy for Retinal Cell Layer Imaging, Suseen Park1, Jyeong Oh1, Yu Kim1, Hong-jik Kim1, Seoul National Univ., Korea; 2Dept. of Communications Engineering, Kyung Hee Univ., South Korea. A reflective differential interference contrast (DIC) microscopy technique was used to non-stained, transparent retinal cells to be possibly imaged in a three-dimensional view.
W3A.95 Modification of SiC surface transport properties using laser irradiation in various atmosphere conditions, Zhanyun Lin; Lingfei Ji; Beijing Univ. of Technology, China. Excerpts were used for the surface modification of transport properties on n-type single-crystal SiC substrates. Corresponding electrical performance was measured and modified mechanism was analyzed.

W3A.96 Fabricating Fine Structures Induced by Femtosecond Laser on Polyethylene Surface, Masato Hishiki; Nagoya Inst. of Technol., Japan. We fabricated nanostructures on polyethylene with a femtosecond laser, and pores and spines that are smaller than LPSS were observed. Additionally, we controlled the wettability with micro and nanostructures as well as just nanostructures.

W3A.97 Research on the laser drilling property of glass fiber composite material by quasi-solid-state wave laser (QCW) is researched under different conditions. Changyong Tian; Beijing Univ. of Technology, China.

W3A.100 Design of Logarithmic-Index Fiber for Orbital Angular Momentum (OAM) Transmission, Shuhei Uji; Pei You; Zhe Xu; Runzuo Zhao; Li Shen; Jian Wang; Wuhan National Lab for Optoelectronics, China. We propose and design a fiber with logarithmic-index profile for orbital angular momentum (OAM) transmission. The designed fiber shows favorable performance of low mode crosstalk and tensile invariance property of mode field diameter (MFD).

W3A.101 Dual-core Photonic Crystal Fiber Matter, Meiqiong Dai; Ning Sheng; Yu Zou; Key Laboratory of Functional Crystal and All-solid Microstructured Fiber for Coherent wave laser (QCW) is researched under different conditions. Changyong Tian; Changyong Tian, Chinese Academy of Sciences, China.

W3A.102 Fabrication of chirped and tilted fiber Bragg gratings on LMA-DC fiber by phase mask technique, Meng Wang; Xuelong Cui; Le Lu; Zefeng Wang; Xianqiu Xu; Xiya Gu; National Univ. of Defense Technology, China; Dayton of Electrical and Computer Engineering, Rayson University, Canada. The inscription of chirped and tilted fiber Bragg gratings (CTFBG) is demonstrated in hydrogen-loaded large-mode-area double-cladding (LMA-DC) fiber by a linearly chirped phase mask.

W3A.103 Design of Broadband Plasmonic Polarization Beam Splitter, Lanting Ji; Yang Gao; Xiaoxiang Sun; Xianqiu Xu; Weiming Wang; Daming Zhang; Zhongyi Lu; Jinlin Univ., China; Key Laboratory of Semiconductors, Chinese Academy of Sciences, China. A polarization beam splitter based on vertical coupling between plasmonic Periodically Poled Lithium Niobate waveguides for optical repeater amplifier in fiber transmission systems. The feature of amplitude noise suppression can improve performance of signal-to-noise ratio in the systems.

W3A.104 Transformation of the fiber based LP01 modes into free-space LG01 beams, Nitin Bhata; Shalendra Varshney; Indian Inst. of Technology Kanpur, India; NIT, India. We show that the beam waist of the LG modes should be less than the fiber core diameter for transforming the LP01 modes into free-space beams. The choice of beam waist does not alter the free-space propagation of the beam, given that the LG mode set is complete.

W3A.105 Design of polarization-maintaining rectangular core fiber supporting eight modes, Zhiqiang Wang; Li Gao; Mingying Lan; Shangyong Ci; Song Yu; State Key Laboratory of Information Photonics and Optical Communications, China. A multi-mode selective coupler based on asymmetric dual core photonic fiber is proposed. Efficient mode conversion between LP01 and high order modes is achieved, more than previous reports. Minimum bandwidth can reach 2 nm.

W3A.106 Experimental Demonstration of Femtosecond-level Quantum Clock Synchronization, Quan Run ai; Zihao Kang; Kei Akira; University of Technology, Australia. We report on the all-fiber single photon buffer for long-distance quantum communications. The coincidence between single photons generated by two independent heralded single photon sources was successfully enhanced without degrading the polarization-entanglement.

W3A.107 Manipulating conditional photon statistics of lasers via second-order interference and post-selections, Kang-Hee Hong; Jisung Jeong; Young-Woo Choi; Sang-Wook Han; Sunghoon Moon; Kyung-Hwan Oh; Yong-Su Kim; Yoo-Ho Kim; Kyoung-Soo Shin; Su-gil & Tech. POSTECH; Korea; Korea Inst. of science and technology, Korea; physics, Younse, Korea. We report here theoretical analysis on the limits of manipulating conditional photon statistics of lasers via interference and post-selections. We demonstrate explicitly that photon antibunching cannot be obtained in such a scheme.

W3A.110 Compression of chirped biphonons by integrated binary phase shaping, Bao-Liu Lin; Xianqiu Xu; Xiya Gu; National Univ. of Science & Technology, China; Key Laboratory of Time and Frequency Standards, National Time Service Center, Chinese Academy of Sciences, China. We theoretically show that chirped biphonons can be compressed to Fourier transform limited by shaping its spectrum using Fresnel-inspired binary phase shaping. This provides a way for the generation of single-cycle biphonons.

W3A.111 Homodyne detection of 1.57 μm squeezed vacuum pulse with degenerate optical parametric oscillator pumped by a common 785-nm laser, Akito Kimoto; Atsuto Hosoaka; Masaya Tomita; Shinzoh Nishimura; Fumihiko Kenneri; Keio Univ., Japan. We generate 1.57 μm squeezed pulses by degenerate spontaneous parametric down conversion (SPDC) and observe 3.5dB anti-squeezing and 0 dB squeezing using local oscillator pulses generated from a degenerate synchronously pumped optical parametric oscillator.

W3A.112 Universal Model for Multi-mode NOON State Generation Using Fock State Filters, Quan Run ai; Xianqiu Xu; Xiya Gu; National Univ. of Science & Technology Kharagpur, India; Photonics and Optical Communications, China. We present a universal model for generating multi-mode NOON states using Fock state filters. The generation efficiencies for different input scenarios such as coherent states as squeezed vacuum states are calculated for comparisons.

W3A.113 Measuring the topological charge of light beams generated by four-wave mixing in Rb vapours, Jack Mur; Nafia Rahman; Alexander Alkhtin; Russell McLean; University of Technology, Australia. We generate Raman scattering in a 1090 nm two-stage fiber laser amplifier using chirped and tilted fiber Bragg gratings (CTFBG) is demonstrated in hydrogen-loaded large-mode-area double-cladding (LMA-DC) fiber by a linearly chirped phase mask.

W3A.114 Uncovering quantum interference between photon numbers using the Fisher information of field quadrature displacements, Junyi Wu; Harbridge; Hirokazu Sugiyama; University of Technology, Australia. We show that the reduction of the Fisher information of field quadrature displacements of primary states in lossy channels reveals characteristic patterns relative to quantum interferences between different photon numbers.

W3A.115 Wannier MZI based Thermo-Optic Switch with Slab Integrated Microheater in SOH, Ramesh Kadi; Biju K Das; IIT MADRAS, India. Silicon waveguide slab integrated microheater is proposed in MZI configuration for efficient and broadband thermo-optic switch. Fabricated devices exhibit fast switching (<4 μs) and extinction of > 20 dB over a broad wavelength range (1520-1640 nm).

W3A.116 Robust Excitation of High-Q Nanocavities via a Super-Luminescent Diode, Shoichi Katoh; Katsutoshi Kohei Ashida; Yasushi Takahashi; Osaka Prefecture Univ., Japan. We employ a super-luminescent diode (SLD) as excitation light source for photonic crystal high-Q nanocavities. We demonstrate that the broad emission of the SLD enables robust and simultaneous excitation of eight high-Q-type nanocavities.

W3A.117 Successful fabrication of GaN/AlGaN ridge waveguide laser diode using hydrophilic bonded InP/substrate, Hiroshi Yada; Naoki Kamada; Yuya Onuki; Xu Han; Gianluca Kallarasan Piyasigama; Kazuki Uchida; Hirokazu Sugiyama; Masaki Aikawa; Natsumi Hayasaka; Kazuhiro Shimizu; Sophia Univ., Japan. We have successfully fabricated 1.5 μm AlGaNP ridge waveguide laser diode using InP/substrate and obtained lasing emission. We have measured lasing characteristics and compared threshold current between InP/ Si and InP/substrate at several temperatures.

W3A.118 Robust TEO + TE1 Waveguide Crossing, PengFei Xu; YanFei Zhang; Yujie Chen; Suyun Yu; SunYan Univ., China; Univ. of Bristol, UK. We proposed a silicon waveguide crossing device supporting both TEO and TE1 modes. TEO mode insertion loss about 1-1.2 dB and TE1 insertion loss about 0.5-3 dB, and the crosstalk is better than ~30 dB.

W3A.119 Measurement of the Threshold of Stimulated Brillouin Scattering with Super-Gaussian-shaped Laser Pulses, Xuehua Zhu; Guangying Wang; Guangchen Dai; Haqun Hu; An Hu; Polytechnic Univ., China. We present a novel method for measuring the threshold of stimulated Brillouin scattering (SBS) from the waveform of reflected light with large-aperture super-Gaussian-shaped laser pulses.

W3A.120 Suppression of SRS in a two-stage 1090 nm fiber amplifier using chirped and tilted fiber Bragg gratings, Hiroshi Sugiyama; Kei Akira; University of Technology, Australia. We report here the suppression of stimulated Raman scattering in a 1090 nm two-stage fiber amplifier with chirped and tilted fiber Bragg gratings (CTFBG).

Room S421
14:00–15:30
Poster Session

Cleo Pacific Rim • 29 July–3 August 2018

CLEO Pacific Rim • 29 July–3 August 2018
W3A.126 Mode Converters Based on LPGs at 1 μm, Le Liu, Meng Wang, Xiaoming Xi, Zefeng Wang, National University of Defense Technology, China. Here we report a LPG, which was converted based on long-period fiber grating (LPFG) in a conventional two-mode fiber (TMF) operating at 1.5 nm. The mode converter was fabricated with point-by-point technique using a CO2 laser.

W3A.127 First-principles investigation of semiconductor-like MXenes, Qian Chen1, Weijun Fai1, Dang Ha Zhang1, Hanbin Su1, Jieheng Pan1, School of EE, Nanyang Technological University, Singapore; OPTIMUS, Centre for Optoelectronics and Biophotonics, LUMINOUS Centre of Excellence for Semiconductor Lightining and Displays, Nanyang Technological University, Singapore; School of Materials Science & Engineering, Nanyang Technological University, Singapore; 1, Materials Research and Engineering (IMRE), Agency for Science, Technology and Research (ASTAR), Singapore. MXenes are a large family of two-dimensional material composed of transition metal carbides or nitrides. This article gives theoretical investigation of a type of MXene that behave like semiconductors.

W3A.128 Frequency Noise Reduction of Injection-Locked Quantum Cascade Lasers, Xing-Guang Wang1, Bin-em Zhao1, Cheng Wang2, Zheng Li1, Min Chen1, Tianjin University, China. This work theoretically shows that the optical injection significantly reduces the frequency noise of quantum cascade lasers in the low frequency range. Frequency detunings close to the positive locking boundary enhance the frequency noise peak.

W3A.129 Application of High-reflectivity non-periodic Sub-wavelength Gratings with Small-angle Beam-steering Ability in Fabry-Perot Cavity, Shuyang Zhang, Xiaofeng Gu1, Zefeng Wang1, National University of Defense Technology, China. We report a high-power 1.5 μm gas laser using a methane-filled hollow-core fiber. The maximum average power is ~380 mW, which is about 20 times as much as the similar experiment reported.

W3A.125 High-efficiency GaAs photodetector enhanced by a near-infrared dipole antenna, Ywen Tang1,2, Beijing Univ. of Posts and Telecom, China. We present a plasma-enhanced PN photodetector structure based on a GaAs nanowire decorated with a half-wave Hertz dipole antenna. By increasing a factor of 100 in the responsivity due to the antenna resonance.

W3A.130 Analysis of collagen fiber orientation using rapidly-polarization-modulated second-harmonic-generation microscopy, Yuhui Xu1, Xiujie Fan1,2,3,4, Takayuki Suzuki1, Shunji Nakamura1, and Masaki Kawai1, University of Tokyo, Japan. We have developed a novel complex amplitude modulation method for the quantitative analysis of collagen fiber orientation in biological tissues.

W3A.131 Imaging and Spectral Analysis of Ultra-wide Bandwidth Optical Emission and Delayed Luminescence from Human Skin, Tori Iwasa1, Masaki Kawai1, Tohoku Inst. of Technology, Japan. Photoplasmon is spontaneous ultra-weak photon emission (UPE) from living body. Delayed luminescence is also UPE from living body but emission after visible light exposure. Both are associated with oxidative stress of the body. We have developed highly sensitive imaging and spectroscopic system for UPE and characterized them for diagnostic application.

W3A.132 A Study on the Sensitivity and Specificity of Tactile Sensation Induced by Pulse Laser, Hyang-Sik Kim1, Jin Ou1, Mi-Hyun Choi1, Soon-Chool Chung1, Biomedical Engineering, Konkuk University, Korea. Pulse laser of two energies was presented on the finger and the perceptual characteristic of the human response from the laser-based tactile sensation was observed.

W3A.134 Spectral Interferometry Based SPR Phase Response on the Non-resonant Wavelengths, Meng-Suyan Jian1, Ding-Zhang Xue1, Shih-Hua Hsiao1,2, Electronic and Computer Engineering, National Taiwan Univ. of Science and Technology, Taiwan. A real-time, high sensitivity and label-free spectral interferometry-based surface plasma resonator biosensor is demonstrated. We prove that the Mycobacterium tuberculosis (MTB) DNA can be captured by the immobilized (5×1011 DNA probe cells successfully. The system sensitivity is showing 10^-162 (rad/g/cm²) from the non-resonant wavelengths.

W3A.135 Dual low coherence scanning interferometer for rapidly measuring large step height and thickness, Jun Woon Jeon1, Hyo Mi Park2, and JiNam Joo2, Chosun Univ., Korea. In this investigation, spectrscopic interferometry using a LC-polymer crystal) type of doppler, named as spatially phase-retarded spectrometers (SPAS), is proposed to significantly raise the measurement speed compared to the typical spectroscopic interferometry.

W3A.136 Mode Density Multiplication of an Optical Fiber Composed of Phase Modulation 2, Taro Hasegawa1, Hidetsugu Kikuchi2, Keio Univ., Japan. We introduce a simple scheme for mode density multiplication of an optical fiber composed by square of an arbitrary integer phase with modulation. The mode density of Er fiber is multiplied by 4.

W3A.137 Piezoelectric Resonance Laser Calorimetry for Optical Absorption Testing of Crystal Boules, Georgi A. Adam1, Nika Kovalenko1, Ivan S. Datsyuk1, Aleksey Konyashkin1, Moscow Inst. of Physics and Technology, Russia; Kotelnikov Inst. of Radio-engineering and Electronics of RAS, Russia. Novel technique for measuring low optical absorption coefficients of massive crystal boules of arbitrary shape is proposed. The accuracy of the method was theoretically estimated.

W3A.138 An Simplified Distance Measurement Method Based on Optoelectronic Oscillator, Tanyuan Xie1, Xing Yang1, Ju Wang1, Zhiyang Xiong1, Chuan Ma1, Yang Yi1, Tianyu Li1, Tiantian Univ., China. We propose a long-range, high-precision distance measurement system with low complexity and cost based on optoelectronic oscillator. The relative accuracy measurement of 1.667 km is ±3×10^-9.

W3A.139 Real-time spectroscopic ellipsometry using a depolarizer, Jin Sub Kim1, Dae Hee Kim1, Ki-Nam Joo2, Chosun Univ., Korea. In this investigation, spectroscopic ellipsometry using a LC (Liquid crystal polymer) type of depolarizer, named as spatially phase-retarded spectrometers (SPAS), is proposed to significantly raise the measurement speed compared to the typical spectroscopic ellipsometry.

W3A.140 Development of a laser system for observation of light-induced drift of Cs atoms, Yuja Kusano1, Naitaka Nishiyama1, Leo Matsumaki1, Graduate School of Engineering, Hiroshima Univ., Japan. A laser system with a widely-tunable stabilized frequency suitable for observation of the light-induced drift was developed. The reference signal was obtained by dichroic atomic vapor spectroscopy over the range of 2 GHz.

W3A.141 Plasmonic-assisted Random Lasing in Perovskite Quantum Dots, Si O. Liu1, Jian He1, Kurlong Wang1, Desheng Yang1, Shu Feng1, Guang Yan1, The Hong Kong Polytechnic University, Hong Kong. Here we report a plasmonic all-inorganic perovskite 0D@NP quantum dot dyes for two photons random laser. The gold nanorods with good optical confinement and strong plasmonic enhancement properties formed randomly closed-loop cavities for the green random laser which are applied for speckle-free imaging.

W3A.142 Plasmonic Resonance Laser Calorimetry for Optical Absorption Testing of Crystal Boules, Georgi A. Adam1, Nika Kovalenko1, Ivan S. Datsyuk1, Aleksey Konyashkin1, Moscow Inst. of Physics and Technology, Russia; Kotelnikov Inst. of Radio-engineering and Electronics of RAS, Russia. Novel technique for measuring low optical absorption coefficients of massive crystal boules of arbitrary shape is proposed. The accuracy of the method was theoretically estimated.

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14:00–15:30
W3A • Poster Session

W3A.147 Tunable hybrid plasmonic split-ring resonator refractive index sensor for high FOM applications, Kishore K R1, Electronics And Communication Engineering, NIT TRICHY, India. We propose a hybrid plasmonic micro-ring resonator combining split-ring and photonic waveguide. The finite difference time domain analysis of the design exhibit strong field confinement and have a figure of merit of 216.67 which can be used for refractive index sensor applications.

W3A.148 Coupling of a metasurface with two non-coplanar and inter-perpendicular graphene nanoribbon arrays, Fang Chao 1, Jin T. Xie1, Qi Chang Ma1, Jin-Hong Park1, Chunhui Zhu1, Emmanuel Flahaut2, Fengqiu Wang3, School of Electronic Science and Engineering, Nanjing Univ., China; 2CNRS, Institut Carnot Carnot, France; 3Univeriste de Toulouse; UPS, INP, Institut Carnot Carnot; 118, route de Narbonne, F-31062 Toulouse cedex 9, France. We observed a novel phenomenon where single-wall carbon nanotube flexuorizations can be photo-actuated in liquids by either sunlight or laser irradiation. The light-actuation phenomenon is found highly repeatable.

W3A.149 Light-actuation of carbon nanotubes in liquids, Kye Lui1, Chuncha Zhu1, Emmanuel Flahaut2, Fengqiu Wang3, School of Electronic Science and Engineering, Nanjing Univ., China; 2CNRS, Institut Carnot Carnot, France; 3Univeriste de Toulouse; UPS, INP, Institut Carnot Carnot; 118, route de Narbonne, F-31062 Toulouse cedex 9, France. We observed a novel phenomenon where single-wall carbon nanotube flexuorizations can be photo-actuated in liquids by either sunlight or laser irradiation. The light-actuation phenomenon is found highly repeatable.

W3A.150 Highly Efficient Multilayer Rhenium Disulfide-based Homo- and Hetero-junction Photovoltaic Devices, Xiao-Lin Liu1, Jin-Hong Park1, Sungkyunkwan Univ., Korea. We demonstrated the photovoltaic devices based on ReS2 homo- and hetero-junctions. First, ReS2 based homo-junction photovoltaic device showed PCE of 2.4%. Furthermore, ReS2/WSe2 heterojunction exhibited high PCE of 12%.

W3A.151 Two-dimensional ReS2 nanosheets based saturable absorbers for passively mode-locked fiber lasers, Menggu Zhang1, Jin-Hee Yu1, Penguan Yan1, College of Optoelectronic Engineering, Shenzhen Univ., China. We propose and demonstrate a visible light communication based on orbital angular momentum multiplexing. The coaxial two signal channels achieve the transmission of the audio and video, which improve the capacity of the system.

W3A.152 Polarization-independent and wide-incident-angle absorber with periodically patterned graphene dielectric arrays, Gaige Zheng1, Xiu-juan Zou1, Nanjing Univ. of Information Sci. & Tech, China. A graphene optical absorber with periodically patterned grating is demonstrated. The proposed absorber exhibits polarization-insensitive behavior and maintains the high absorption above 90% within a wide range of incident angle (more than 80°).

W3A.153 Wearable Full-duplex Digital Transceiver for Underwater Optical Wireless Communications, Zixuan Wei1, Xin-Mu1, Hongyan Fu1, Tinghua-Berkeley Shenzhen Inst., China. We demonstrate an UOWC system with up to 235 Mbps at BER of 1.0×10^-3 over 11.5 meters in water which is based on a compact full-duplex digital transceiver by integrating commercial available blue-LED and APD.

W3A.154 A Multichannel WDM-PON System with Port Agnostic Tunable SFP+ Transceiver Modules, Yang Liu1, Da Li 1, Tiantian Zhang1, Jian-Jun He1, Zhejiang Univ., China. We demonstrate a WDM-PON system with port agnostic tunable SFP+ transceiver modules. With low-frequency digital transceiver by integrating commercial available blue-LED and APD.

W3A.155 Visible Light Communication based on Orbital Angular Momentum Multiplexing, Youpeng Xie1, Le Ting1, Zhan Shao1, Xiacong L. Yuan1, Shenzhen Univ., China. We propose and demonstrate a visible light communication based on orbital angular momentum multiplexing. The coaxial two signal channels achieve the transmission of the audio and video, which improve the capacity of the system.

W3A.156 Visible Frequency Comb in a Silica Microbubble Resonator, Shu Kausar1, Jonathan Ward1, Site Nic Chormaci1, Yong Yang1, OIST Graduate Univ., Japan; 2Aston Inst. of Photonic Technologies, UK. Kerr frequency comb generation in a microbubble resonator has its advantage in its manipulatability of the total dispersion of the cavity. Here we try to improve the comb so it include more comb lines and extend to shorter wavelength.

W3A.157 Photonic multiple microwave frequency measurement based on a swept frequency silicon microring resonator, Feng Zhou1, Hao Chen1, Xue Wang1, Unye Zhou1, Jian Dong1, Xinliang Zhang1. Wuhan National Lab for Optoelectronics, China; 2State Key Laboratory of Advanced Optical Communication Systems and Networks, Dept. of Electronic Engineering, Shanghai Jiao Tong Univ., China. A photonic multiple microwave frequency measurement system is presented based on a swept frequency silicon microring resonator. The measurement bandwidth, accuracy and multi-frequency resolution are 25 GHz, ±510 MHz and ±5 GHz, respectively.

W3A.158 A Tunable Narrowband Microwave Photonic Bandpass Filter With An Ultra-high-Q Silicon Microring Resonator, Huaying Qi1, Feng Zhou1, Yuhu Yao1, Shijun Yang1, Yuan Yu1, Xiao Xu1, Xinliang Zhang1. Wuhan National Lab for Optoelectronics, China; 2State Key Laboratory of Optical Communication Technologies and Networks, Wuhan Research Inst. of Posts & Telecommunications, China. A 170-MHz 3-dB bandwidth microwave photonic bandpass filter is achieved owing to utilize an ultra-high-Q as 1.14×10^12 of the silicon microring resonator. The central frequency could be tuned from 2.0 GHz to 18.4 GHz.

15:30–16:00 Coffee Break
Wednesday, 1 August
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

**Room S223**

**16:00–18:00**

**W4A • Advanced Light Sources II**

*Presider: Anting Wang; Univ. of Sci & Tech of China, China*

**W4A.1 • 16:00**

*Multi-GHz mode-locked Yb:YAG channel waveguide laser using SESAM and carbon nanotube saturable absorbers, Sun Young Choi1, Thomas Calmano2, Fabian Rotermund2, Clara Serafini2, Christian Kränkel2* Dept. of Physics, KAST, Korea; 3Institut für Laser-Physik, Universität Hamburg, Germany; 4Photonics and Ultrafast Laser-Science, Ruhr-Universität Bochum, Germany; 5Zentrum für Lasermaterialien, Leibniz-Institut für Kristallzüchtung, Germany. We demonstrated GHz modelocking of femtosecond laser inscribed Yb:YAG channel waveguide lasers using SESAM and single-walled carbon nanotube saturable absorber. Sub-2-ps pulses at multi-GHz repetition rates are generated from a dispersion-managed compact laser cavity with watt-level output powers.

**W4A.2 • 16:15**

*Growth, Characterization and Laser Operation of Tm3+ Na+ codoped CNGG (Tm,CNNGG) Disordered Garnet, Zhongyao Pan1, Huali Li2, Xianjun Dai1, Huaqiang Cai1, Josep Sorribes2, Xavier Mateos1, Magdalena Aguado1, Francesca D’Anta1, Kicheng Wang1, Yongguang Zhao1,2, Pavel Loko1, Uwe Griebner1, Valentin Petrov1, Max Born Inst., Germany; 4Inst of Chemical Materials, China; 5Universitat Autonoma de Barcelona, Spain.* Films are engineered to possess high Kerr nonlinearity and negligible two-photon absorption at telecommunications wavelengths. We demonstrate high-gain optical parametric amplifiers, wavelength conversion, slow light and supercontinuum devices.

**Room S224**

**16:00–18:00**

**W4B • Nonlinear Nanophotonics and Waveguides**

*Presider: Cornelia Denz; Westfaelische Wilhelms Univ Munster, Germany*

**W4B.1 • 16:00**

*High Nonlinear Figure of Merit Nonlinear Optics Leveraging Ultra-Silicon-Rich Nitride Devices, Dawn T. Tan1,2; Singapore Univ. of Technology & Design, Singapore.* Nonlinear optics leveraging CMOS-compatible, ultra-silicon-rich nitride devices is presented. Films are engineered to possess high Kerr nonlinearity and negligible two-photon absorption at telecommunications wavelengths. We demonstrate high-gain optical parametric amplifiers, wavelength conversion, slow light and supercontinuum devices.

**W4B.2 • 16:15**

*Chalcogenedine Planar Waveguides for Infrared Applications, Duk-Yong Choi1,2; Laser Physics Centre, Australian National Univ., Australia.* We demonstrated GHz modelocking of femtosecond laser inscribed Yb:YAG channel waveguide lasers using SESAM and single-walled carbon nanotube saturable absorber. Sub-2-ps pulses at multi-GHz repetition rates are generated from a dispersion-managed compact laser cavity with watt-level output powers.

**Room S225**

**16:00–18:00**

**W4C • Infrared and Terahertz Materials and Light Sources for High Performance Applications**

*Presider: Fabien Sorn; Ecole Polytechnique Federale de Lausanne, Switzerland*

**W4C.1 • 16:00**

*Flat Subwavelength Grating Achromatic Lens over Whole Visible Bandwidths, Yasha Peacock1,2; Univ. of Michigan, USA.* The achromatic micro grating lens covering the whole visible spectrum is demonstrated by utilizing relatively low index contrast gratings. Our work is promising for compact integrated nanophotonic devices on chip.

**W4C.2 • 16:15**

*Infrared and Terahertz Nanophotonic Devices, Jinan Univ., China.* The research on infrared and terahertz photonic devices is presented. Films are engineered to possess high Kerr nonlinearity and negligible two-photon absorption at telecommunications wavelengths. We demonstrate high-gain optical parametric amplifiers, wavelength conversion, slow light and supercontinuum devices.

**Room S226**

**16:00–18:00**

**W4D • Integrated Nanophotonic Devices**

*Presider: Xinlun Cai; Sun Yat-Sen Univ., China*

**W4D.1 • 16:00**

*Fiber Integrated Silicon Photonics, Anna C. Peacock1,2; Univ. of Southampton, UK.* This paper reviews the recent advancements in the fabrication and application of silicon core optical fibers. Particular focus is placed on novel materials and device designs for use in optical signal processing systems.

**W4D.2 • 16:15**

*Fiber Integrated Optical Frequency Combs Outside of the Metrology Lab: Opportunities and Beyond Spectroscopy, Pedro Martin-Mateo1, Pablo Acedo1,2; Universidad Carlos II de Madrid, Spain.* The rapid evolution of Electro-Optic Dual Comb spectrometer design during the last years has opened new opportunities for such powerful optical technique beyond the research/metrology lab that are reviewed in this work.

**Room S227**

**16:00–18:00**

**W4E • Fiber Devices I**

*Presider: John Canning; Univ. of Technology Sydney, Australia*

**W4E.1 • 16:00**

*Flat Subwavelength Grating Achromatic Lens over Whole Visible Bandwidths, Yasha Peacock1,2; Univ. of Michigan, USA.* The achromatic micro grating lens covering the whole visible spectrum is demonstrated by utilizing relatively low index contrast gratings. Our work is promising for compact integrated nanophotonic devices on chip.

**W4E.2 • 16:15**

*Infrared and Terahertz Nanophotonic Devices, Jinan Univ., China.* The research on infrared and terahertz photonic devices is presented. Films are engineered to possess high Kerr nonlinearity and negligible two-photon absorption at telecommunications wavelengths. We demonstrate high-gain optical parametric amplifiers, wavelength conversion, slow light and supercontinuum devices.

**Room S228**

**16:00–18:00**

**W4F • Fiber-Optic Dual Optical Frequency Combs**

*Presider: Xiaoguang Zhang; Beijing Univ. of Posts and Telecom, China*

**W4F.1 • 16:00**

*Fiber Optic Dual Comb spectrometer design during the last years has opened new opportunities for such powerful optical technique beyond the research/metrology lab that are reviewed in this work.*
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

**Room S423**

16:00–18:00  
**W4G • Holographic Technologies**  
Presider: Linbo Liu; Nanyang Technological Univ., Singapore

**Room S424**

16:00–18:00  
**W4H • Integrated Photonics**  
Presider: Andrew Poon; Hong Kong Univ of Science & Technology, Hong Kong

**Room S425**

16:00–18:00  
**W4I • Optical Signal Characterization**  
Presider: Leslie Rusch; Universite Laval, Canada

**Room S426**

16:00–18:00  
**W4J • Integrated Devices for Communications**  
Presider: Duncan MacFarlane; Southern Methodist Univ., USA

**Room S427**

16:00–18:00  
**W4K • Biophotonics and Applications V**  
Presider: Tuan Guo; Jinan Univ., China

**Room S428**

16:00–18:00  
**W4L • Fiber Devices & Sensing II**  
Presider: Zinan Wang; Univ. Electronic Sci. & Tech. of China, China

**W4G.1 • 16:00 Tutorial**  
Displaying Digital Holograms on Phase-only Devices, Peter Tsang1; 1City Univ. of Hong Kong, Hong Kong. A number of methods for generating phase-only hologram (POH) are reviewed in this tutorial. These works share the common advantage that the POHs generated can be displayed directly on a single phase-only spatial light modulator.

**W4H.1 • 16:00 Invited**  
Quantum Communication using Integrated Silicon Photonics, Shayan Mookherjea1; Univ. of California San-Diego, USA. Silicon microring resonators have made major recent improvements in high-quality entangled photon pair generation, with CAR > 19,000 and g2(0) < 0.006. They are now being used in prototypical quantum optical communication links.

**W4I.1 • 16:00 Invited**  
Image Processing Techniques for Signal Processing in Optical Communication Systems, Tianwei Bu1; Calvin C. K. Chan2; Hoon Kim3; ‘School of Electrical Engineering, Korea Adv-anced Inst. of Science and Technology (KAIST), Korea; ‘Dept. of Information Engineering, The Chinese Univ. of Hong Kong, Hong Kong. We review the image processing techniques for signal processing in optical communication sys-tems. Their applications in optical performance monitoring and compensation of common phase error are discussed in terms of imple-mentation complexity and system performance.

**W4J.1 • 16:00 Invited**  
Hybrid Photonic Integration and Plasmonic Devices - New Perspectives for High-Speed Communications and Signal Processing, Christian Koos1, Sebastian Randel1, Wolfgang Freude1, Larry R. Dalton2, Stefan Wolf2, Clemens Kieninger1, Yasar Kutuvantavida1, Matthias Lauer-mann1, Delwen Elder1, Sascha Muehlbradt1, Heiner Zwicktal1, Argishti Melkyan1, Tobias Harter1, Sandeep Ummedhara1, Muhammad R. Bitla1, Matthais Blachter1, Philipp I. Dietrich1, Tobias Hoese1; Karlsruhe Inst. of Technology (KIT), Germany; ‘Univ. of Washington, USA. Hybrid photonic integration allows to combine the advantages of different material platforms while maintaining the scalability advantages of monolithically integrated systems. Here we give an overview on our research in the field of hybrid integration, combining multi-chip approaches on a package level with hybrid on-chip integration.

**W4K.1 • 16:00 Invited**  
New Progress of Photoacoustic Imaging Technology in Biomedical Applications, Da Xing1, Sihua Yang1; 1South China Normal Univ., China. This report presented the new progresses in photoacoustic dermoscopy, all-optical photoacoustic microscopy, intravascular photoacoustic tomography, photoacoustic elastography and viscosity imaging toward biomedical and clinical applications.

**W4L.1 • 16:00 Invited**  
Specialty Few Mode Fiber and Its Application, Songnan Fu1; Huazhong Univ of Science & Technology, China. We review the design, fabrication and characterization of several specialty few mode fibers (FMFs) in-cluding elliptical-core FMFs (FMF), pandatype FMF (pFMF), and panda type e-FMF (pFMF). Those specialty FMFs and its corresponding applications have lots of potentials to be further exploited.
Wednesday, 1 August

**W4A** • Advanced Light Sources II—Continued

W4B.2 • 16:30
Optical Pulse Generation Using Fast Graphene Saturation Absorbers on Silicon Waveguides

**W4C** • Nonlinear Nanophotonics and Waveguides—Continued

W4B.3 • 16:45
Passively mode-locked Thulium-doped nanengineered Yttrium-Alumina Silica fiber laser

**W4D** • Infrared and Terahertz Materials and Light Sources for High Performance Applications—Continued

W4C.2 + 16:30
Invited
Lithium Niobate Nanophotonics for Ultra-fast Optoelectronics, Chang Wang1,2,3,4, City Univ. of Hong Kong, Hong Kong, The Chinese Univ. of Hong Kong, Hong Kong. We demonstrate a nanophotonic lithium niobate platform that simultaneously features sub-wavelength optical confinement, ultralow optical propagation loss and ultra-fast electro-optic control capability (> 108 GHz). These devices are promising for future chip-scale ultra-fast optoelectronic interface.

**W4E** • Integrated Nanophotonic Devices—Continued

W4D.2 • 16:30
Genetic-algorithm-optimized wideband on-chip polarisation rotator with an ultrasmall footprint, Zeyu Yu1,2, Harshan Cui3, Xiankai Sun2,4, The Chinese Univ. of Hong Kong, Hong Kong. With a genetic algorithm, we designed an on-chip TES-TMR polarization rotator with a footprint of 0.96 μm×4.2 μm and experimentally demonstrated its conversion loss of ~2.5dB and extinction ratio of ~10dB in the wavelength range of 1440–1580nm.

**W4F** • Fiber Devices I—Continued

W4E.2 • 16:30
Optical Nanofibers for Fiber-in-line Quantum Photonics, Kohzo Hikata1, Ramachandranarasu Yallu2, K. Muhammad Shafi1,1, 2 The Univ. of Electro-Communications, Japan. Recent progress in quantum photonics with optical nanofibers (ONFs) is reported. Emphasis is on the photon channeling into the fiber guided modes for a hybrid system of an ONF cavity and a single quantum emitter.

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

**W4G** • Holographic Technologies—Continued

**W4H** • Integrated Photonics—Continued

**W4I** • Optical Signal Characterization—Continued

**W4J** • Integrated Devices for Communications—Continued

**W4K** • Biophotonics and Applications V—Continued

**W4L** • Fiber Devices & Sensing II—Continued

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**W4G.2 • 16:30**
An ultra-compact multimode waveguide crossing based on subwavelength asymmetric Y-junction, Weijie Chang1, Luluzi Lu1, Deming Liu1, Minming Zhang1; Huazhong Univ. of Science and Technology, China. An ultra-compact multimode waveguide crossing composed of a pair of asymmetric Y-junctions based on subwavelength structures is proposed and demonstrated with a footprint of 34 × 34 μm², low insertion loss < 1.5 dB.

**W4H.2 • 16:30**
OSNR Monitoring and Modulation Format Recognition Based on Neural Networks and Normalized Autocorrelation Function, Zhili Huang1, Jiong Qu1, Honghang Zhou1, Xue J1, Jiu Wu1; Beijing Univ. of Posts and Telecom., China. We experimentally demonstrate the use of neural networks in combination with normalized autocorrelation function (NACF) of noisy signal for simultaneous optical signal to noise ratio (OSNR) monitoring and modulation format recognition (MFR).

**W4I.2 • 16:30**
OSNR Monitoring and Modulation Format Recognition Based on Neural Networks and Normalized Autocorrelation Function, Zhili Huang1, Jiong Qu1, Honghang Zhou1, Xue J1, Jiu Wu1; Beijing Univ. of Posts and Telecom., China. We experimentally demonstrate the use of neural networks in combination with normalized autocorrelation function (NACF) of noisy signal for simultaneous optical signal to noise ratio (OSNR) monitoring and modulation format recognition (MFR).

**W4J.2 • 16:30**
O-L band bias-free high-speed UTC-PD for advanced optical fiber communications, Toshimasa Umezawa1, Atsushi Kanno1, Kouichi Akahane1, Atsushi Matsumoto1, Naokatsu Yamamoto1; National Inst of Information & Comm Tech, Japan. We present an O-L band high-baud-rate UTC-PD excluding a bias circuit, which can be operated at zero bias. The 100 Gbaud (NRZ) good eye diagram performances were confirmed for 1320 nm and 1550 nm.

**W4K.2 • 16:30**
Invited Super-resolution Dipole Orientation Microscopy, Peng Xi1, Karl Zhanghao1, Long Chen1, Juntao Gao2; Dept. of Biomedical Engineering, Peking Univ., China; Dept. of Automation, Tsinghua Univ., China. With the modulation of fluorescent excitation polarization, here we report a novel super-resolution microscopy technique in which the orientation of the fluorophores can be mapped in addition to super-resolution imaging.

**W4L.2 • 16:30**
Invited Multicore Optical Fiber Sensors, Rodrigo Amezcua Correa1, E. Antonio-Lopez1, O. Arrizabalaga2, J. Zubia2, A. Schülzgen1, J. Villatoro3; Univ. of Central Florida, CREOL, USA; Dept. of Communications Engineering, Escuela de Ingenieria de Bilbao, Univ. of the Basque Country (UPV/EHU), Spain; IKERBASQUE—Basque Foundation for Science, Spain. We review recent multicore optical fiber-based interferometric sensors for vibration, strain and temperature monitoring. Simple, highly sensitive sensors operating in reflection and transmission mode have been fabricated using short segments of strongly coupled core MCFs.

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**W4H.3 • 16:45**
Improved CMOS compatible photonic crystal demultiplexer, Shangji Jin1, Yuta Ooka1, Tomohiro Tetsutomo1, Nurul A. Daud1, Naotaka Kamisaka1, Taku Okamura1, Takasumi Tanabe1; Keio Univ., Japan. We optimized a compact photolithographically fabricated photonic crystal DeMUX and obtained flat and high transmittance between channels. A thermal analysis showed that a footprint of 110 μm²/ch is possible with PhC technology.

**W4I.3 • 16:45**
Joint Modulation Format, Bit-Rate and OSNR Identification Using Cascaded Deep Neural Networks, Yuanxiang Chen1, Yongtao Huang1, Kaile Li1, Jianguo Yu1; Beijing Univ. of Posts and Telecommunications, China. Cascaded deep neural networks model trained with signal amplitude histograms is developed for joint optical modulation format, bit-rate and OSNR identification. The averaged joint identification accuracy is 98.78% for four modulation formats.

**W4J.3 • 16:45**
A Horn-Waveguide Asymmetric RSOA as Colorless Transmitter in WDM-PON with Reduced Crosstalk, Chengliang Zuo1, Xun Li2; Huazhong Univ. of Science and Technology, China; McMaster Univ., Canada. A horn-waveguide reflective semiconductor optical amplifier was studied. Experimental results reveal that it can reduce downstream extinction ratio from 5 dB to 1.2 dB, and a 5 Gbps upstream signal was reloaded with clear eye-opening.
Wednesday, 1 August

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

Room S223

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Room S228

W4A • Advanced Light Sources II—Continued

W4A.5 • 17:00
1GHz harmonic mode-locked fiber laser using carbon nanotubes film saturable absorber, Qianqian Huang1, Chunheng Zou1, Tiansheng Wang1, Mohammed Al-Araimi1, Alkis Bayraktar1, Chengbo Mou1; Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China; 1Aston Inst. of Photonics Technologies, Aston Univ., UK; 2Alston Inst. of Photonics Technologies, Aston Univ., UK; 3’AI Musanna College of Technology, Oman; 4Vrije University, Brussels, Belgium. Absorption and transmission of 1GHz pulses at the 34th harmonic waveguide with 41GHz super-mode suppression ratio can be generated.

W4A.6 • 17:15
LD pumped Q-switched Nd:YAG slab laser with stable output within temperature range of 30 - 50 degrees centigrade, Wei Xu1, Xiaozhou Xu1, Xiaochao Zhou1, Dinghao Huang1, Song Ji1, Xiaoyong Gao1, Zhiyao Gu1, Shreyas L. Talukdar1, Ravi P. Singh2; 1Shanghai Inst. of Optics and Fine Mechanics, Chinese Academy of Sciences, China; 2Institut Foton, France. A novel dual-mode DFB semiconductor laser, which emits two pulse trains with different time delays, is demonstrated. Harmonic mode competition in the laser.

W4B • Nonlinear Nanophotonics and Waveguides—Continued

W4B.4 • 17:00
32Gbps physical random bit generation from chaotic optoelectronic oscillator with silicon modulator, Wenyong Tian1,2, Lei Zhang1, Jianfeng Ding1, Xin Fu1, Lin Yang1,3; 1State Key Laboratory on Integrated Optoelectronics, Inst of Semiconductors, Chinese Academy of Sciences, China; 2College of Materials Science and Optoelectronic Technology, Univ. of Chinese Academy of Sciences, China. We demonstrate a physical random bit generation scheme based on a chaotic optoelectronic oscillator with silicon Mach-Zehnder modulator. The randomness of the 32Gbps sequence after two self-delay XOR operations is verified with NIST statistical tests.

W4B.5 • 17:15
Characterization of Acoustic Phonons in InGaAsP MQW by Asynchronous Optical Sampling, Kenichi Hisachi1, Mayu Someya1,2, Shinya Nishikawa1, Tatsuhiko Gotoh1, NTT Basic Research Laboratories, Japan; 1Tokyo Denki Univ., Japan. We measured transient reflectivity in an InGaAsP multi-quantum well by asynchronous optical sampling with an Er-doped fiber laser. The oscillation in longitudinal acoustic phonons induced by resonant Raman scattering lasts more than 1 ns.

W4B.6 • 17:15
Temperature-driven phase transitions in silicon photonic nanowire devices, Yingli Zou1,2, Zhiyuan Pan1,2, Wenjing Fan1,2, Weibiao Chen1,2, John Marsh1,2,3, Lianping Hou1,4, Zebin Zhu1,2, Yuqing Li1,2, Xin Zhao1,2; 1State Key Laboratory of Infrared and Laser Engineering, Univ. of Electronic Science and Technology of China, China; 2Division of Advanced Innovation Center for Big Data- and Cloud-based Precision Medicine, China. A precise and in-situ measurement of diameter of optical nanofibers (ONFs) is presented. Mounting a commercial micron-scale-period ruled grating on ONFs forms a high-order Bragg reflector, making possible convenient diagnosis of the ONF diameter.

W4C • Infrared and Terahertz Nanophotonics and Applications—Continued

W4C.4 • 17:15
Dual-comb 1.5 µm distributed-Bragg-reflector mode-locked laser at 20 MHz repetition rate, 100084, China, China; 2Division of Advanced Manufacturing, Graduate School at Shenzhen, Tsinghua Univ., Shenzhen 518055, China, China. We present an angle measurement method of dual-comb interferometry which uses a grating and a corner cube combined sensor. The precision is better than 10 arc-seconds within 3000 arc-seconds and 30 arc-seconds within 7800 arc-seconds.

W4D • Integrated Nanophotonic Devices—Continued

W4D.5 • 17:15
High Quality Factor Deuterated Silicon Nitride (Si3N4) Microroring Resonators, Zexing Wu1,2, Zengkai Shao1,2, Zihan Xu1,2, Yanfeng Zeng1,2; 1Huazhong Univ. of Sci. and Tech., China; 2Shenzhen University, China. A silicon deuterated microresonator fabricated by low-temperature plasma-deposition technique with high intracavity quality factor of up to 1.2 x 10^11 at 1547.6 nm, and >0.8 x 10^11 throughout 1500 - 1600 nm.

W4E • Fiber Devices I—Continued

W4E.3 • 17:00
Diameter Measurement of Optical Nanofibers by Using a Commercial and Standardized Ruled Grating, Ming Zhu1,2, Zhe Zhang1,2, Junhua Wu1,2, Jie Chen1,2, Zhe Zheng1,2; 1School of Electronic and Information Engineering, Beihang Univ., China; 2Beijing Advanced Innovation Center for Big Data- and Cloud-based Precision Medicine, China. Dual-comb absorption spectroscopy is realized by using a dispersion-managed, hybrid mode-locked fiber laser, which emits two pulse trains with different bandwidths due to hybrid pulse formation mechanisms.
Two-channel polarization holography and angular multiplexing techniques are presented, including capacity for holographic mass-data storage. We demonstrate the unidirectional propagation of several micrometers were fabricated. Excel lent MIR optical waveguiding properties were obtained experimentally with waveguiding losses of several dB/cm, which demonstrated reasonable simplified polarization modeling for fiber channel, we propose a window-split frequency domain Kalman scheme to equalize the signal distortion induced by combined large DGD (more than 200 ps) and fast RSOP (up to 2 Mrad/s).

We demonstrate a temperature sensor by splicing a short highly germanium-doped fiber to a single mode fiber with a bow-tie-type taper. The sensor possesses miniature size of 1.4 mm and high sensitivity of 100 ppm/°C.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
Incoherent Digital Holography Adaptive Imaging by phase Diversity, Yuhong Wan, Hongqiang Zhou, Tianlong Man; Beijing Univ. of Technology, China. We developed an adaptive imaging technique by Fresnel incoherent digital holography combined with phase diversity (PD-FINCH). The experimental results demonstrated the improvement of reconstructed image quality after adaptive wavefront aberration compensation.

Characteristics of DNA Biopolymer Devices, Yamaoka Shuhei1,2, Na Zhang1, Cheungchuen Yu3,4, Na Zhang3, Cheungchuen Yu3; 1Beijing Univ. of Posts and Telecom., China; 2Centre of Advanced Microelectronic Devices, National Univ. of Singapore (Singapore) Research Inst., Singapore; 3Anlight Optoelectronics Research Inst., China; 4Dept. of Electronic and Information Engineering, The Hong Kong Polytechnic Univ., Hong Kong. A pair of integrated optical chips is proposed for short WDM transceiver. One is emitting at 848.1nm and receiving at 805.3nm, while the other is emitting at 805.3nm and receiving at 848.1nm.

Novel FM-Noise Spectrum Measurement Based on Three-Wave Interference, Shuei Tamadaki1, Yoichi Morii1, Hiroshi Hasegawa1; 1Inst. of Photonics Technologies, National Tsing Hua Univ., Taiwan. We present both resonant switching and electrochromatic characterizations in a transparent DNA biopolymer-based device. The device exhibits an on/off ratio of ~100 at 0.4V and more than 20% change in transmittance under applied voltages.

Proposal of Integrated-Optical Circuit for Recognition of 8PSK-Coded Label for Photonic Label Routing, Derrick Yang1, Ahmad Amirul Abdullah Rahim2, Jeselynong3, May Win Naing4; 1Precision Measurements Group, Singapore; 2Inst. of Mtg Tech, Singapore; 3Micromanufacturing Programme, Singapore Inst. of Mtg Tech, Singapore; 4Dept. of Electronic and Information Engineering, The Hong Kong Polytechnic University, Hong Kong. We propose and demonstrate a simple vector bending sensor based on polarization dependent supermodes interference in a high birefringence two-core photonic crystal fiber. The bending responses of both two polarizations depend on the bending direction.
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<td>S224</td>
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<td>Th1A • Novel Laser Sources I&lt;br&gt;Presider: Zhichao Luo; South China Normal Univ., China</td>
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<td>S225</td>
<td>08:30–10:00</td>
<td>Th1B • Nonlinear Spectroscopy and Imaging&lt;br&gt;Presider: Jinhui Yuan; Beijing Univ of Posts and Telecomm, China</td>
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<td>S226</td>
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<td>Th1C • Frequency Control and Measurement for Optical Metrology&lt;br&gt;Presider: Bowen Li; Univ. of Hong Kong, Hong Kong</td>
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<td>S227</td>
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<td>Th1D • Quantum Information Processing II&lt;br&gt;Presider: Guofeng Zhang; The Hong Kong Polytechnic Univ., Hong Kong</td>
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<td>S228</td>
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<td>Th1F • Metamaterials and Meta-devices&lt;br&gt;Presider: Xifeng Ren; Key laboratory of quantum information, China</td>
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These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

08:00–18:00 Registration, S221 Foyer of HKCEC

08:30–10:00

**Th1G • 2D Nonlinear Materials**

**Presider: Han Zhang, Shenzhen Univ., China**

**Th1G.1 • 2D Nonlinear Optical Materials, Jun Wang**

Shanghai Inst of Optics and Fine Mech, China; D Nonlinear Optical Materials, Jun Wang; Cogenides (TMDCs) (MoS2, WS2, MoSe2, WSe2) in four types of layered transition metal dichalcogenides (TMD/Cs): The saturation of two-photon absorption (TPA) is an important parameter that determines the nonlinear response of 2D materials. In this work, we report the saturation of TPA in these materials, and the results show that the saturation is greatly enhanced in few-layered Cogenides (TMDCs).

08:30–10:00

**Th1H • Nanostructures for Optoelectronic Applications**

**Presider: Xuming Zhang; The Hong Kong Polytechnic Univ., Hong Kong**

**Th1H.1 • 08:30**

Tunable Amplified Spontaneous Emission and Lasing from All-inorganic Perovskite Nanocube, Zhenghang Liu1, Zhiguo Wang2, Tongchao Shi1, Zeyu Zhang1, Juan Du1, Yuxin Leng1; Shanghai Inst of Optics and Fine Mech, China; Changxing Univ., China. We report high-quality and low-threshold lasing, enhanced stability, and excellent wavelength tunability from a facile solution-processed sub-wavelength size of cesium lead halide perovskite CsPbX3 (X= I/Br) nanocubes under both one- and two-photon excitation.

**Th1H.2 • 08:45**

High-Q Nanocavity-Based Raman Laser Fabricated on a (100) SOI Substrate with a 45-Degree-Rotated Top Silicon Layer, Nakho Yamauchi1, Makoto Okano1, Susumu Noda1, Yasushi Takahashi1; Osaka prefecture Univ., Japan; National Inst. of Advanced Industrial Science and Technology, Japan; Kyute Univ., Japan. We report a low-threshold Raman laser based on nanocavities fabricated on an improved (100) SOI substrate with a 45-degree-rotated top silicon layer. We consider that this SOI substrate enables mass production of silicon Raman lasers.

08:30–10:00

**Th1I • Probabilistic Signal Shaping**

**Presider: Fan Zhang; Peking Univ., China**

**Th1I.1 • 08:30**

Simultaneous RSOCP and Carrier Phase Noise Equalization for Probabilistic Shaping QAM Signals Based on Extended Kalman Filter, Naman Zhang1, Gaoxiang Zhang1, Zhibin Zheng1, Nan Cui1, Wenzhong Zhang1; Hongxiang Xu1, Xiangfeng Tang1, Lina Xi, Xiaoguang Zhang1; Beijing Univ of Posts & Telecom, China. We propose a joint equalization method for rastion station of polarization (RSOP) and carrier phase noise (CPN) utilizing EKF for probabilistic shaping (QAMPS-QAM). The influences of RSOCP and CPN are analyzed by numerical simulation.

08:30–10:00

**Th1J • Waveguides and Sensors**

**Presider: Songnian Fu; Huazhong Univ of Science & Technology, China**

**Th1J.1 • 08:30**

Monolithically Integrated 3D Silicon Photonics, Joyce K. Poon1; Electrical and Computer Engineering, Univ. of Toronto, Canada. I will review multi-layer silicon nitride-on-silicon (SiN-on-Si) photonic platforms that incorporate several SiN waveguide layers on top of an active Si waveguide layer. These 3D photonic platforms enable very large-scale photonic circuits.

08:30–10:00

**Th1K • Display Technologies**

**Presider: Toyohiko Yatagai; Utsunomiya Univ., Japan**

**Th1K.1 • 08:30**

Volumetric Bubble Display, Yoshihiro Haysakai1, Keta Kumagai1; Utsunomiya Univ., Japan. Volumetric bubble display using high viscosity liquid is presented. The bubbles are produced by the holographic parallel femtosecond laser pulse excitations.
<table>
<thead>
<tr>
<th>Th1A.2 • Novel Laser Sources I—Continued</th>
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<tbody>
<tr>
<td><strong>Th1.2 • 09:00</strong></td>
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<tr>
<td><strong>Th1.3 • 09:15</strong></td>
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<td><strong>Th1.4 • 10:00</strong></td>
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<td><strong>Th1.5 • 10:45</strong></td>
</tr>
</tbody>
</table>

**These concurrent sessions are grouped across two pages. Please review both pages for complete session information.**
Mitetelo2, Tatiana Murzina2, Muhammad Butt3, shina1, Yuriy Petrov1, Iliya Kolesnikov1, Nikolai Alina A. Man...

2D carbon allotrope with incorporated Au nanoclusters – laser-induced synthesis and optical characterization, Alina A. Manchina1, Yury Petrov2, Illya Kolesnikov2, Nikolai Mantaka2, Tanana Muzina2, Muhammad Butt2, Martin Neugebauer3, Peter Banzer3, Gerd Leuchs4

We report here a simple approach to precisely control the lasing and hybrid plasmonic laser (spaser) actions based on MAPbX3 perovskite nanosheets by tailoring the substrate.

Morita Ryohei 1, Yoshinori Tanaka 1, Susumu Morita 1; 1Kyoto Univ., Japan. We demonstrate self-pulsing with a pulse width of 100 ps and a beam divergence angle of 0.35° in a photonic-crystal surface-emitting laser by introducing a saturable absorber section and employing a new double-hole photonic crystal.

We report a crypto-display metasurface features for Crypto-Display, Yung-Min Pai1, chih-hao Lin1, Huang-Yi2, Tzu-Chang Hsueh1, Yu Lin1, Chun-Fu Lee 1, cheng-huan CHEN 1, Hao-Chung Kuo1; 1National Chiao Tung Univ., Taiwan. We verified our analysis and show a lower BER performance compared with the conventional median threshold.

Yang Zhang1, Wenjing Zhou2, Xiang Gao2; 1Univ. of Electronics and Information Engineering, Beihang Univ., China; 2Beijing Advanced Innovation Center for Big Data-based Precision Medicine, China. We proposed a probabilistic shaped QC-LDPC coded modulation scheme with the same total overhead.
Thursday, 2 August

Th1A • Novel Laser Sources—I—Continued

Th1A.4 • 09:30

Wavelength tunable carbon nanotube mode-locked fiber laser based on an all-fiber birefringent filter, Bingbing Lu1, Chuanzhang Zou1, Qunping Huang1, Zhiyu Yan1; Mohammed AlKharrat2, Alasayk Roshan2, Chengba Mou1; Key Lab of Specialty Fiber Optics and Optical Access Networks, Shanhai Univ., China; School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China; 2Aston Inst. of Photonic Technologies, Aston Univ., UK

We propose and study an FDML laser with ultrafast spin dynamics with nanometer spatial and femtosecond temporal resolution using a lab-scale source.

Th1B • Nonlinear Spectroscopy and Imaging—Continued

Th1B.4 • 09:30

Magnetic sub-Wavelength Imaging using High-Harmonic Radiation, Sergey ZavjalOve; Olle Kihl1, Michael Heilig1, Murat Sivis1, Manfred Albrecht2; Claas Reifer2; 1IV. Physical Inst.; Solid and Nanostructures, Univ. of Göttingen, Germany; 2Inst. of Physics, Univ. of Augsburg, Germany. We demonstrate nanoscale magnetic imaging with sub-20 nm spatial resolution using high-harmonic radiation. This first demonstration will allow for comprehensive studies of ultrafast spin dynamics with nanometer spatial and femtosecond temporal resolution using a lab-scale source.

Th1C • Frequency Control and Measurement for Optical Metrology—Continued

Th1C.4 • 09:30

Frequency-Stabilized Pump Laser for Wavelength Conversion in Long-Distance Quantum Communication, Kohki Ikeda1, Yuusuke Haisa1, Tomoyuki Hanaki1, Kazumichi Yodohi1, Hides Kosa1, Feng Lei-Hong1; Yokohama National Univ., Japan. We develop a compact frequency-stabilized laser at 1064 nm for wavelength conversion in long-distance quantum communication. Line-width and frequency stability are demonstrated to be sufficient to connect nitrogen-vacancy centers in diamond in remote nodes.

Th1D • Quantum Information Processing II—Continued

Th1D.4 • 09:30

Witness assisted eigenspectrum solver on a silicon quantum photonic simulator, Antonio Gentile1, Raffaele Santagati1, Janwes Wang1, Stefano Pascazio1, Nathan Wiebel1, Jarrod McClean2, Damien Bonneau1, Joshua Silverstone1, Sam Morley-Short1, Peter Shadbolt1, David You1, Xueqiang Zhou1, Jeremy O’Brien1; 1School of Physics and Astronomy, 2Microsoft Research, Canada. We develop a compact quantum lab-scale source. We demonstrate quantum mutual communication. Linewidth and frequency-stabilized laser at 1064 nm for quantum communication will allow for comprehensive studies of ultrafast spin dynamics with nanometer spatial and femtosecond temporal resolution using a lab-scale source.

Th1E • Fiber Devices II—Continued

Th1E.5 • 09:45

Tunable Conducting Oxide Epsilon-Near-Zero Meta-Devices, Aleksei Anopichkin1, Long Tao2, Sudip Gurung2, Yingfang Wang2, Suhaijai Bej3, Catherine Arndt1, Ho Wai H. Lee1; 1Dept. of Physics, Baylor Univ., USA; 2The Inst. for Quantum Science and Engineering, TexasAM, USA. This talk will review our recent development on an electrically tunable conducting oxide metasurface that can tune the optical phase and amplitude of a broadband, tunable, and ultrathin conducting oxide epsilon-near-zero metaabsorber.

Th1F • Meta-devices—Continued

Th1F.4 • 09:45

A High-Index Ring Core Layer for Highly Sensitive Micro Fiber Mach-Zehnder Temperature Sensors, Xian Li1, Yu Jian Hu1, Nan-Kuang Chen2, Xiaoguang Zhang1, Liva Xi1, Hu Zhang1, State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 2National United Univ., Taiwan; 3Shandong Provincial Key Laboratory of Optical Communication Science and Technology, LiaoZong Univ., China; 4School of Physics Sciences and Information Technology, LiaoZong Univ., China. We demonstrate micro-fiber Mach-Zehnder interferometric temperature sensors based on tapered ring core fiber with a thinned high-index ring structure to separate core and cladding modes to improve the temperature sensitivity up to 60 ppm/°C.

Th2A.5 • 09:45

Fourier domain mode-locked lasers with an optical intensity modulator, Xiaolong Yuan1, Feng Liu1, Qian Li1, P. K. A. Wai2, Mohammed AlKharrat2, Alasayk Roshan2, Chengba Mou1; Key Lab of Specialty Fiber Optics and Optical Access Networks, Shanhai Univ., China; School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China; 2Aston Inst. of Photonic Technologies, Aston Univ., UK

We propose and study an FDML laser with ultrafast spin dynamics with nanometer spatial and femtosecond temporal resolution using a lab-scale source.

Th2B • Nonlinear Optics and Imaging

Th2B.4 • 09:30

High-Resolution No-Scanning 3D Image Detection Using Sum-Frequency Generation of Chirped Optical Frequency Combs, Y Furuta1, Takanori Ishii1, Toshihiko Kino1, Yukihiro Ohtake1, Kenji Nomoto1, Toshiyuki Ando1, Tetsuyuki Yamashita1; 1National Inst. of Information and Communications Technology, Japan. We demonstrate nanoscale magnetic imaging with sub-20 nm spatial resolution using high-harmonic radiation. This first demonstration will allow for comprehensive studies of ultrafast spin dynamics with nanometer spatial and femtosecond temporal resolution using a lab-scale source.

Th2C • Quantum Information Processing I—Continued

Th2C.5 • 09:45

Volatile organic gas recognition with an on-chip microcavity Fabry-Perot interferometer, Ting Hao1, Yu-Jian Hu2, Nan-Kuang Chen3, Cen Xia1; 1Univ of Electronic Science and Technology of China, China; 2Electronic Engineering, Shandong Univ., China; 3Shandong Provincial Key Laboratory of Optical Communication Science and Technology, LiaoZong Univer.; China. We demonstrate an infrared gas micro-photonic sensor coated with ZIF-8, which can absorb different gases and cause significant shifts of the interference fringes of the MZI.
ellipsometry, optical constants of monolayer MoS2 are extracted from experimental data modelling the surface current model, and compare the two theories for the first time. Their applications have been demonstrated for sub-band multi-photon detections.

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
We review recent results on cascaded Raman fiber lasers (RFLs) with broadband random distributed feedback (RDFB) enabling tuning in 1-2 micron range, and directly diode-random distributed feedback (RDFB) enabling Raman fiber lasers (RFLs) with broadband properties for a wide range of applications. However, careful compositional tuning can render fibers with far more remarkable properties for a wide range of applications.

We demonstrate new dissipative Kerr soliton formation route for the lowest optical fiber loss ever. We report on ultra-low loss fibers for the mid-infrared and the ultraviolet, the absence of solitonation, mid-IR gas lasers and prospects for the lowest optical fiber loss ever.

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
Th2A.3 • 11:15
Sub-70fs generation from passively mode locked Erbium doped fiber laser using 45° tilted fiber grating. Tianting Wang1, Zhiyuan Yan1, Qianqian Huang1, Chuanhang Zou1, Chengbo Mou1, Kaming Zhou2, Lin Zhang2, Key Laboratory of Specialty Fiber Optics and Optical Access Networks, Shanghai Univ., China; 2School of Optical and Electronic Information, Huazhong Univ. of Science and Technology, China. We have demonstrated an all-fiber Erbium doped ultrafast laser by inserting a 45° tilted fiber grating. After optimizing the balance between intra-cavity nonlinearity and dispersion, an ultrashort pulse with sub-70 fs pulse duration can be achieved.

Th2A.4 • 11:30
Elegant modes of confocal laser resonators with OAM and its intracavity self-healing properties. Alfredo J. James-Najera1, Songjie Liu1, Jianrong Fu1, Sabino Chávez-Cerda1; INAOE, Mexico; 2Fujian Provincial Key Laboratory of Information Science and Engineering, Huqiao Univ., China. Elegant beams were introduced as a variant to standard Gaussian beams that are not eigenmodes of confocal cavities. We remove this asymmetry by superposing a finite number of elegant Laguerre-Gauss beams, rendering a new family of angle pass cavity eigenmodes.

Th2B • Solitons and Temporal Wave Guiding, and Frequency Comb—Continued

Th2B.3 • 11:15
Strong resonant radiation limits Kerr cavity soliton existence in longitudinally modulated resonators. Alexander U. Nielsen1, Bruno Garbi2, Stephanie Coen1, Stuart G. Murdoch1, Miro J. Eckert1, 1The Dodd-Walls Centre for Photonic and and Quantum Technologies, Dept. of Physics, The Univ. of Auckland, New Zealand. We have experimentally and numerically studied the effects of dispersion management on temporal Kerr cavity solitons. We find that the solitons can parametrically excite strong resonant sidebands that affect their range of existence.

Th2B.4 • 11:30
Fiber-Optic Solitons with Gain and Loss, Alexander Hausel1, Christoph Mahnke1, Fedor Mitchl1, 1Univ. of Rostock, Germany; 2German Propagation of solitons in fibers with gain or loss beyond the perturbative regime is considered. Analytical results, corroborated with soliton eigenvalues from numerical studies, predict generation and decay of solitons, and the energy budget.

Th2B.5 • 11:45
Fiber-Optic Solitons with Gain and Loss, Alexander Hausel1, Christoph Mahnke1, Fedor Mitchl1, 1Univ. of Rostock, Germany; 2German Propagation of solitons in fibers with gain or loss beyond the perturbative regime is considered. Analytical results, corroborated with soliton eigenvalues from numerical studies, predict generation and decay of solitons, and the energy budget.

Th2C • Integrated Optical Devices for Switching Multiplexing and Signal Processing—Continued

Th2C.2 • 11:30
Integrated Multi-Functional Photonic Filters Based on Mode-Split Cascaded Sagnac Loop Reflectors, Jiaoyang Wu1, Tania Moin1, Xingyuan Xu1, David Moss1, 1Swinburne Univ. of Technology, Australia. We propose and demonstrate integrated multi-functional photonic filters implemented by mode-split cascaded Sagnac loop reflectors (SLRs). A wide range of filter shapes for diverse applications are experimentally studied and show good agreement with theory.

Th2D • High Energy Laser—Continued

Th2D.3 • 11:30
1 TW-Class OPCPA Pumped with Fiber Laser Seeded Two-Cascaded Yb:YAG Rod Amplifier-Compressor, Aleksey Rodin1, 1Dept. of Physics, The Hong Kong Polytechnic Univ., Hong Kong; 2Center for Physical Sciences and Technology, Lithuania; 3ELEPRA Ltd, Lithuania. Fiber laser seeded two-stage double-pass chirped pulse amplifier-compressor based on Yb:YAG rods with scalable output energy from 20 mJ to 60 mJ at a repetition rate of 100 Hz, a pulsewidth of 1.2 ps and excellent beam quality is used to pump 1 TW-class OPCPA.

Th2E • Special Fibers II—Continued

Th2E.3 • 11:30
Optimized design of 125-μm 6-core fiber with large effective area for wideband optical transmission, Shoulin Jiang1, 1Dept. of Physics, The Hong Kong Polytechnic Univ., Hong Kong; 2College of Physical Science and Technology, Sichuan Univ., China; 3Dept. of Applied Physics, The Hong Kong Polytechnic Univ., Hong Kong; 4Dept. of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong. We demonstrate a lattice of 3D chiral plasmonic nano-holes, with strong relative optical circular dichroism ~0.5, high Q-factor up to 45, and a perfect lattice of 10 μm. The CD enhancement is due to the interaction between the chiral response of the chiral holes and the scattering modes of the lattice.

Th2F • Plasmonics Metasurfaces—Continued

Th2F.3 • 11:15
Optical Superchirality in a Perfect Lattice of Three-dimensional Nano-holes with High Q-factor and large area, Meng Qi1, 1Univ. of Rostock, Germany; 2College of Physical Science and Technology, Sichuan Univ., China; 3Dept. of Applied Physics, The Hong Kong Polytechnic Univ., Hong Kong; 4Dept. of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong. We propose an optimized design of 125-μm 6-core fiber with large effective area for wideband optical transmission. Relative core multiplicity factor of 6.75 was achieved.

Th2F.4 • 11:30
The radiation-reaction force in two-dimensional systems. How do we go from the microscopic description to the macroscopic one? The radiative-reaction field connects micro to macro.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

Th2A • Novel Laser Sources II—Continued

Th2A.4 • 11:45
Generation and manipulation of polarization dependent sidebands in a fiber parametric oscillator, Kangwen Yang1, Peng Zhao2, Pengbo Yi1, Guang Hai1, Kun Huang1, Heping Zeng1; 1Univ of Shanghai Science & Technol., China. A tunable fiber optical parametric oscillator was demonstrated to generate and control of scalar and cross-phase modulation instabilities at 779-93 nm and 864-978 nm respectively, which could be used in coherent anti-Stokes Raman spectroscopy.

Th2A.5 • 11:45
Dispersion and nonlinearity jointly engineered silicon waveguide taper for self-similar parabolic pulse propagation, Chao Mai1,2, Feng Lu1, Jinli Yuan3, Zhe Kang3, Xiangli Zheng3, Yan Xu4, Binbin Yan1, xiaoyu sang1, Kun Wang1, Chenguang Yu1, Ping Kang4, A. W.0.1,2; 1Beijing Univ of Posts & Telecom, China; 2The Hong Kong Polytechnic Univ, Hong Kong. We analytically investigate the condition of passive self-similar propagation for parabolic pulse. Based on the derived condition, a dispersion and nonlinearity jointly engineered silicon waveguide taper for the parabolic simulation propagation is designed and analyzed.

Th2B • Solitons and Temporal Wave Guiding, and Frequency Comb—Continued

Th2B.5 • 11:45
Mid-infrared Optical Frequency Comb via Coherent Supercontinuum Processes in Nano-photonic Waveguides, Harun Gultekin1, Wenlu Wang1, Martin H. Pfeiffer1, Tobias J. Kippenberg1; 1École polytechnique fédérale de Lausanne, Switzerland. We demonstrated mid-infrared optical frequency comb generation via coherent supercontinuum generation process in a large-area cross-section nitride nano-photonic waveguide. We experimentally assessed the coherence of the mid-infrared dispersive wave that serves as the frequency comb.

Th2C • Integrated Optical Devices for Switching Multiplexing and Signal Processing—Continued

Th2C.3 • 11:45
A Silicon Photonic Optical Add-Drop Multiplexer based on Mode-Selective Device and Bragg Grating, Zhen Wang1, Bruno Ta- gnier2, Ming Ma1, Lawrence R. Chen1; McGill Univ., Canada. We demonstrate a compact add-drop multiplexer using Bragg grating in a mode-selective device for the silicon-on-insulator (SOI) platform. The proposed design has crosstalk lower than -42 dB within the 3.8 bandwidth of 1.6 nm.

Th2C.4 • 12:00
Mode Instability in Yb:YAG Crystalline Fiber Amplifiers, Shicheng Zhu1, Hengnan Xu1, Zhiwen Lou1; Fudan Univ., China. On-chip multi-mode communication has attracted much attention for its potential to greatly expand the bandwidth of data transmission. In this paper, we will introduce some silicon integrated devices for on-chip mode multiplexing, including the multiplexers, multimode crossing and the multimode banding.

Th2D • High Energy Laser—Continued

Th2D.4 • 11:45
Impact of disk laser geometry on excess nonlinear heat release, Mikhail R. Volkov1, Ivan Kuksenkov1, Ivan Mihanov1; 1Inst. of Applied Physics of the RAS, Russia. Disk active elements of various doping and geometry are investigated for heat sources and lasing. Yb:YAG of 10% doping has strong overheating under high excitation level. The phenomenon is most severe for thin disk, while composite disk shows much less overheating. The latter case shows less lasing efficiency but better small-signal gain.

Th2E • Special Fibers II—Continued

Th2E.4 • 11:45
High-resolution imaging microstructured optical fibers, Stephen C. Warren-Smith1, Alazooz Oweiss2, Hao Huynh1, Heike Ebendorff-Heidebrecht1; 1Univ. of Adelaide, Australia. We show that an imaging fiber with a pixel pitch of 2 μm is theoretically achievable using silica-based microstructured fibers. Preliminary fabrication results are presented using extrusion of glass through 3D printed titanium dies.

Th2F • Plasmonics Metasurfaces—Continued

Th2F.6 • 12:15
Single-polarization single-mode double-layer hollow-core antireflection fiber, Shibo Yan1, Shuang Lou1, Xin Wang1, Zhan Xing1, 1Beijing Jiaotong Univ., China; 2Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China. Mode instability (MI) in Yb:YAG crystal fiber amplifiers is investigated through full-numerical simulations. The MI threshold in a 50/250 μm Yb:YAG crystal fiber is found to be greater than 10W.
<table>
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<tr>
<th>Time</th>
<th>Session Title</th>
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<tbody>
<tr>
<td>10:30–12:00</td>
<td>Th2G.5 • 11:45 Flexible Dielectric Microsphere-Embedded Film for Enhanced-Raman Spectroscopy, Cheng Ying, Yinhou Tan, Yuan Jiang, Beijng Univ. of Technology, China; 2College of Optoelectronic Information, Univ. of Technology, Japan; 3School of Opto-electronic Engineering, Univ. of Jinan, China. Flexible dielectric microsphere-embedded film was developed as a possible Raman enhancer, which provides a ~10-fold enhancement ratio and can be coupled with conventional SERS active substrates for ultrasensitive Raman trace-detection.</td>
</tr>
</tbody>
</table>
of 1.85-2.03 μm. With its wavelength being tuned within a range generated at a low lasing threshold (1.2 mJ), a milli-joule level vortex output was formed of a periodically poled stoichiometric configuration. A milli-joule level vortex output was formed of a periodically poled stoichiometric search center, Chiba Univ., Japan. We report a laser source, Double-clad Fiber Laser, Th3A.1 • 14:00

Sci & Tech of China, China

Presider: Anting Wang; Univ of

14:00–15:30

Room S223

Room S224

Room S225

Room S226

Room S227

Room S228

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

14:00–15:30

Th3A • Vectorial Light Sources

Presider: Anting Wang; Univ of Sci & Tech of China, China

Th3A.1 • 14:00

Implied

Square-wave Dynamics in the Er:Yb-doped Double-clad Fiber Laser, ychang ming1,2, Georges Semaan1, Fatma Benbrahim1, Mensem Kemal1, Mohamed Salhi1, Andrey Komar21, Francois Sanchez2, Universite d’Angers, France; School of Sciences, Hebei Univ of Science and Technology, China; Rus.

Invited

Russian Academy of Sciences, Russia; 2Univ. de Carthage, Tunisia. We have experimentally demonstrated dissipative soliton resonance (DSR) in double-clad Er:Yb-doped fiber lasers with dual amplifier figure-of-eight and ring cavity. In anomalous dispersion regime, different features of DSR are demonstrated.

14:00–15:30

Th3B • High-field Technologies

Presider: Jinhuai Yuan; Beijing Univ. of Posts and Telecomm., China

Th3B.1 • 14:00

Implied

Short-range Photon-phonon Interactions, Brigl Stiller1, Monte Merklein1, Benjamin Egginton1, Uni of Sydney, Australia. Using photophonon interactions, we experimentally demonstrate the storage of 20ps-long optical pulses for over 70 pulse widths. We moreover show that this concept is suitable for the non-reciprocal storage at multiple optical wavelengths.

Th3B.2 • 14:30

Relativistic, high-order harmonic generation from laser plasmas using few-cycle laser pulses, Guangia Ma1, Dmiriti Kornev1, Chunlin U1, Zhiping Zhou1, Jin He1, Laszlo Veisz1, School of Electronics Engineering and Computer Science, Peking Univ., China; 1Shenzhen SyC Key Laboratory, Peking University-USTC Shenzhen-Hong Kong Institution, China; 2Max-Planck-Institut fuer Quantenoptik, Germany; 3Dept. of Physics, Umea Univ., Sweden. We investigate relativistic high-order harmonic generation from intense few-cycle laser and plasma interactions via particle-in-cell simula-

tions. Differences of spectral and temporal structures in XUV beam resulted from few-cycle and non-few-cycle driver pulses are compared.

14:00–15:30

Th3C • Germinator Modules and Ge Photonics

Presider: Linjie Zhou; Shanghai Jiao Tong Univ., China

Th3C.1 • 14:00

High-contrast quantum-confined Stark effect in Ge/SiGe quantum well stacks on Si with ultra-thin buffer layers, Srivatsan Ashhey1, Srivatsan2, Clement Porret1, Ewald Voss1, Peter Geraghty1, Dries Vanhoutryhe1, Roger Liu1, Marnara Pansvikovski1, Joris Van Campenhout1, iMac, Belgium; 2Univ. of Ghent, Belgium. Quantum-confined Stark effect with a record absorption contrast of 2.5 for 14 swing is demonstrated in Ge/GeSi quantum well stacks grown on Si using ultra-thin buffer layers, targeting future integration in a silicon photonics platform.

Th3C.2 • 14:15

5G GloSis/GloSi Optical Modulator, Lorenzo Mastronardi1, Mehdi Barakar1, Ali Khaliki1, Namitha Hattasan1, Teerapat Rutrakul1, Thalia Domínguez Buíto1, Kasia Grabka1, Luttig2,3, Alexandre Bazin1, Go-ran Mashanovich1, Frederic Gardes1, Univ. of Southampton, UK; 3Silicon Technologies Centre of Excellence, NTU, Singapore. We present experimental measurements of an EAM modulator developed on an 800 nm SOI platform. Measurements show a dynamic ER of 5.2 dB at 56 Gb/s at 1566 nm and power consumption of 44 Ub/s.

14:00–15:30

Th3D • Power Scaling and Plasmonics

Presider: Sui Zhan; China Physics, China

Th3D.1 • 14:00

Implied

Ubiquitous Signal Processing Based on Silicon Photonic Integrated Circuits, Ke Xu1, College of Chemistry, Univ. of California Berkeley, USA. Abstract not available.

Th3D.2 • 14:15

Potassium ion-selective SPR sensor based on GO-chitosan nanocomposite for agriculture application, Banish D. Gupta1, Aishika Pathak1, Vivek Semwal1, Indian Inst. of Technology, Delhi, India. The fabrication and characterization of a fiber optic potassium ion sensor based on surface plasmon resonance using GO-coated GO-chitosan nano composite has been carried out for soil nutrients. The sensor operates in the range 0-200 μm.

14:00–15:30

Th3E • Waveguide Devices II

Presider: Xin Gai; The City Univ. of Hong Kong, Australia

Th3E.1 • 14:00

Invited

UGB-359: An Integrated Optoelectronic Oscillator, Ming Li1,1, Inst. of Semiconductors, CAS, China. In this paper, we proposed and experimentally demonstrate a novel integrated OEO, in which the optical parts are manufactured using a monolithically integrated InP technology platform and the electrical part assembles on a single PCB.

14:00–15:30

Th3F • Integrated Microwave Photonics II

Presider: Santiago Mas Prada, Universidad Carlos III de Madrid, Spain

Th3F.1 • 14:00

Invited

Chip-based Reconfigurable Microwave Photonic Filter and Time Delay Line, Simin Li1,2, Jiai Mou1,2, Shiliang Pan2,3, Nanyang Univ. Astronaut Astronaut, China. We propose an approach to realize a reconfigurable microwave photonic filter and time delay line using a single optical micro-ring resonator (MMR). Based on the multi-wavelength single sideband modulation, the MMR responses are mapping to microwave frequency with tunable center frequency and magnitude.

14:00–15:30

Th3G • Integrated Microwave Photonics II

Presider: Santiago Mas Prada, Universidad Carlos III de Madrid, Spain

Th3G.1 • 14:00

Invited

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Thursday, 2 August

CLEO Pacific Rim • 29 July–3 August 2018

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2018 CLEOPacific Rim Program.indd 78

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These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

14:00–15:30

Th3G • Structured 2D Surfaces
President: Amo Rauschenbeutel, Humboldt-Universität zu Berlin, Germany

Th3H • Entanglement and Squeezed States I
President: Jin-Shi Xu; Univ of Science and Technology of China, China

Th3I • Ultrathin Structured 2D Surfaces: Hybridizing 2D Materials & Metasurfaces, Chengwei Qiu; National Univ of Singapore, Singapore. Interfacial engineering via artificially con-

structured nanostuctures hold great potentials for advanced light-matter interactions. I will discuss the fundamental and emerging results for meta-photonic devices by hybridizing

metasurfaces and 2D materials.

14:00–15:30

Th3J • 2D and Metamaterials
President: Howard Lee; Baylor Univ., USA

Th3K • Microscopy
President: Chao Zuo; Nanjing Univ. of Science and Technology, China

14:00–15:30

Th3L • Novel Fiber Structures
President: Xuping Zhang; Nanjing Univ., China

14:00–15:30

Th3M • 2D Materials & Metasurfaces, Ultrathin Structured 2D Surfaces, Chengwei Qiu; National Univ of Singapore, Singapore. Interfacial engineering via artificially con-

structured nanostuctures hold great potentials for advanced light-matter interactions. I will discuss the fundamental and emerging results for meta-photonic devices by hybridizing

metasurfaces and 2D materials.
The concurrent sessions are grouped across two pages. Please review both pages for complete session information.

Th3A.3 • 14:45 Tunable repetition rate mode-locked all-fiber laser with cylindrical-vector beams output, Rushan Chen1, Junna Yao1, Fangling Sun2, Jinghao Wang3, Aijing Wang4, Hai Ming5; Dept. of Optics and Optical Engineering, Univ of Sci & Tech of China, China. We propose and demonstrate a mode-locked all-fiber cylindrical-vector beam (CVB) laser with high efficiency and tunable repetition rate. By controlling the intra-cavity polarization states, both azimuthally polarized and radially polarized beams are selectively obtained under harmonic mode-locking (HML) states.

Th3A.4 • 15:00 All-fiber actively Q-switched cylindrical vector beam laser based on a mode selective coupler, Tianfan Yuan1, Hongdan Wan1, Je Wang1, Xuexian Zhang2, Lin Zhang3; Nanjing Univ. of Posts & Telecommunication, China. High purity, pulsed cylindrical vector beams (CVBs) can be generated by using a mode selective coupler (MSC) as the transverse mode converter and mode splitter in an all-fiber actively Q-switched fiber laser.

Th3B.3 • 15:15 Spatiotemporal analysis of XUV pulse generation in gas HHG, Lifeng Wang1, Hao Li1, Ying Zhang1; SIMTech, Singapore. We numerically analyze spatiotemporal profile of HHG. A detailed physical picture of HHG over four-dimensional spatiotemporal spaces is studied for the first time, which may benefit potential applications like super-resolution XUV imaging, XUV tweezers.

Th3B.4 • 15:00 Phase-matched slow-slow high-order harmonics driven by loosely focused TiW femtosecond infrared pulses, Katsuo Nishimura1, Yui Fu2, Akira Suzuki1, Katsumi Midorikawa1, Eiji J. Takahashi1; AtoScience Research Team, RIKEN Center for Advanced Photonics, Japan; Dept. of Physics, Tokyo Univ. of Science, Japan. We generate high flux slow-slow x-ray phase-matched high-order harmonics driven by loosely focused 80-mJ, 45-fs, 1.55-µm infrared pulses. The maximum harmonic photon energies attained are 370 and 350 eV in Ne and He, respectively.

Th3B.4 • 15:00 High Power Mid-Infrared Supercontinuum Sources: Current Status and Future Perspectives, Deepak Jain1, Ole Bang2; DTU Fotonik, Denmark; “NKT Photonics, Denmark. Mid-infrared fiber based supercontinuum sources have great potential for several applications. This paper reviews their current status of power scaling and discusses the challenges and future development in power scaling.

Th3C.4 • 14:45 Mid-Infrared Germanium Photonic Integrated Circuits for on-chip Biochemical Sensing, Zhenhui Cheng1, Ting-Hu Xiao1, Xiayang Zhao1, Wen Zhou1, Mitsuhiro Takekawa2, Hon K. Tse1, Kasuke Goda1; “The Univ. of Tokyo, Japan; “The Chinese Univ. of Hong Kong, Hong Kong. We report our recent progress on mid-infrared germanium photonic integrated circuits. Specifically, a suspended-membrane waveguide, focusing subwavelength grating coupler, microring resonator, and photonic crystal nanoantennas are demonstrated based on a germanium-on-insulator wafer.

Th3D.3 • 15:00 Multi-Photon Fabrication of Ultra-compact Optical Waveguides in Polydimethylsiloxane, Ye Pu1, Giulia Panus1, Jiepeng Wang2, Christophose Moser1, Demetri Psaltis1; “Ecole Polytechnique Federale de Lausanne, Switzerland. We demonstrate the fabrication of ultra-compact, low-loss optical waveguides in polydimethylsiloxane through multiphoton polymerization, without a photoinitiator, using laser direct writing. The transmission loss was measured 0.03 dB/cm in the 650-700 nm band.

Th3E.4 • 15:15 A Tunable Microwave Frequency Multiplication System Based on Injection Locking without Photodetector, Shaoshuai Wang1, Ji Wang1, Tianyu Li1, Chuang Ma1, Tianyan Xie1, Yang Yu2, Jiuong Yu1; Tianjin Univ., China. Using a directly modulated laser to injection locking the high-order sideband of modulated light, multiplication frequency is detected at its radio frequency port. Instead of employing photodetector, the proposed tunable frequency multiplication system costs low obviously.

Room S223
Room S224
Room S225
Room S226
Room S227
Room S228

15:30–16:00 Coffee Break
2D Materials for Inkjet Printing of Photonic and Optoelectronic Devices

Meng Zhang, Yang Yu, Yang Guo, Hong Chang; 1Wuhan Inst. of Technology, China; 2The Univ. of Electro-Optics and Photonics, National Chiao-Tung Univ., Taiwan.

A comparative study about colloidal quantum dot and NaCl inorganic crystalline materials was set up. After the 300-hour aging tests, the samples made by the colloidal method is better in terms of degradation and spectral characteristics.

Room S423

Th3G • Structured 2D Surfaces—Continued

Th3H • Entanglement and Squeezed States I—Continued

Th3I • Quantum interferometric spectroscopy, Rui-Bo Jin, Ryusuke Shimizu; 1Wuhan Inst. of Technology, China; 2The Univ. of Electro-Communications, Japan. The difference- and sum-frequency distribution of the biphoton wavefunctions were extracted by applying a Fourier transform on the time-domain Hong-Ou-Mandel interference (HOMI) and the NOON state interference (NOONI) patterns.

Room S424

Th3J • 15:00

High Stability Frequency Transfer over a 35 km Fiber Link Based on Injection-Locked DFG, Guangming Zhao, Fei Yuan, Shumin Li, Xiandi Xiong, Jinlong Yu, Zixiong Wang, Shuai Zhou, Tianquan Xu, Chuan Ma, Tianjin University, China. A 10 GHz frequency transfer experiment was realized over a 35 km fiber link. An injection-locked optoelectronic oscillator was used in the remote site for stabilization of the phase noise.

Room S425

Th3K • Microscopy—Continued

Th3L • Novel Fiber Structures—Continued

Room S426

Th3M • 15:00

Ultra-Low-Loss Spliceless Fiber Ring Resonators for Resonant Micro-Optic Gyroscopes, Yi Lin, Huilin Ma, Zhonghe Jin; 1School of Aeronautics and Astronautics, Zhejiang Univ., China; 2Inst. of Photonic System, National Chiao-Tung Univ., Taiwan; 3Electrical Engineering, Univ. of the Philippines Diliman, Philippines.

A new record for ultra-low-loss spliceless fiber ring resonators, to the best of our knowledge, is demonstrated experimentally. The measured finesse and Q-factor of the 60-cm long fiber ring resonator are 1324 and 3 \times 10^7, respectively.

Room S427

Th3N • 15:00

Quantum interferometric spectroscopy, Rui-Bo Jin, Ryusuke Shimizu; 1Wuhan Inst. of Technology, China; 2The Univ. of Electro-Communications, Japan. The difference- and sum-frequency distribution of the biphoton wavefunctions were extracted by applying a Fourier transform on the time-domain Hong-Ou-Mandel interference (HOMI) and the NOON state interference (NOONI) patterns.

Room S428

Th3O • 15:00

Coffee Break

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

Th3P • 14:45

Enhanced Nanoparticle Detection with Quasi-droplet Modes, Jonathan Ward, Yuchuan Lei, Site Nik Charmaci; 1Okina Inst of Science & Technology, Japan; 2Intelligent Info and Comm. Lab, Waseda Univ., Tokyo, Japan. We demonstrate nanoparticle sensing with quasi-droplet modes in an ultrathin-walled hollow whispering gallery resonator. Experimental results show 400 MHz mode shifts for interaction with 100 nm particles and a corresponding linewidth broadening of 75 MHz.

Th3Q • 15:00

Quantum interferometric spectroscopy, Rui-Bo Jin, Ryusuke Shimizu; 1Wuhan Inst. of Technology, China; 2The Univ. of Electro-Communications, Japan. The difference- and sum-frequency distribution of the biphoton wavefunctions were extracted by applying a Fourier transform on the time-domain Hong-Ou-Mandel interference (HOMI) and the NOON state interference (NOONI) patterns.

Room S429

Th3R • 14:45

A programable time-stretch microscopy based on dispersion-tuned swept laser, Xin Dong, Xi Zhou, Chi Zhang, Xinliang Zhang; 1Wuhan National Lab for Optoelectronics, China; 2Dispersion-tuned swept laser (DTS) is applied to the ultrafast time-stretch microscopy for the first time, and achieves large and programmable time-stretch ratio with minimum dispersion and suitable modulation frequency within the laser cavity.

Room S430

Th3S • 14:45

Ultra-Low-Loss Spliceless Fiber Ring Resonators for Resonant Micro-Optic Gyroscopes, Yi Lin, Huilin Ma, Zhonghe Jin; 1School of Aeronautics and Astronautics, Zhejiang Univ., China; 2Inst. of Photonic System, National Chiao-Tung Univ., Taiwan; 3Electrical Engineering, Univ. of the Philippines Diliman, Philippines.

A new record for ultra-low-loss spliceless fiber ring resonators, to the best of our knowledge, is demonstrated experimentally. The measured finesse and Q-factor of the 60-cm long fiber ring resonator are 1324 and 3 \times 10^7, respectively.

15:30–16:00

Coffee Break

CLEO Pacific Rim • 29 July–3 August 2018
Thursday, 2 August

16:00–18:00  Th4A • Characteristics of Shortpulse Lasers
Presider: Zhi-Chao Luo; South China Normal Univ, China

16:00–18:00  Th4B • Nonlinear Optical Technologies
Presider: Birgit Stiller; Univ. of Sydney, Australia

16:00–18:00  Th4C • Novel Laser System and its Applications
Presider: Chung-Wei Cheng; National Chiao Tung Univ, Taiwan

16:00–18:00  Th4D • High Power CW Lasers and Coherent Combining
Presider: Wenn Jing Lai; Nanyang Tech Univ, China

16:00–18:00  Th4E • Plasmon-enhanced Spectroscopies and Imaging
Presider: Dangyuan Lei; The Institute of Technology, China

16:00–18:00  Th4F • Radio Over Fiber and Optical Wireless Communication
Presider: Yi Dong; Beijing Institute of Technology, China

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
16:00–18:00
Th4G • 2D Photonics Devices
President: Han Zhang, Shenzhen Univ., China

Th4G.1 • 16:00
Two-Dimensional Layered Materials/Silicon Heterojunctions for Energy and Optoelectronic Applications
Jianchang Jie, Inst. of Functional Nano and Soft Materials Laboratory (FUNSOM), Soochow Univ., China. We report investigation on 2D layered material/silicon heterojunction based photovoltaic and optoelectronic devices to solve the problem of low light absorption in monolayer materials as well as difficulties in controllable doping and p-n junction fabrications.

16:00–18:00
Th4H • Novel Photonic Structures
President: Xuming Zhang; The Hong Kong Polytechnic Univ., Hong Kong

Th4H.1 • 16:00
Optofluidic Lattice and Single Bacteria and Nanoparticle Manipulation
Ai-Qun Liu1, Zhejiang Univ., China. By integrating free-standing optical nanofibers and nanowires with microfluidic channels or silicon photonic chips, we show on-chip nanowire photonic devices including optical sensors, interferometers, modulators and light emitting devices with small footprints and high flexibility.

16:00–18:00
Th4I • Optical Access Technologies
President: Songnian Fu; Huazhong Univ. of Science and Technology, China

Th4I.1 • 16:00
Simplified signal processing for high-speed PON
Lilin Yi1, Lei Xue1, Wenxing Hu2; Shanghai Jiao Tong Univ., China. We have experimentally demonstrated symmetric 4×25 Gb/s TDWD-PON and 50 Gb/s TDWM-PON based on 100 class devices. Low-cost DMLs are used as transmitter and single optical signal process is used for bandwidth equalization and DSP simplification.

16:00–18:00
Th4J • Entanglement and Squeezed States II
President: Li You; Tsinghua Univ., China

Th4J.1 • 16:00
Unconditional Shot-noise-limit Violation in Photonic Quantum Metrology
Geoffrey Pryde1, Sergei Susarevsky2, Morgan Weston3, Helen Chrzanowski2, Lynden Shalm3, Helen Chrzanowski2, Lynden Shalm3, Varun Verma2, Sae Woo Nam1; Griffith Univ., Australia; National Inst. of Standards and Technology, USA. We demonstrate the first unconditional violation of the shot-noise limit in photonic NOON-state interferometry. Using ultrahigh-efficiency source and detectors, we outperform ideal classical measurement without employing postselection, or correction for loss and imperfections.

16:00–18:00
Th4K • Imaging and Sensors & Technology
President: Xinyong Dong; China Jiliang Univ., China

Th4K.1 • 16:00
High-temperature Optical Techniques Development and Its Application in Thermal Barrier Coatings
W. He1, Humin Xue2, Q. Zhang3, Y.J. Yin2, Z.W. Liu2, L.F. Wu1, X.L. Dai1; AML, Dept. of Engineering Mechanics, Tsinghua Univ., China; School of Aerospace Engineering, Beijing Inst. of Technology, China. Owing to demanding operating environment and multi-layered structure, the experimental characterization of thermal barrier coatings is challenging. Herein, our ongoing work on the high-temperature optical techniques for their deformation and residual stress measurements are reviewed.

16:00–18:00
Th4L • Optical Fiber Gratings, Sensors & Technology
President: Yanyong Song; Shanghai Jiao Tong Univ., China

Th4L.1 • 16:00
Plasmonic Enhancement for Optoelectronic Devices
Dai Hua Zhang1; Nanyang Technological Univ., Singapore. We present split-ring resonators (SRR) and their applications, two-dimensional metallic square hole array enhanced mid-wave infrared photodetectors with room temperature detective of 8 x 109 Jones and new type of two-terminal millimetre wave photodetectors with a room temperature noise equivalent power of 1.5 x 10^-13 W Hz^-1/2.

16:00–18:00
Th4L.2 • 16:30
Digital Orthogonal Filtering-Multiplexed Access over IMDD PON systems utilizing EMLs
Xiao L. Zhang1,2, Chao Di1,2, Ying Jie1,2, Wei Jin1,2, Kun Qiu1,2; Univ. Electron. Sci. & Technol. China; School of Electrical and Electronic Engineering, Nanyang Technological Univ., Singapore. We investigate the power budget performance of implementing a digital orthogonal filtering-multiplexed access (DFMA) technology for the passive optical network (PON) systems by using electro-absorption modulated lasers (EML).
880 MHz Yb-doped mode-locked fiber lasers in China. We characterized the timing jitter of two Fiber Lasers Based on Nonlinear Amplifying Yb-doped oxides as saturable absorbers for the Chromium and cobalt doped saturable absorbers for passively Q-switched visible lasers, Hiroki Tanaka1, Elena Castellano-Hernández2, Christian Kränkel2,3, Shogo Fujita1,3, Ailin Guo1, Haidong Zhu1, Meizhi Sun1; Peking Univ., China; 2Tianjin Univ., China; 3Inst. of Laser-Physics, Universität Hamburg, Germany. We present a detailed characterization of Co2+ and Co3+-doped oxides as saturable absorbers for the visible spectral region. The first visibly emitting Q-switched laser utilizing a Co3+-doped oxide is demonstrated.

Th4A.3 • 16:45 Time-resolved circular-dichroism spectrometer for coherent control experiments, Tuma Saito1, Heronon Itu1, Kazukhis Misawa1,2, Dept. of Applied Physics, Tokyo Univ. of Agriculture and Tech., Japan; 1Inst. of Global Innovation Research, Tokyo Univ. of Agriculture and Tech, Japan. We developed a time-resolved circular-dichroism spectrometer to conduct coherent control experiments of chiral materials. The spectrometer yielded satisfactory results for two references samples, chiral camphor sulfonic acid and [Ru(bpy)3]2+.

Th4B • Nonlinear Optical Technologies—Continued

Th4B.5 • 17:15 Intensity Noise Comparison of Mode-Locked Fiber Lasers Based on Nonlinear Amplifying Loop Mirror and Nonlinear Polarization Rotation, Sia Wang, Peng Qin, Qian K. Xue, Kuan K. Liao, Laboratory of Space Technology, Chinese Academy of Space Technology, China. We demonstrate ~30% reduction in the relative intensity noise (10 Hz-100 kHz) of mode-locked fiber lasers by the nonlinear amplifying loop mirror compared with nonlinear polarization rotation, under similar 30 nm output spectral bandwidth.

Th4B.4 • 17:00 Spectral dynamics measurement using a free-space angular-chirp-enhanced delay cavity, Ying Yu1, Xiaoming Wei1,2, Jangia Wu1, Jingzhuang Xu1, Kenrith-Kin-Yip Wong1, Kevin K. Tse1, Ying Xu1,2, Univ. of Hong Kong, Hong Kong; 1California Inst. of Technology, USA; 2Zhejiang Univ., China. We present a study of spectral dynamics measurement using the newly invented apparatus named free-space angular-chirp-enhanced delay cavity (FACED cavity). The shot-to-shot spectra are observed and the corresponding spectral correlation maps are analyzed.

Th4C • Novel Laser System and its Applications—Continued

Th4C.4 • 17:15 Thermal Regimes of Laser Reduction of Graphene Oxide, Sergey E. Sysoykovsky1, Nikita Minev1, Stanislav Eskalnik1, M. V. Lomonosov Moscow State Univ, Russia; 1Inst. of Laser and Information Technology of Russian Academy of Sciences, Russia; 2Skolkovo Inst. of Science and Technology, Russia. The far-reaching method of the graphene oxide photoreduction has been developed for the robust production of graphene nanoflakes. We study the influence of photoreduction spectra on optical and electrical properties and the material surface wettability.

Th4D • High Power CW Lasers and Coherent Combining—Continued

Th4D.3 • 16:45 Coherent Beam Combining for Ultrafast Intensity Laser Systems, Yan-Qi Gao1; Shanghai Inst. of Laser Plasma, China. Three kinds of factors, including phase distribution, spectral dispersion and longitudinal chromatic, are investigated for ultra-short beam combining. General control requirements are given. High-quality combining is realized, and time jitter is less than 150 attosecond.

Th4E • Plasmon-enhanced Spectroscopies and Imaging—Continued

Th4E.5 • 17:15 Plasmonic Narrow Bandpass Filters Based on Metal-Dielectric-Metal for Multispectral Imaging, Xi-Ha1, Nicholas D’Keefe1, Dechuan Sun1, Yajing Liu1, Hemanet Udder1, Ampala-vanapillai Nimalaths1, Ranh R. Unnithan1, Yonsei Univ., Korea. A nonlinear mitigation technique with spectral shaping of signal power is proposed in analog multi-IF over Fiber link using OFDM signal. Its feasibility was experimentally verified through EVM performance and channel linearity.
Negative gate voltages are applied to $\text{WSe}_2$, negative photocurrents are obtained. $\text{WSe}_2$ is a semiconductor material with direct bandgap, which is a key material in optoelectronics. The negative photocurrents indicate the material's ability to detect light with photoinduced charge separation, a fundamental property for photodetectors and solar cells.

We report a high-speed single-layer graphene-Si electro-absorption modulator, demonstrating a single-layer graphene electro-absorption modulator with a modulation depth of 0.026 dB/um for 6.5 Vpp. This is achieved at a switching time of 10ps, showcasing the material's potential in high-speed optical communications.

We find that weak-light nonlinear photonics, with vortex beams, leads to direct observation of topological charge transformation, including spin-orbital angular momentum conversion. This is a fascinating phenomenon that can lead to new applications in quantum information processing.

A high-speed colorless light source is indispensable for low-cost and efficient channel equalization. The proposed LD-based colorless light source is realized with efficient channel equalization and the inter-user interference mitigation are achieved at 95% RH, demonstrating robustness in practical environments.

A novel taper-shaped polymer incorporating a Fiber Bragg Grating, with high humidity sensitivity (1.2902 nm/RH) in RH range of 60% to 95% RH, coated with polyethylene glycol/polyvinyl alcohol, is experimentally demonstrated to function as a humidity sensor based on long period grating with polyethylene glycol (polyvinyl) alcohol film. This sensor has a high sensitivity (1.2902 nm/RH) in RH range of 60% to 95% RH.

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
Influence of Intra-Cavity Loss on Mode-Locking of Fiber Lasers, Goran Kovacevic1, Takuma Shirahata1, Pengtao Yuan1, Sze Y. Set1, Shu1 Yamashita1; RCAST, Univ. of Tokyo, Japan. We experimentally characterize the influence of intra-cavity loss on mode-locking of fiber lasers using a variable attenuator and NPR. We back-up our results numerically and hope they will open a path to high loss components in fiber lasers, like optical chips or high percentage output couplers.

Compressions of optical pulses using a free-space angular-chirp-enhanced delay cavity, Ying Yu1, Xiaoming Wei2, Jingang X1,2, Jingang Xu1,2, Kenneth Kin-Yip Wong2, Kevin K. Tsai1, Ying Xu1,2; Univ. of Hong Kong, Hong Kong, China; 1California Inst. of Technology, USA; 2Shanghai Univ., China. We present a study of compression of optical pulses using a free-space angular-chirp enhanced delay (FACED) cavity. The amount of induced dispersion can be adjusted by simply modifying the geometry of the FACED cavity.

We experimentally characterize the influence of intra-cavity loss on mode-locking of fiber lasers using a variable attenuator and NPR. We back-up our results numerically and hope they will open a path to high loss components in fiber lasers, like optical chips or high percentage output couplers.

We present a study of compression of optical pulses using a free-space angular-chirp enhanced delay (FACED) cavity. The amount of induced dispersion can be adjusted by simply modifying the geometry of the FACED cavity.
Stereolithography, Duyang Xia, Zhenqian Yin1, 2, Jiahua Wu, A. Ping Zhang, Changhe Zhou, Dept. of Electrical Engineering, The Hong Kong Polytechnic Univ., Hong Kong, 1Shanghai Inst. of Optics and Fine Mechanics, Chinese Academy of Sciences, China. A new optical fabrication technology for fabrication of dual-focus microlens array is presented. We experimentally demonstrated that the surface of microlens can be precisely tailored by the technology to engineer the focal structure of microlens.

High Speed Geometrically Shaped 8-QAM modulation based Underwater Visible Light Communication System, Xingbang Wu, Fangshen Hu, Shangling Liang, Nan Chi, Fujian Univ., China. We demonstrate an underwater VLC system at 1.2m transmission distance with geometrically shaped 8-QAM modulation. The best performance can be achieved by utilizing circle 8QAM modulation and the highest data rate is 1.4 Gb/s.

Spatially resolved control of ac-Stark shifts in cold atomic ensemble, Matusz Mazlana, Adam Leszczynski1, Michal Lipka1, Michal Parniak1, Michal Cibula2, Wojciech Wasilewski1, Univ. of Warsaw, Poland. We demonstrate spatially resolved control of fictitious magnetic fields generated by an optically induced ac-Stark shift as a versatile tool to efficiently prepare complex spin patterns in cold atomic ensemble.

Fast and high-quality object reconstruction based on Fourier spectrum acquisition in single-pixel imaging, Yin Xiao1, Shen Chen2, Dept. of Electronics and Information Engineering, The Hong Kong Polytechnic Univ., China; 1Shanghai Inst. of Optics and Fine Mechanics, Chinese Academy of Sciences, China. A new method allows the nondestructive and contactless evaluation of the internal traxial strain without any preprocessing. The second-order cross-correlation function reveals narrow linewidth of 2.4 MHz and the highest spectral brightness of 3.94 × 10^7 pairs/(s×MHz×mW).

Th4J • Imaging and Applications—Continued

Fast and high-quality object reconstruction based on Fourier spectrum acquisition in single-pixel imaging, Yin Xiao1, Shen Chen2, Dept. of Electronics and Information Engineering, The Hong Kong Polytechnic Univ., China; 1Shanghai Inst. of Optics and Fine Mechanics, Chinese Academy of Sciences, China. A new method allows the nondestructive and contactless evaluation of the internal traxial strain without any preprocessing. The second-order cross-correlation function reveals narrow linewidth of 2.4 MHz and the highest spectral brightness of 3.94 × 10^7 pairs/(s×MHz×mW).

Th4J • Entanglement and Squeezed States II—Continued

The photon experiment was performed by using a noncollinear four wave mixing (NCFWM) interferometer. In the coherence measurement, the second-order cross-correlation function reveals a linewidth of 2.4 MHz and the highest spectral brightness of 3.94 × 10^7 pairs/(s×MHz×mW).
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F1A.1 • 08:30

High-Efficiency Watt-Level Mid-Infrared Fiber Lasers Beyond 3 μm using Dy:ZBLAN, Robert I. Woodward1, Matthew Majewski1, Kan Wu1, Xiufu Taximaiti1, Judith C. Adamek1, Paul B. Corkum1,2, and M. в. K. M. Khan1,3,4; Dept. of Electrical Engineering and Computer Science, McMaster University, Canada. We demonstrate high-efficiency, high-power mid-infrared fiber lasers above 3 μm using Dy:ZBLAN in a fiber laser with a slope efficiency of 37.02% to 8.6%. This work presents the first demonstration of a high-power fiber laser above 3 μm using Dy-doped ZBLAN fiber.

F1A.2 • 08:45

Handedness control of a mid-infrared 3.5 μm optical vortex MgO:PPLN parametric oscillator; Yusaku Taniguchi1, Rangkuti Fuli1, Sujan Niu1, Katsuhiko Miyamoto2, Takashige Omatsu2, and Tetsuya Tanaka2; 1Inst. of Industrial Science, U. of Tokyo, Japan; 2Univ. of Tokyo, Japan. We demonstrate the first milli-peak-to-peak tunable mid-infrared (3.362-3.677μm) optical vortex output with a topological charge of ±1 by a 1 μm vortex pump quasi-phase matching MgO:PPLN optical parametric oscillator.

F1B.1 • 08:30

3D printing, photonics and the IoT; John Canning1,2, Kevin Cook1, and Martin O’Neill2; 1Inst. of Technology Sligo, Ireland; 2Cork Institute of Technology, Ireland. This tutorial will review recent advances in 3D printing technologies, including their applications in photonics and the Internet of Things. The tutorial will cover the fundamentals of 3D printing, the use of 3D printing in photonics, and the integration of 3D printing with the IoT.

F1B.2 • 09:00

Laser performances of Yb-doped alumino-phosphosphate fiber under γ-radiation; Ying Y. Wang1, Cong Gao2, Kun Peng1, Li Ni1, Xiaodong Wang1, Huan Zhan1, Yawei Li1, Lijun Jang1, Aixing Lin1, Jianzhang Wang1, Peng Tang1, and Jun Liu1; 1China Academy of Engineering Physics, China; 2Univ. of Sydney, Australia. We investigate the effects of γ-radiation on the performance of Yb-doped alumino-phosphate fiber under γ-radiation.

F1C.1 • 08:30

Key Technologies of Orbital Angular Momentum based Wireless Communication; Shile Zhang1,2; 1Shenzhen Univ., China; 2IF-S, University of Sydney, Australia. This tutorial will review the key technologies of orbital angular momentum (OAM) communication, including the theory, experimental demonstration, and potential applications.

F1C.2 • 09:00

Nonlinear Dynamics of Microwave State Switching in a Semiconductor Laser with Feedback; Jia Xe Dong1, Sae-Chun Chiu1; 1Dept. of Electronic Engineering, City Univ. of Hong Kong, China. We study the nonlinear dynamics of microwave state switching in a semiconductor laser with feedback under γ-radiation.

F1D.1 • 08:30

Production of Non-Monochromatic Tidies And Their Interferometric Applications; Li You1,2, Jiang Hua1, China. This tutorial will review the production of non-monochromatic tidies and their interferometric applications, including the theory, experimental demonstration, and potential applications.

F1D.2 • 09:00

Generation of ultra-short wavelength two-photon NOON state for high precision quantum metrology; Bai-Sen Shi1,2, and Qixian Peng1,2; 1Dept. of Physics, Zhejiang Univ., China; 2Inst. of Physics, Chinese Academy of Sciences, China. We propose a method to generate ultra-short wavelength two-photon NOON states for high precision quantum metrology.

F1E.1 • 08:30

New Approaches to Optical Fiber Sensing, Ali Massoud1, Angeliki Zafeiropoulou1, and Andris D. Dzents1; 1Univ. of Southhampton, UK. Optical fiber sensors can be classified in point, quasi-distributed and distributed sensors. This tutorial will review the different types of optical fibre sensors, with a focus on recent developments that can improve sensitivity, dynamic range and resolution.

F1E.2 • 08:45

A Laser Beam Homogenization Technology Based on Diffractive Optical Component and Corresponding Experimental Research; Xin Cu Zhao1, Peng Gao1, and Guang-Rui Li1; 1Tsinghua Univ., China. We propose a method of laser beam homogenization based on diffractive optical components. The experiment shows that the homogenization system and the image processing reduce the local spot non-uniformity from 37.02% to 6.6%.

F1E.3 • 09:00

A Real-time, Precise Artery Pulse Monitor System Based on Graphene-Coated Fiber, Shengyao Xu1,2, Cong Gao1, Kun Peng1, Li Ni1, Xiaolong Wang1, Huan Zhan1, Yuwei Li1, Lei Lian1, Sze-Chun Chan1,2, Jia Xin Dong1, Sze-Chun Chan1,2, Zhi-Yuan Li1, and Cai Zhao1; 1Dept. of Electronic Engineering, City Univ. of Hong Kong, China; 2Inst. of fluid physics, CAEP, China. We propose a method of real-time, precise artery pulse monitor system based on graphene-coated fiber.
High tunable bandwidth 2µm single-frequency laser for next-generation gravitational wave detection, Shuyan Qi, Yubin Hou, Guan Zhang, Pu Wang, Beijing Univ. of Technology, China. We demonstrate a low noise, GHz sweeping bandwidth with all silica single-frequency-distributed Bragg reflector laser and a 160W power fiber amplifier at 1992.6 nm for next-generation gravitational wave detection.

Flat-gain Wide-band Thulium-based Fiber Laser, Elizabet M. Leal1, 2, Juan Luis1, 2, Biao Sun1, Junhua Ji1, Vincent Lamraj1, 2, Xu Yu1, Qije Wang1, 2, School of Electrical & Electronic Engineering, Nanyang Technological University, Singapore. We report a design method for flat-gain wide-band all-fiber laser using cascaded bidirectional pumping of multi-segment thulium-doped fibers. Experimental demonstration of two-fiber setup achieved the widest reported 3-dB bandwidth of 178 nm.

Fiber optic sensors and microfluidics—Continued

Broadband Achromatic Aplanatic Flat Doublet in Mid-infrared, Hao Chenglong1, 2, Changquan Yu1, 2, Changwei Qu1, 2, National Univ. of Singapore, Singapore; 1State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 2National Polytechnic University, Hong Kong. We propose a broadband achromatic aplanatic flat doublet, which works at 3.8 μm to 4.4 μm. The combination of aspheric flat lens and fused silica flat lens suppress the chromatic aberration and off-axial aberrations simultaneously.

Computational Analysis of optically Pumped Quantum Dots Array on the Glass for Micro-LED Applications, Ching Ping Ng1, Chien-Chung Lin1, Shu-Hao Chang1, Yu-Ming Huang1, Ching-Ping Yu1, Hsiao-Chung Ku1, 2, Inst. of Lighting and Energy Photonics, National Chiao-Tung Univ., Taiwan; 1State Key Laboratory of Imaging and Biomedical Photonics, National Chiao-Tung Univ., Taiwan; 2Inst. of Photonics System, National Chiao-Tung Univ., Taiwan; 1State Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China.

A Hole-Filling Method for DIBR Based on Convolutional Neural Network, Yongui Li1, Xiru Zhu1, Duo Chen1, Peng Wang1, Huachen Wang1, Jinhu Yuan1, 2, Kun Wang1, Binbin Yan1, 3, Key Laboratory of Information Photonics and Optical Communications, Beijing Univ. of Posts and Telecommunications, China; 3Materials Research Centre, National Polytechnic University, Hong Kong.

If you are interested in a specific session, you can direct your attention to the relevant table entries.
Half-cycle mJ-level CEP-stable Pulses from Parametric Waveform Synthesis, Giulo Mara Rossi,1,2 Roland E. Marsi,1 Fabian Scheibl,3 Yudong Yang,1 Giovanni Cerri1,2, Franz Kaerntner1,2, DESY - CRTF, Germany; Physics Dept and The Hamburg Centre for Ultrafast Imaging, Univ. of Hamburg, Germany. Nearly transform-limited, carrier-envelope phase stable, 3.4 fs pulses with central wavelength of 1.8 µm are generated via parametric waveform synthesis. The mJ-level energy, at 1 Hz repetition rate, allows for waveform-controlled bright high-harmonic generation.

Nonlinear amplification for a 10 W, 750-MHz Yb:fiber frequency comb, Hironori Ishii,1,2, Zhenxu Bai1,2, Soumya Sarang1, David J. Gundel1,2, Byoungho Lee1; 1Univ. of Electronic Science & Tech of China, China. 2Harbin Inst. of Technology, China.

Anisotropic Plasmonic Light Scattering, Jiarong Wang1, Dept. of Physics, The Chinese Univ. of Hong Kong, Hong Kong; Control of light propagation in space is important in optical and optoelectronic devices, photonic circuits and solar energy harvesting. Plasmonic nanostructures are demonstrated to scatter light in specific directions in space.

Microwave Nanophotonic Technologies for Instantaneous Frequency Measurement Systems, Maurizio Bults1, Xu Wang1, Ming Li,2 Lukas Christowiski,3 Jose Azurdu1; ETH-Zürich, Switzerland; 2Univ. of British Columbia, Canada; 3Inst. of Semiconductors, China; Institut National de la Recherche Scientifique, Canada. This paper describes recent solutions for microwave instantaneous frequency measurement (IFM) systems based on integrated microwave photonic, with particular emphasis on the use of waveguide Bragg gratings (WBG) as a possible approach for the creation of a monolithic photonic IFM system.

Soliton Transient Dynamics in Ultrafast Fiber Lasers, Zh-i Chao Luo1,2, Meng Liu1,2, Aiping Luo1,2, Wen-Chung Kuo1,2, Qi Guo1; 1South China Normal Univ., China; 2South China Normal Univ., China. We review recent advances on the soliton dynamics of dissipative soliton and conventional soliton, soliton explosions, rogue wave generation, real-time spectral features of vector soliton. Our findings may be useful for better understanding the soliton dynamics.

F2C.2 • 11:00
Wideband Microwave Frequency Down-Conversion with Optical Harmonics Intensifier and Low-Frequency Local Oscillator, Xinhai Hou1,2, Byoungwoo Lee1, Seoul National Univ., Korea. A novel metasurface providing arbitrarily designed spin-orbit interactions of light has been proposed. Our theoretical and experimental demonstrations show the great potential of the phenomenon for various applications including optical communications and quantum optical process.

F2C.2 • 11:00
High-Security Stream-Cipher Generation Employing Synchronized Random Bit Generation and RC4 Algorithm, Changkun Xue1, Ning Jiang1, Xiaoyan Zhao1, Anke Zhao1, Yaxiu Hong1, Kun Gu1; 1Univ. of Electronic Science & Tech China, China; 2Bangor Univ., UK. We propose a new stream-cipher generation scheme based on the correlated physical random bit generation with synchronized chaotic lasers and pseudo-random bit extension RC4 algorithm. The proposed scheme shows high-security, extendable rate and strong robustness.

F2C.2 • 11:00
Generation of scalar and vector solitons in a bidirectional mode-locked fiber laser, Yang Kang1, Yang Liu1, Bowen Liu1, hai lu1, Zhijun Yang1, Deming Liu1, Qizhen Sun1; Huzhong Univ. of Science and Technology, China. We report on a bidirectional fiber laser mode-locked by the nonlinear polarization rotation technique. Experimentally, the scalar and vector solitons are observed in the opposite directions of a fiber laser for the first time.
mutual coherent properties in a single cavity, locked polarization-maintain fiber cavity. With dual-comb scheme with different repetition rates emitted from the laser cavity. Is demonstrated for realizing simple and robust fiber laser with nonlinear-amplifying-loop-mirror technologies—Continued

All-polarization-maintaining Er-fiber-based F2A.6 • 11:45 picosecond and femtosecond operation of a diode-pumped Nd:Gd:SilF, laser, yasutake kuboeck1, michal jelinko, miroslav cech, david vyhildal, fengli ma,dapeng jiang, jiang Bi, czech technic university, czech republic, czech academy of sciences, czechia; 2CAS key laboratory of transparent and opto-functional inorganic materials, Shanghai Inst. of Ceramics, Chinese Academy of Sciences, China. Passively mode-locked operation of diode-pumped Nd:Gd:SilF, laser is reported. Tois of 1.9 ps pulses at 1051 nm, 1.2 ps at 1059 nm, and 321 % at 1053 nm were obtained for pump power lower than 1.3 W.

Room S227

Room S228

F2C • Photonics Technologies for Communications—Continued

S2C.5 • 11:45 Joint Switching Characteristics of LCoS-Based Wavelength Selective Switches, Kusak Yamahata, Masahiko Jenno, Kagaya Univ., Japan. We show that inter-subchannel crosstalk of a joint-switching wavelength selective-switch based on a liquid-crystal-on-silicon spatial-light modulator significantly degrades while the applied optical attenuation increases even in an interleaved fiber arrangement.

Room S223

Room S224

F2B • Novel Plasmonics Nanostreams and Phenomena—Continued

F2B.3 • 11:15 Ultra-narrow Nanostrip Cavities for High-Q Resonances in the Visible Range, Kai Chen*, Gary Ratzkin*, Henning Velker*, Heklo Gross*, Xiaohu Wu*, André Beyer*, Armin Gölblasier†, Bert Heidt*, Jian Univ., China; †Universität Würzburg, Germany; ‡Universitat Bielefeld, Germany. We fabricated asymmetric nanostrip cavities by milling with helium ion microscope on the edge of single-crystal gold strips with one end open to the air. The cavities exhibit high-Q multiple resonances in the visible range.

Room S225

F2C • Photonic Microwave Generation, Processing and Measurement—Continued

F2C.3 • 11:15 Microwave Generation by an Optoelectronic Oscillator with 1.55μm AlGaInAs/InP Microcavity Laser, Yue-De Yang*, Inst. of Semiconductors, CAS, China. We demonstrate the optoelectronic oscillator based on a 1.55μm direct-modulated AlGaInAs/InP microcavity laser for generation of a single sideband phase noise of -116 dBc/Hz at 10kHz frequency offset is obtained for the generated signal.

F2D • Technologies and Approaches for Optical Transmission and Processing—Continued

F2D.3 • 11:15 Bidirectional mode-locked Er-fiber laser with symmetrical cavity configuration, Yuya Haru*, Yoshiaki Nakajima*, Kako Minohama†, †JST, ERATO MINOSHIMA Intelligent Optical Synthesizer Project, Japan; 2The Univ. of Electro-Communications, Japan. Bidirectional mode-locked Er-fiber laser with two saturable absorber mirrors and nonlinear polarization rotation is developed. Remarkable broad optical spectra in both directions with high relative stability is performed owing to symmetrical cavity configuration.

Room S226

F2F • Wideband Complexity-Enhanced Optical Chaos Generation and its Application for Fast Random Bit Generation, Anke Zhai†, Ning Jiang*, Chao Wang1,2, Zhijun Liu1; 1Jinan Univ., China; 2Univ. of Science and Technology, China. The angle-insensitive absorption is attributed on the edge of single-crystal gold stripes with symmetrical cavity configuration.

F2F.4 • 11:30 Picosemicond and Femtosecond Operation of a Diode-pumped Nd:Gd:SilF, Laser, Vector Kuboeck1, Michal Jelinek1, Miroslav Cech 1, David Vyhildal1, Fengli Ma1, Dapeng Jiang1, Jianguo Li1, Czech Technical University in Prague, Czechia; 2CAS Key Laboratory of Transparent and Opto-functional Inorganic Materials, Shanghai Inst. of Ceramics, Chinese Academy of Sciences, China. Passively mode-locked operation of diode-pumped Nd:Gd:SilF, laser is reported. Tois of 1.9 ps pulses at 1051 nm, 1.2 ps at 1059 nm, and 321 % at 1053 nm were obtained for pump power lower than 1.3 W.

F2F.5 • 11:45 Observation of Soliton Molecules in a Fiber Laser Based on WS2, Satifiable Absorber, Bowei Liu, Yang Xiang1, Yonggang Gou1, Kaitun Tang1, Huazhong Univ. of Science and Technology, China. We report the observation of soliton molecules in a WS2 fiber laser. Experimentally, tightly bound soliton molecules and bunch of soliton molecules are respectively obtained which reveals the dynamics of soliton complexes in fiber lasers.

F2E • Laser Dynamics—Continued

F2E.3 • 11:15 Nonlinear Phenomena in a Fiber Laser with a Single-waveguide Chirped Bragg Grating, Liangbi Su2, Xiaofei Wu2, André Beyer3, Armin Gölblasier3; 1Jinan Univ., China; 2Universität Bielefeld, Germany; 3CAS Key Laboratory of Transparent and Opto-functional Inorganic Materials, Shanghai Inst. of Ceramics, Chinese Academy of Sciences, China. We propose a novel method for fast switchable, reconfigurable optical beam generation using multiple parallel phase modulator. Frequency spacing and offset of the generated combs are flexibly multiplied in several times against the driving frequency. Design criteria is clarified and numerically verified.

F2E.2 • 11:30 Frequency Comb Generation Using Multiple-Parallel Phase Modulator, Takahide Sakamoto1, Akihito Chiba1; 1National Inst. of Information & Comm Techn., Japan; 2Gunma Univ., Japan. We propose reconfigurable optical comb generation using multiple parallel phase modulator. Frequency spacing and offset of the generated combs are flexibly multiplied in several times against the driving frequency. Design criteria is clarified and numerically verified.
An hybrid Er:fiber femtosecond Laser for optical frequency comb applications, Yanjun Zhang1,2, Lulu Yan1,2, Bingjie Rao1,2, Yanyan Zhang1,2, Haifeng Jiang1,2; National Time Service Center, China; Univ. of Chinese Academy of Science, China. An Er:fiber based femtosecond laser employing nonlinear amplification loop mirror (NALM) and nonlinear polarization evolution (NPE) mode-locking mechanisms is demonstrated. The hybrid laser combines advantages of good robustness of NALM and low noise feature of NPE.

Numerical analysis on double frequency-division multiplexing—Continued

Point-like surface plasmon polariton source from complementary split-ring resonators, Jin-Kyu Yang1, Optical Engineering, Kogaku National Univ., Korea. We numerically studied about the point-like surface plasmon polariton source from the complementary split-ring resonator (CSRR). When the normal incident light was linearly polarized parallel to the symmetry axis of the CSRR, monopole-like point SPP source was excited.

Microwave Photonic Upconverter With Frequency Doubling Based on Dual-Polarization Dual-Parallel Mach-Zehnder Modulator, Dayong Wang1,2, Jinjun Li1, Yunxin Wang1,2, Jiahao Xu1,2, Tao Zhou3, Xin Zhong3, Dengcai Yu1,2; Beijing Univ. of Posts and Telecommunications, China; Univ. of Chinese Academy of Science, China. We report an automatic fiber laser system from complementary split-ring resonators, Jin-Kyu Yang1, Optical Engineering, Kogaku National Univ., Korea. We numerically studied about the point-like surface plasmon polariton source from the complementary split-ring resonator (CSRR). When the normal incident light was linearly polarized parallel to the symmetry axis of the CSRR, monopole-like point SPP source was excited.

Microscopic dynamics of the plasmonic dimer. Spectral splitting satisfies the strong coupling criterion. Electromagnetic energy Rabi oscillation is also observed.

An hybrid Er:fiber femtosecond Laser for optical frequency comb applications, Yanjun Zhang1,2, Lulu Yan1,2, Bingjie Rao1,2, Yanyan Zhang1,2, Haifeng Jiang1,2; National Time Service Center, China; Univ. of Chinese Academy of Science, China. An Er:fiber based femtosecond laser employing nonlinear amplification loop mirror (NALM) and nonlinear polarization evolution (NPE) mode-locking mechanisms is demonstrated. The hybrid laser combines advantages of good robustness of NALM and low noise feature of NPE.