Track 1: Optical Fibers, Fiber-based Devices

Venue: Nanjing Room I & II, 3F

October 25

13:30–15:30

M4A • Advances in Quantum & Classical Light Sources

Presider: Limin Tong, Zhejiang University, China

M4A.1 • 13:30 Invited

Fiber-Based Sources of Quantum Light for Quantum Information Processing, Xiaoying Li[1]; [1]*Tianjin Univ., China.* Using the parametric process of four-wave mixing in silica core fibers, we demonstrate the generation of various kinds of quantum states, including the pure state single photons and spatially entangled photon pairs in telecom band.

M4A.2 • 14:00 Invited

Spatiotemporal Sculpturing of Ultrashort Pulses, Qiwen Zhan[1]; [1]*Univ. of Shanghai for Sci. and Tech., China.* We present a pulse shaping technique that enables directly imprinting a spatial modulation to the spatiotemporal domain through taking advantage of the relationship between frequency and time of chirped pulses.

M4A.3 • 14:30 Invited

Few-Mode Amplifers and Their Applications, Guifang Li[1]; [1]*Univ. of Central Florida, USA.* We describe few-mode Er-doped fiber amplifers and their applications in free-space optical com- munication and LiDAR.

M4A.4 • 15:00 Invited

Title to be Announced, Trevor M. Benson[1]; [1]*Univ. of Nottingham, UK.* Abstract not available.

16:00–18:00

M5A • Microstructured & Nano Fibers

Presider: Zefeng Wang, University of Defense Technology, China

M5A.1 • 16:00 Tutorial

Hollow Core Fibres: Past, Present and Future, Francesco Poletti[1]; [1]*Univ. of Southampton, UK.* Hollow core fibers have improved their optical performance by orders-of-magnitude in the last decade, and are now close to challenging solid core fibers. We will review this progress and high- light some disruptive applications.

M5A.2 • 16:45

Tuning Thermal Coefficient of Delay of Photonic-Bandgap Hollow-Core Fiber by Surface-Mode Coupling, Fei Yu[1], Yazhou Wang[1], Zhengran Li[1], Lili Hu[1], Jonathan Knight[2]; [1]*Shanghai Inst. of Optics and Fine Mech., China;* [2]*Physics, Univ. of Bath, UK.* We numerically demonstrate that surface modes play an important role in the tuning of temperature dependent group delay of PBG-HCF, with the thermal coefficient of delay tuned from -400 ps/km/K to 400 ps/km/K.

M5A.3 • 17:00

Large Mode Area Fibers With High Birefringece Induced by Internal Nanostructuring of the Core, Ryszard

Buczynski[2,1], Damian Michalik[1], Alicja Anuszkiewicz[2,3], Adam Filipkowski[1,2], Grzegorz Stepniewski[2,1], Dariusz Pysz[2], Ireneusz Kujawa[2], Rafal Kasztelanic[1,2]; [1]*Faculty of Physics, Univ. of Warsaw, Poland;* [2]*Department of Photonic Materials, Lukasiewicz Research Network - Inst. of Microelectronics and Photonics, Poland;* [3]*Fac- ulty of Electronics and Information Technology, Warsaw Univ. of Technology, Poland.* We study a polarization maintaining silica glass fibers with artificially anisotropic core. A phase birefringence of 1.92×10^{-4} for the single mode fiber with core diameter of 30 µm is reported.

M5A.4 • 17:15

Experimental Demonstration of a Compact Variable Single-Mode Fiber Coupler Based on Microfiber, Luqing Shao[1], Yingxin Xu[1], Hao Wu[1], Wei Fang[1], Limin Tong[1]; [1]*Zhejiang Univ., China.* Abstract: A compact variable fiber coupler consisting of two identical microfibers is demon- strated. By twisting microfibers, the coupling ratio varies from 3.15% to 98.5% due to the change of evanescent field interaction length.

M5A.5 • 17:30 Invited

Title to be Announced, Limin Tong[1]; [1]*Zhejiang Univ., China.* Abstract not available.

October 26

08:30–10:00

T1A • Fiber Devices & Applications

Presider: Ming Tang, Huazhong University and Science and Technology, China

M5A.5 • 17:30 Invited

Title to be Announced, Limin Tong[1]; [1]*Zhejiang Univ., China.* Abstract not available.

T1A.3 • 09:15

An Intrusion Recognition Method Based on the Combination of One-Dimensional CNN and DenseNet With DAS System, Qizhen Sun[2,1], Shixiong Zhang[2], Tao He[2], Cunzheng Fan[2], Hao Li[2], Zhijun Yan[2], Deming Liu[2]; [1]*PGMF and School of Physics, Huazhong Univ. of Science and Tech- nology, China;* [2]*School of Optical and Electronic Information, Wuhan National Laboratory for Op- toelectronics, National Engineering Laboratory for Next Generation Internet Access System, Huazhong Univ. of Science and Technology, China.* Assisted with fiber optic distributed acous- tic sensing (DAS) system, the average recognition accuracy of 98.4% for six types of events and 2ms processing time were achieved in the field test.

T1A.4 • 09:30

Spectral Line Spacing Multiplied Optical Fre- quency Comb Generation Based on Talbot Ef- fects, Ruifeng He[1], Juanjuan Yan[1]; [1]*Beihang Univ., China.* An optical frequency comb line spacing control system based on temporal and spectral Talbot effects is demonstrated. The spectral line spacing is respectively increased to 2, 3, 4, and 5 times of the original.

T1A.5 • 09:45

High Sensitivity Refractive Index Sensor Based on the Cascaded Long-Period Fiber Grating Near the Dispersion Turning Point, Kangkang Lu[1], Chen Jiang[1], Dandan Liao[1], Yunqi Liu[1]; [1]*Shanghai Univ., China.* We demonstrate the fabrication of refractive index sensor based on the cascaded long-period fiber grating near dispersion turning point. The measured refractive index sensitivity is up to 2095.9 nm/RIU in the RI range of 1.333-

1.395.

10:30–12:00

T2A • OAM in Fibers

Presider: Qiwen Zhan, University of Shanghai for Science and Technology, China

T2A.1 • 10:30 Invited

Orbital Angular Momentum Fibres, Mode (De) Multiplexers, and SDM/MDM Transmission Experiments, Siyuan Yu[1]; *[1]State Key Laboratory of Optoelectronic Materials and Technologies, School of Electronics and Information Engineer- ing, Sun Yat-sen Univ., China.* Recent break- throughs in the optical fibres, (de)multiplexing devices and SDM/MDM transmission based on the orbital angular momentum modes of light will be reviewed, achieving record transmission capacity and spectral efficiency with ultra-low MIMO complexity .

T2A.2 • 11:00

LP_{01}-LP_{31} Mode Converter Based on Helical Long-Period Grating Inscribed in Six-Mode Fiber Using CO_2-Laser, Weidong Zhang[1], Chen Jiang[1], Yuehui Ma[1], Xinyi Zhao[1], Yunqi Liu[1], Lei Shen[2], Lei Zhang[2], Jie Luo[2]; *[1]Shanghai Univ., China; [2]Yangtze optical fiber and cable joint stock limited company, China.* We fabricate the LP_{01}-LP_{31} mode converter based on helical long-period grating inscribed in six-mode fiber using CO_2-laser. The results show that the mode converter has the maximum conversion efficiency of over 90%.

T2A.3 • 11:15

The Consecutive Generation of the $+1^{st}$ and -1^{st} Order Orbital Angular Momentum Modes Based on a Chiral Long-Period Fiber Grating Cascaded With Opposite Helicities, Xiongfeng Rao[1,2], Qiming Ban[1,2], Xu Deng[1,2], Li Yang[1,2]; *[1]Department of Electronic Engineering and Information Science, Univ. of Science and Technology of China, China; [2]Key Laboratory of Electromagnetic Space Information, Chinese Academy of Sciences, China.* We propose and fabricate a novel chiral long-period fiber grating cascaded with opposite helicities (CLPG-OH) for the consecutive generation of the $+1^{st}$ and -1^{st} order orbital angular momentum (OAM) modes in a specific wavelength range.

T2A.4 • 11:30

Optical Fiber-Generated Vector Beams for BGO-Crystal Based Magnetic Field Sensing, Pengchong Wang[1], Lina Xiang[1], Yunzhe Gu[1], Yana Shang[1], Liang Zhang[1], Heming Wei[1], Fufei Pang[1]; *[1]Shanghai Univ., China.* We demonstrated mag- netic field sensing based on the magneto-optic effect of optical fiber-generated vector beams in BGO crystal. A sensitivity of 9.1%/T is obtained by utilizing a slit and optical power measurement.

T2A.5 • 11:45

Splice Loss Characterization of High Order OAM Modes in Ring-Core Fibers, Cong Huang[1], Junyi Liu[1], Jie Liu[1], Siyuan Yu[1]; *[1]Sun Yat-sen Univ., China.* The fusion splice loss characteristics based on Rayleigh back-scattering in a ring-core fiber are experimentally demonstrated. The tolerance of the ring core fiber towards fusion splice loss is similar to that of few mode fibers.

13:30–15:30

T3A • Fiber Sensors I

Presider: Huilian Ma, Zhejiang University, China

T3A.1 • 13:30 Invited

Title to be Announced, Haiwen Cai[1]; [1]*Shanghai Inst of Optics and Fine Mech, China.* Abstract not available.

T3A.2 • 14:00

A Detection Scheme of Abnormal Sound Events on Highway Based on Φ-OTDR, Yiming Hong[1,2], Bingyao Cao[1,2], Kechen Yuan[1,2]; [1]*Key laboratory of Specialty Fiber Optics and Optical Access Networks, China;* [2]*Joint International Research Labora- tory of Specialty Fiber Optics and Advanced Communication, Shanghai Univ., China.* Based on Φ-OTDR technology, opti- cal fiber attached on the guardrail surface is used to detect highway abnormal events. The results come out good with variable-weight-election logistic regression algorithm in low-cost real-time system.

T3A.3 • 14:15

Multi-Channel Quasi-Distributed Acoustic Sensing Based on Spatial Division Multiplexing and Time-Gated OFDR, Yuanpeng Deng[1], Qingwen Liu[1], Yanming Chang[1], Zuyuan He[1]; [1]*Shanghai Jiao Tong Univ., China.* In this work, two weak reflector arrays are interrogated simultaneously using spatial division multiplexing and TGD-OFDR techniques. Vibrations on the two channels are detected with ignorable cross-talk.

T3A.4 • 14:30

Large-Scale Multiplexed in-Fiber Micro-Cavity Array for Distributed High Temperature Sensing*, Bin Du[1], Jun He[1], Kuikui Guo[1], Xizhen Xu[1], Yiping Wang[1];* [1]Shenzhen Univ., China. We demonstrated a femtosecond laser-induced in-fiber micro- cavity array (MCA) for distributed high temperature sensing. The temperature response from room temperature to 1000 °C of the MCA was investigated, and a temperature demodulation accuracy of 0.49 °C was successfully achieved.

T3A.5 • 14:45

Dual-Mode Heterodyne gas Tracing in a Graphene-Based Fiber Laser Microresonator*, Yanhong Guo[1], Ning An[1,2], Yiwei Li[1], Teng Tan[1,2], Yiping Wang[3], Yunjiang Rao[1,2], Baicheng Yao[1], ;* [1]*Univ of Electronic Science & Tech China, China;* [2]*Research Centre of Optical Fiber, Zhejiang Laboratory Sensing, China;* [3]*Guangdong and Hong Kong Joint Research Center for Optical Fiber Sensors, Shenzhen Univ., China.* By combining monolayer graphene in an erbium-doped D-shaped fiber DBR, we achieve both Q-switching and cavity-oscillation mode lasers in an all- in-one fiber-optical device, label-freely detecting NH_3 and CO_2 gas in mixture with nM/L sensitivity.

T3A.6 • 15:00

Simultaneous Pressure and Temperature Measurement System for Flexible Ureteroscope Lithotripsy, *Yanjin Zhao[1], Ningfang Song[1], Fuyu Gao[1], Xiaobin Xu[1];* [1]BUAA, China. For real-time pressure and temperature monitoring during flexible ureteral lithotripsy, a optical fiber sensor based on the Fabry- Pérot cavity and a synchronous decoupling detection system are proposed to realize the high-sensitivity and quick-response measurement.

T3A.7 • 15:15

Relative Humidity Sensor Based on Graphene Oxide-Coated D-Shaped Fiber and Polarimetric Heterodyning Demodula- tion, *Kuikui Guo[1], Jun He[1], Yiping Wang[1];* [1]Shenzhen Univ., China. We demonstrate a polarimetric fiber laser system for relative humidity (RH) sensing based on the beat frequency demodulation. The RH sensor probe was fabricated by the graphene oxide-coated D-shaped fiber. It exhibits a sensitivity of 34.7 kHz/RH% in a RH range of 30%-98%.

October 27

08:30–10:00

W1A • Multicore Fibers

Presider: Siyuan Yu, University of Bristol, UK

W1A.1 • 08:30 Invited

Coupled Multi-Core Fiber Technologies, Taiji Sakamoto[1], Masaki Wada[1], Yusuke Yamada[1], Shinichi Aozasa[1], Kazuhide Nakajima[1]; [1]*NTT Access Service Systems Labo- ratories, Japan.* We briefly review the recent progress of the coupled multi-core fiber technologies in terms of the fiber design, cabling and amplification for high spatial density and energy efficient space division multiplexing (SDM) transmission system.

W1A.2 • 09:00 Invited

Title to be Announced, Ming Tang[1]; [1]*Huazhong Univ of Science and Technology, China.* Abstract not available.

W1A.3 • 09:30

Design, Fabrication and Measurement of a Novel Ultra Low Crosstalk 7-Core-10- Mode Fiber, **Lei Shen[2,1], Xiaoyue Deng[3], Jun Chu[2,1], Yin Li[2,1], Zhao Yao[2,1], Peng Li[2,1], Liubo Yang[2,1], Lei Zhang[2,1], Jie Luo[2,1], Xiaobo Lan[2,1], Hui Lv[3], Yucheng Yao[3]; *[1]YOFC, China; [2]State Key Laboratory of Optical Fiber and Cable Manufacture technology, China; [3]School of Science, Hubei Univ. of Technology, China.* We report the design, fabrication and measurement of a weakly-coupled 7-core-10-mode fiber. The at- tenuation of LP01 mode is 0.22dB/km and the crosstalk of the cores are less than -50dB/km. This FM-MCF can be used in weakly-coupled SDM systems that allows to multiply the capacity.**

10:30–12:00

W2A • Ultrafast Fiber Lasers & Nonlinear Optics

Presider: Pu Zhou, National University of Defense Technology, China

W2A.1 • 10:30 Invited

Omitting Conventional Saturable Absorbers in Thulium-Doped Mode-Locked Fibre Lasers, Dennis C. Kirsch[1], Maria Chernysheva[1]; [1]*Leibniz Inst. of Photonic Tech- nology, Germany.* Conventional material saturable absorbers and artificial modulators cause a high risk of damage, a rise of self-starting threshold, and poor integration. The exclusion of such elements enables more reliable, highly integrated ultrafast fibre laser architecture.

W2A.2 • 11:00

Observation of Pulsating Dissipative-Soliton-Resonance Pulses in an Yb-Doped Fiber Laser, Zhuang Wang[1], Heping Li[1], Junwen Li[1], Wenxiong Du[1], Zhiyao Zhang[1], Yong Liu[1]; [1]*Univ of Electronic Science & Tech China, China.* We present the first experimental observation of pulsating dissipative-soliton-resonance (DSR) pulses in an Yb-doped figure-eight fiber laser. Our results would stimulate further research on the dynamics of DSR pulses in dissipative systems.

W2A.3 • 11:15

Phase-Sensitive Amplification in a Dispersion Oscillating Fiber With Two Pumps, Debanuj Chatterjee[1], Andrey Konyukhov[2], Alexej Sysoliatin[3], Deepa Venkitesh[1]; [1]*Elec- trical Engineering, IIT Madras, India; [2]Saratov State Univ., Russian Federation; [3]A.M. Prokhorov General Physics Inst., Russian Federation.* Propagation of two pumps and degenerate signal in a dispersion oscillating fiber(DOF) is investigated analytically and numerically. Unlike the single-pump case, the gain sidebands are found to be influenced by the generated high-order pumps.

W2A.4 • 11:30

The Impact of Fiber Cladding Diameter on Forward Brillouin Scattering in Single-Mode Fibers, Yunshan Zhou[1], Zhiyong Zhao[1], Ming Tang[1]; [1]*Wuhan National Laboratory for Optoelectronics (WNLO), School of Optical and Electronic Informa- tion, Huazhong Univ. of Science and Technology, China.* The impact of fiber cladding diameter on forward stimulated Brillouin scattering (FSBS) in single-mode fiber is investigated by simulation and experiment in this work, providing a guidance for FSBS engineering in optical fibers.

W2A.5 • 11:45

Different Electrodes Partial Discharge Detections via Fluorescent Fiber, Qiang Guo[1], Feiyang Xie[1], Xiaoqi Huang[2], Changfeng Zhang[1], Mao Li[1], Yuheng Yan[1], Luchuan Zheng[1], Taiqi Wang[1]; [1]*Shanghai Univ., China;* [2]*China Academy of Space Technology, China.* Fluorescent fiber is used for Partial Discharge (PD) with different electrodes. The PD signal is linearly correlated with transient discharge current. Experimental results show the shape of the electrode affects the intensity of PD signal.

13:30–15:30

W3A • Fiber Lasers

Presider: TBA

W3A.1 • 13:30 Invited

High Power Narrow-Linewidth Fiber Lasers, Pu Zhou[1]; *[1]National Univ of Defense Technology, China.* The key technology for power scaling of narrow-linewidth will be discussed, the status of high power narrow-linewidth fiber lasers, and its future perspective, will be briefly summarized.

W3A.2 • 14:00

A High Slope Efficiency Ring-Cavity Single-Frequency Fiber Laser Based on Yb: YAG Crystal-Derived Silica Fiber, Ying Wan[1], Jianxiang Wen[1], Kai Zou[1], Chen Jiang[1], Fufei Pang[1], Tingyun Wang[1]; *[1]Shanghai Univ., China.* A high-concentration Yb-doped YAG crystal-derived silica fiber (YCDSF) is fabricated using the melt-in-tube method . Based on this fiber, a ring-cavity single-frequency fiber laser (SFFL) has been accom- plished, and its slope efficiency is up to 21 .7%.

W3A.3 • 14:15

S-Band Single-Longitudinal-Mode Fiber Laser With Ultra-Narrow Linewidth, Ultra-High OSNR and High Stability, Zhengkang Wang[1], Jianming Shang[2], Yaojun Qiao[1], Song Yu[2]; *[1]Beijing Key Laboratory of Space-Ground Interconnection and Convergence, School of Information and Communication Engineering, Beijing Univ. of Posts and Telecommunications, China; [2]School of Electronic Engineering, Beijing Univ. of Posts and Telecommunications, China.* We investigated an S-band single-longitudinal-mode fiber laser based on a high-quality double-ring passive subring resonator. An ultra-narrow linewidth of 568 Hz and an ultra-high OSNR of 77 dB were achieved.

W3A.4 • 14:30

Blue Laser-Induced Destruction of Active Centers in Cladding-Pumped Bi-Doped Fiber, Aleksandr Kharakhordin[1], Aleksandr Vakhrushev[1], Sergey Alyshev[1], Elena Fir- stova[1], Aleksandr Khegai[1], Konstantin Riumkin[1], Mikhail Melkumov[1], Alexey Lobanov[2], Vladimir Khopin[2], Alexey Guryanov[2], Sergey Firstov[1]; *[1]Prokhorov General Physics Inst. of the Russian Academy of Sciences, Russian Federation; [2]Inst. of Chemistry of High-Purity Substances of the Russian Academy of Sciences, Russian Federation.* We report the destruction of laser-active centers in a bismuth-doped fiber induced by a blue laser diode using a cladding-pump configuration. The effect of bleaching in this configuration on bismuth-doped fiber laser characteristics was studied.

W3A.5 • 14:45

Transverse Mode Fiber Laser Based on Few-Mode Polarization-Maintaining Fiber Long-Period Grating, Chen Jiang[1], Yunqi Liu[1], Yuehui Ma[1], Ying Wan[1], Zinan Huang[1], Chengbo Mou[1]; *[1]Shanghai Univ., China.* We propose the fabrication of long-period grating in a few-mode polarization-maintaining fiber using CO2-laser. A transverse mode fiber laser based on the grating has been proposed and dem- onstrated experimentally.

W3A.6 • 15:00 Invited

Mid-Infrared Fiber Lasers Based on Gas-Filled HCFs, Zefeng Wang[1], Zhiyue Zhou[1], Yulong Cui[1], Wei Huang[1], Hao Li[1], Wenxi Pei[1]; *[1]National Univ. of Defense Technol- ogy, China.* With the rapid development of HCFs, fiber gas lasers have emerged as an alternative technology. Recent progress of fiber gas lasers operating at the mid-infrared has been reviewed and prospected.

16:00–18:00

W4A • Fiber Sensors II

Presider: Haiwen Cai, Shanghai Institute of Optics and Fine Mechanics, China

W4A.1 • 16:00 Invited

Near-Infrared Plasmonic Optical Fiber Biosensing, Christophe Caucheteur[1]; [1]*Universite de Mons, Belgium.* We report in vitro bioassays using gold-coated tilted fiber Bragg gratings functionalized for both proteins and cells sensing. Our work is focused towards the measurement of relevant cancer biomarkers.

W4A.2 • 16:30

Temperature Insensitive Refractive Index Sensor Based on Long-Period Fiber Gratings in Capillary, Mengxue Tang[1], Yunhe Zhao[1,2], Wei Wang[1], Yongsheng Yang[1], Zuyuan He[2]; [1]*Shanghai Maritime Univ., China;* [2]*Shanghai Jiao Tong Univ., China.* We proposed a refractive index (RI) sensor based on arc-discharged long-period fiber gratings in capillary. Sensing performance of the gratings have been investigated experimentally. The proposed RI sensor is insensitive to the external temperature variation.

W4A.3 • 16:45

High Sensitivity Interferometric Refractive Index Sensor Based on Tapered Double-Cladding Fiber, Long Chen[1], Chen Jiang[1], Yuehui Ma[1], Kai Guo[1], Yunqi Liu[1]; [1]*Shanghai Univ., China.* We proposed an ultra-sensitive refractive index sensor based on tapered double-cladding fiber Mach-Zehnder Interferometer using CO_2-laser heating and tapering system. The sensitivity of the sensor can be up to 5484.4575 nm/RIU.

W4A.4 • 17:00 Invited

Development of Passive Resonant Optical Gyroscopes, Huilian Ma[1], Lu Liu[1], Weiwen Qian[1], Shuang Liu[1]; [1]*School of Aeronautics and Astronautics, Zhejiang Univ., China.* This paper presents a review on passive resonant optical gyroscopes that we developed in recent years. Two types of gyroscopes including resonant fiber optic gyroscope (RFOG) and resonant micro optic gyroscope (RMOG) are introduced, respectively.

W4A.5 • 17:30

Fast-Response High-Temperature all-Fiber Fabry-Perot Dynamic Pressure Sensor for Internal Combustion Engine, Xiu He[1], ZengLing Ran[1], Zhaoyang Ding[1], Tianqi Shao[1], Lupeng Gan[1], Mengke Yu[1], Nan Wang[1], Zhengxi He[1], Yunjiang Rao[1]; [1]*Univ of Electronic Science & Tech China, China.* A fast-response high-temperature all-fiber Fabry-Perot sensor for measuring dynamic pressure in an internal combustion engine was investigated. Field tests demonstrated the performance of the sensor was well consistent with that of a commercial Kistler sensor.

W4A.6 • 17:45

Twist Sensor Based on Long-Period Grating Mach-Zehnder Interferometer at 2-µm Waveband, Dandan Liao[1], Chen Jiang[1], Kangkang Lu[1], Yunqi Liu[1]; [1]*Shanghai Univ., China.* We demonstrate the fabrication of Mach-Zehnder interferometer twist sensor based on the cascaded long-period fiber gratings operating at 2-µm wave- band. The torsion sensitivities of wavelength and intensity are 0.333 nm/(rad/m) and -1.095 dB/(rad/m), respectively.