

December 2, 2020 (Wednesday)

We-A: Sensing III

Presider: Takayuki Shima (AIST, Japan)

We-A-01 Invited

9:00 Silicon-plasmonic-integrated sensors for Lab-on-Chip application

Masanobu Haraguchi¹, Shun Kamada¹, Salah E. El-Zohary², Hiroyuki Okamoto³, Toshihiro Okamoto¹

¹Tokushima University (Japan), ²Tanta University (Egypt), ³National Institute of Technology, Anan College (Japan)

We proposed a Silicon-plasmonic-integrated sensors for Lab-on-Chip application. We numerically and experimentally observed the optical characteristics of surface plasmon polariton (SPP) rectangular resonator connected SPP waveguides. Simple rectangular resonator providing two types of SPP resonance modes enable high sensitivity of molecular detection for Lab-on-Chip application.

We-A-02 Invited

9:25 Velocity distribution measurements based on differential laser Doppler velocimetry

Koichi Maru

Kagawa University (Japan)

Velocity distribution measurement techniques using differential laser Doppler velocimetry are presented. The principle is based on non-mechanical scanning and simultaneous multipoint measurement using spatial encoding. Several methods for measuring 1-dimensional and 2-dimensional velocity distributions are described.

We-A-03

9:50 Detection of Pitch Uniformity of Microstructure using Simple Light Illumination

Toshiki Azuma, Kanami Ikeda, Osanori Koyama, Makoto Yamada

Osaka Prefecture University (Japan)

The pitch of the grating structures may not be uniform. It could lead to equipment malfunction. In this study, we simulate reflected light from grating

structures to investigate the possibility of detecting grating pitch uniformity using a simple system configuration.

We-A-04

10:05 Electro-Optic Probe Using $\text{KTa}_{1-x}\text{Nb}_x\text{O}_3$ for Low-Frequency Measurement

Keita Takano¹, Mitsuru Shinagawa¹, Jun Katsuyama², Yoshinori Matsumoto², Shogo Yagi³, Takafumi Ogawa³

¹Hosei University (Japan), ²Yokogawa Electric Corporation (Japan), ³NTT Advanced Technology Corporation (Japan)

This paper describes the feasibility of an EO probe using a KTN crystal for measuring low frequency signals. The experimental results shows that the KTN crystal increases the sensitivity of the EO probe and enables measurement of low frequency signals.

10:20 - 10:35 Break

We-B: Nanophotonics and Plasmonics

Presider: Ryuichi Katayama (Fukuoka Institute of Technology, Japan)

We-B-01 Invited

10:35 High Dimensional Quantum Entanglement Meta-lens Array Optical Chip

L. Li¹, Z. Liu², X. Ren³, S. Wang², M.-K. Chen¹, V.-C. Su⁴, C. H. Chu⁵, H. Y. Kuo⁶, B. Liu³, W. Zang², G. Guo³, L. Zhang², Z. Wang², S. Zhu², D. P. Tsai¹

¹The Hong Kong Polytechnic University (Hong Kong), ²Nanjing University (P.R.China), ³University of Science and Technology of China (P.R.China), ⁴National United University, Miaoli (R.O.C.), ⁵Academia Sinica (R.O.C.), ⁶National Taiwan University (R.O.C.)

By integrating a meta-lens array with a nonlinear crystal, we demonstrate a 100-path spontaneous parametric down-conversion photon-pair optical chip, which is promising for high-dimensional quantum entanglement and multi-photon state generations.

We-B-02

11:00 The Correlation between Electrical Properties and Surface Plasmonic Properties on ITO Films with diffraction grating

Nobutoshi Miyamoto, Kohei Funahashi, Noriyuki Hasuike, Minoru Takeda

Kyoto Institute of Technology (Japan)

SPP mode along the ITO/air interface were discussed for ITO films with different electric properties by using diffraction grating structure.

We-B-03

11:15 Significant enhancement of magneto-optical effect at ultraviolet wavelength using Ni-subwavelength grating on SiO₂/Ni structure

Yuusuke Takashima, Masanobu Haraguchi, Yoshiki Naoi

Tokushima University (Japan)

Significant enhancement of magneto-optical (MO) effect was theoretically demonstrated using Ni-subwavelength grating on SiO₂/Ni. Electromagnetic field simulated indicates that the concentrated electric field at SiO₂-Ni interface assisted interaction between magnetized matter and light, and our structure achieved 224 times greater polarization rotation MO effect than that of bulk Ni.

We-B-04

11:30 Dimensional Characteristics of Guided-mode Resonant Nanostructures

Akari Watanabe¹, Junichi Inoue¹, Kenji Kintaka², Shanwen Zhang³, Shogo Ura¹, Robert Magnusson⁴

¹Kyoto Institute of Technology (Japan), ²National Institute of Advanced Industrial Science and Technology (AIST) (Japan), ³Chinese Academy of Sciences (P.R.China), ⁴University of Texas (U.S.A.)

Guided-mode resonance shows different filtering behaviors between one- and two-dimensional grating structures. Reflection spectra are simulated and discussed with dimensional transformation between them by introducing intermediate structures consisting of vertically-stacked different-dimensional gratings.

We-B-05

11:45 Transmission and Reflection Coherent Diffraction for High-accuracy Cross-sectional Measurement by Soft X-rays

Tetsuya Hoshino¹, Sadao Aoki¹, Masahide Itoh¹, Motoharu Shichiri², Hiroshi Itoh²

¹University of Tsukuba (Japan), ²National Institute of Advanced Industrial Science and Technology (AIST) (Japan)

This study is a cross-sectional shape measurement with high accuracy in the plane including the optical axis in soft X-rays. Conventionally, only a periodic structure can be observed with the accuracy of a few wavelengths. Our aim is an isolated structure measurement and it has wide applications including optical memory.

We-B-06

12:00 Evaluation of the Plasmon Resonance Antenna with Bulls-eye Structures

Masahiro Deguchi, Genta Yonezawa, Minoru Takeda, Noriyuki Hasuike

Kyoto Institute of Technology (Japan)

We designed and fabricated bulls-eye plasmonic structures that efficiently enhance the electric field in the central part by exciting surface plasmons in the visible regions, and emitting light of the resonant wavelength from the central aperture with high directionality. We experimentally evaluated the characteristics and compared with FDTD simulation results.

12:15 - 12:20 ISOM'20 Commemorative Photo

12:20 - 13:15 Lunch

We-C: Biological and Life Application II

President: Masanori Takabayashi (Kyushu Institute of Technology, Japan)

We-C-01 Invited

13:15 Securing IoT Sensor Networks Based on LoRa

Shoichiro Seno, Akinori Furuya, Hiroyuki Nakayama

Tokushima Bunri University (Japan)

IoT sensor networks based on LoRa are being deployed increasingly thanks to its relatively wide range. As LoRa becomes popular, security threats like traffic analysis and localization will impose a major issue. This paper proposes a new security measure called address randomization in addition to standardized encryption and message authentication.

We-C-02

13:40 Wearable broadband photo-thermoelectric sensor sheet with flexible carbon nanotube thin channel films for passive liquidity monitoring

Kou Li, Yukio Kawano

Tokyo Institute of Technology (Japan)

This paper reports wearable passive liquidity monitoring with freely attachable broadband sensitive photo-thermoelectric thin-film sensor sheets. The device consists of bendable carbon nanotube films, and can be smoothly patched on sterically curved liquid pipes. The proposed sensor demonstrates label-free photo-sourceless inspections of the glucose solution concentration based on black-body radiation.

We-C-03

13:55 Dynamic Signal Sensing of Intra-body Communication in Three Walking Persons

Sotaro Sawa, Mitsuru Shinagawa, Rikuma Ashizawa

Hosei University (Japan)

This paper describes a signal sensing for three walking persons in intra-body communication by using a dynamic signal sensing system. The power margin is proposed in a situation of three walking persons for preventing the system from wrong authentication caused by unintentional signal.

14:10 - 14:25 Break

We-D: Optical Memory III

Presider: Osamu Matoba (Kobe University, Japan)

We-D-01 Invited

14:25 All-optical quantum memories towards photonic quantum information processing

Mamoru Endo, Jun-ichi Yoshikawa, Akira Furusawa

The University of Tokyo (Japan)

One of the most promising approaches to realize fault-tolerant universal quantum computation is the use of a travelling electromagnetic field of light. We review how to implement an optical quantum computer with all-optical quantum memories.

We-D-02 Invited

14:50 Dynamic sampling iterative phase reconstruction for holographic data storage

Xiao Lin, Ruixian Chen, Jianying Hao, Changyu Yu, Qijing Zheng, Xianying Qiu, Suping Wang, Kun Wang, Xiaodi Tan

Fujian Normal University (P.R.China)

We proposed a method of dynamic sampling iterative phase reconstruction for holographic data storage. Compared with traditional method that using same Fourier intensity pattern in every iteration, the bit-error-rate is lower and the iteration number is fewer by using the dynamic sampling method.

We-D-03 Invited

15:15 A recording method for SQAM signal in holographic memories and improvement of areal information density

Satoshi Honma, Haruki Watanabe, Yugo Nakajima

University of Yamanashi (Japan)

A two-step exposure method and interleaved phase pages are investigated for recording SQAM with multi-level phase and amplitude in holographic storage. This paper clarifies the relationship between the number of pixels of SLM used to represent a symbol, the amount of information per page, and the areal recording density.

We-D-04 Invited

15:40 Recording Strategies of Self-Referential Holography Toward More Flexible Inter-Pixel Interactions

Masanori Takabayashi

Kyushu Institute of Technology (Japan)

Self-referential holography is a holographic data recording method based on inter-pixel interactions of reading beam which can be controlled by recording conditions. We present some recording strategies, which will lead to multi-level datapage recording and clarification of recording conditions for high quality readout etc.

16:05 - 16:20 Break

We-PD: Post Deadline Papers

President: Shinya Hasegawa (Hiroshima Institute of Technology, Japan)

We-PD-01

16:20 High-Speed Three-Dimensional Object Profiling Using FMCW Optical Ranging System by Continuous Scanning of Laser Beam

Tomoharu Konishi, Koichi Iiyama

Kanazawa University (Japan)

High-speed object profiling is realized by using the FMCW optical ranging system. The Galvano scanner for laser beam scan is continuously scanned to avoid response delay of the Galvano scanner. As a result, the profiling time is 3 times faster than the system using a step-scanned Galvano scanner.

We-PD-02

16:35 Spatially varying polarization fringe projection method for three-dimensional shape measurement

Nobukazu Yoshikawa, Naoya Hasegawa, Shusuke Kobayashi

Saitama University (Japan)

We propose a fringe projection 3D measurement system using a spatially varying polarization fringe pattern. We develop a 4-step phase-shifting method using the phase-shifted angle of polarization maps to reconstruct the object phase.

We-PD-03

16:50 Effect of Fiber Profile Parameters on Sensitivity of the Tapered Optical Fiber Sensors

Behnaz Fatehi Raviz, Mohammad Vahedi

Iran University of Science and Technology (Iran)

We have proposed a study on the effect of the fiber profile parameters on the sensitivity of the tapered optical fiber sensors. We believe that by increasing the taper angle and waist-length, the sensitivity of the sensor can be improved. The effect of angle is 23.3 times greater than the effect of length, based on our experimental tests.

17:05 - 17:25 Awards & Closing Remarks

Takanori Nomura (Wakayama University, Japan)

Akinori Furuya (Tokushima Bunri University, Japan)