Session WP: Poster Session / Student & Young Professionals Poster Competition and Job Fair
Wednesday, 3 October 2018
6:00 PM–8:00 PM
Room: Grand Ballroom E/F/G

Session Chair: Carmen Menoni, *Colorado State University, CO, USA*

WP1
All-In-One Optofluidic Platform for Differential Diagnostics of Multiple Biomarkers with Single Molecule Sensitivity, A. Jain, G. G. Meena, J. W. Parks, A. Stambaugh, *University of California Santa Cruz, Santa Cruz, CA, USA,* J. L. Patterson, *Texas Biomedical Research Institute, San Antonio, TX, USA,* A. R. Hawkins, *Brigham Young University, Provo, UT, USA,* and H. Schmidt, *University of California Santa Cruz, Santa Cruz, CA, USA*

Amplification-free and high throughput single nucleic acid detection, with minimal user input, is achieved by integrating optical waveguides with programmable valve array on a single microfluidic platform. Automated preparation and analysis of a dual protein-nucleic acid assay for Zika viral diagnostics is demonstrated.

WP2
Applying Voltage-Current-Converter Circuitry for Increasing Gray Levels in Dual-Panel Active-Matrix Organic Light-Emitting Display Architecture, Henglong Yang and Anne-Chin Lin, *Natioanl Taipei University of Technology (Taipei Tech), Taipei, Taiwan*

We investigated the feasibility of increasing effective gray levels of organic light-emitting diode (OLED) by applying voltage-current converter (VCC) circuitry for converting the driving voltage signals used in liquid-crystal display (LCD) to precise output driving current utilizing dual-panel (DP) active-matrix organic light-emitting display (AMOLED) architecture.

WP3
Fourier Transforms for Wavelength-Selective Optical Packet Switching with Wavelength Translation, Robert T. Weverka, *Fathom Computing, Palo Alto, CA, USA*

We show spatial switching and wavelength translation using an optical temporal Fourier transform to give wavelength-selective spatial switches where the number of spatial switches is reduced by 1/M for an M multiplexed wavelengths and the system uses order $\log_2(M)$ switches for wavelength translation.

WP4
Lighting as a Service that Provides Simultaneous 3D Imaging and Optical Wireless Connectivity, Johannes Herrnsdorf, Jonathan McKendry, Mark Stonehouse, *University of Strathclyde, Glasgow, UK*, Laurence Broadbent, Glynn C. Wright, *Aralia Systems, Bristol, UK*, Martin D. Dawson, and Michael J. Strain, *University of Strathclyde, Glasgow, UK*

Light-emitting diodes enable optical wireless datatransmission and advanced imaging methods such as photometricstereo-imaging. Both, wireless communications into a scene and3D imaging of that scene is enabled in parallel using the sameset of LEDs thus providing lighting-based infrastructure e.g. forautomated agents.

WP5
Synthesis, Microstructure and Quantum-Cutting Luminescence of Pr^{3+}/Yb^{3+}: $NaGdF_4$@ Yb^{3+}:$NaYF_4$ Core/Shell Nanocrystals, Yuansheng Wang, *Chinese Academy of Sciences, Fuzhou, China*

Pr^{3+}/Yb^{3+}:$NaGdF_4$@Yb^{3+}:$NaYF_4$ active-core/active-shell nanoparticles were fabricated, and their luminescent properties were studied. Rational distribution of active rare earth ions owing to the introduction of extra Yb^{3+} ions into the shells greatly suppresses the adverse concentration quenching effect, resulting in an efficient quantum-cutting luminescence for the nanostructures. “

WP6
Plasmonic Enhancement in Anisotropic Thin Films of Rhenium Disulphide (ReS_2), Bablu Mukherjee, Sandipta Roy, *Indian Institute of Technology Bombay, Mumbai, India*, Ergun Simsek, *Exponent, Inc., Bowie, MD, USA*, Sayantan Ghosh, *Indian Institute of Technology Bombay, Mumbai, India*, Venu G. Achanta, *Tata Institute of Fundamental Research, Mumbai, India*, and Saurabh Lodha, *Indian Institute of Technology Bombay, Mumbai, India*

Anisotropic optical constants of N-layer ReS_2 are determined by angle resolved reflection measurements. Optimum parameters for a metal nanoparticle array leading to maximum light-matter interaction are determined using numerical simulations. Plasmonic enhancement in absorptance of the ReS_2 layer and photocurrent are observed experimentally.

WP7

Design and Analysis of Graphene-Based Single Mode SOI Integrated Optical Sensor, Venkatesha M., Vaibhav L Shah, Sai Preethi Jatta, and Narayan K, *Sai Vidya Institute of Technology, Bangalore, India*

In this study, use of graphene in reduction of optical power loss occurring in SOI waveguides at red wavelength region has been presented. In comparison with SOI waveguide, 17.07% reduction in optical power loss is observed for graphene based SOI waveguide at 660 nm wavelength.

WP8

Thick Epsilon-Near-Zero ITO Metamaterial Films, Jimmy Ni, Wendy Sarney, *U.S. Army Research Laboratory, Adelphi, MD, USA*, Joe Bennett, *National Institute of Standards and Technology, Gaithersburg, MD, USA*, and Weimin Zhou, *U.S. Army Research Laboratory, Adelphi, MD, USA*

We explore the concept, material, and design of EMNZ material within the RF photonics regime. Thee wave-matter interaction has been studied on the ITO-based platforms and suggest feasible designs for implementation of environmental insensitive applications in the microwave regime.

WP9

Propagation across Chiral Interfaces and Tunable Slab Resonators Without and With Dispersion, Monish R. Chatterjee and Rajab Y. Ataai, *University of Dayton, Dayton, OH, USA*

Following up on analysis of Fresnel coefficients for a non-chiral/chiral interface, propagation and imaging characteristics are examined for materials with dispersion and chirality, including discrete chiral components such as lenses and chiral resonators. Properties such as anomalies, tunability, and possible new applications are also explored.

WP10

Laterally Coupled Nanowire Lasers: Bifurcations, Dynamics and High-Speed Potential, A. Hurtado, D. Jevtics, M. D. Dawson, *University of Strathclyde, Glasgow, UK*, M. J. Adams, and I. D. Henning, *University of Essex, Colchester, UK*

Regions of stability in two laterally-coupled InP nanowire lasers are analysed in terms of their separation, difference in resonant frequencies and pumping rate. The frequency of periodic oscillations for realistic laser separations and pumping is estimated to be of order 100–1000 GHz.

WP11

Biocompatible, Inkjet Printed Heterostructure Photodetector for Biosensing Applications, Ridwan F. Hossain and Anupama B. Kaul, *PACCAR Technology Institute and University of North Texas, Denton, TX, USA*

An inkjet printed, biocompatible photodetector to combat age-related-macular degeneration is described here that was constructed using inks of photo-active molybdenum disulfide and electrically conducting graphene which facilitated charge collection of the photocarriers. The flexible photodetector was tested as a function of photo intensity and strain.

WP12

Increasing Maximum Gain in InAs Quantum Dot Lasers on GaAs and Si, Samuel Shutts, *Cardiff University, Cardiff, UK,* Clemens Spinnler, *University of Basel, Basel, Switzerland*, Zhibo Li, Lydia Jarvis, Emmanuel Le Boulbar, David Hayes, *Cardiff University, Cardiff, UK*, Mingchu Tang, Huiyun Liu, *University College London, London, UK*, and Peter M. Smowton, *Cardiff University, Cardiff, UK*

InAs quantum-dot (QD) lasers emitting at 1300 nm with nominally undoped and modulated p-type doping are studied. Modal-gain measurements indicate a higher gain can be achieved from the ground-state for a given Fermi-level separation with p-doping and a reduced temperature-dependence of threshold current for short-cavity lasers.

WP13

Simulation of Integrated Transmitter with Enhanced Power for Analog RF Links, Varghese A. Thomas, Christian G. Bottenfield, Gareeyasee Saha, Siddharth J. Varughese, and Stephen E. Ralph, *Georgia Institute of Technology, Atlanta, GA, USA*

We present integrated transmitter architectures that overcome typical power limitations of silicon photonic modulators by relying on a silicon nitride bypass. Simulations demonstrate improvements in SFDR by ~10dB, NF by ~15 dB and Gain by ~25 dB.

WP14

Filtering, Unwrapping, and Denoising Sterategy for Quality Enhancement of the Noisy Wrapped Phase of the Neuronal Cells, Behnam Tayebi and Jae-Ho Han, *Korea University, Seoul, South Korea*

We present a novel technique to improve the quality of a noisy phase by reducing the residues using sin/cos averaging, unwrapping by the 2D minimum-network-flow, and denoising by the non-local filter. The feasibility of technique is demonstrated by improving the phase of neuronal cells.

WP15

Optomechanically Enhanced High-Q Slot Mode Photonic Crystal Nanobeam Cavity, Mertcan Erdil and Serdar Kocaman, *Middle East Technical University, Ankara, Turkey*

A high-Q slot mode photonic crystal nanobeam cavity based biosensor design with positive optomechanical feedback is presented. Detailed analysis of sensitivity enhancement due to feedback shows a fourfold improvement without any compromise in quality factor.

WP16

Optical Fiber Immunosensors Optimized with Cladding Etching and ITO Nanodeposition, Yamile Cardona-Maya, *Universidad Nacional de Colombia, Medellín, Colombia*, Ignacio Del Villar, Abian B. Socorro, Jesús M. Corres, *Public University of Navarra, Pamplona, Spain*, and Juan F. Botero-Cadavid, *Universidad Nacional de Colombia, Medellín, Colombia*

Etched optical fiber immunosensors, with and without nanodeposition, have been developed. The performance of these immunosensors has been assessed implementing an immunoassay. The sensitivity of the immnunosensor increased by a factor of 4 with the nanocoating.

WP17

Three-Dimensional Label-Free Characterization of Frog Erythrocytes Using Optical Diffraction Tomography, Geon Kim, Moosung Lee, *Korea Advanced Institute of Science and Technology, Daejeon, South Korea*, Daeheon Kwon, SeongYeon Youn, EuiTae Lee, Jonghun Shin, *Daejeon Science High School for the Gifted, Daejeon, South Korea*, SangYun Lee, *Korea Advanced Institute of Science and Technology, Daejeon, South Korea*, Youn Sil Lee, *Daejeon Science High School for the Gifted, Daejeon, South Korea*, and YongKeun Park, *Korea Advanced Institute of Science and Technology, Daejeon, South Korea*

Amphibian erythrocytes have cellular structures distinct from mammalian erythrocytes, yet have not been investigated in details. Here, we access the structures of live frog erythrocytes in three-dimension using optical diffraction tomography.

WP18

Controlled Synthesis of InGaN Quantum Dots for Efficient Light Emitters, Xiongliang Wei, Syed Ahmed Al Muyeed, Matthew Peart, Nelson Tansu, and Jonathan J. Wierer, Jr., *Lehigh University, Bethlehem, PA, USA*

InGaN quantum dots formed by quantum-size controlled photoelectrochemical etching are demonstrated. The QDs are capped with AlGaN/GaN passivation layers to reduce surface recombination. These QDs are small-sized, <10 nm in diameter, and emit at ~412 nm with a narrow FWHM of 8 nm at 77K.

WP19

Color Simulation and Demonstration of Perovskite Nanocrystal Filters for Wide Color Gamut Displays, Sinan Genc, Emre Beskazak, *Abdullah Gül University, Kayseri, Turkey*, Can Uran, *NANOME R&D, Erciyes Teknopark, Kayseri, Turkey*, and Evren Mutlugun, *Abdullah Gül University, Kayseri, Turkey*

In this study, we define spectral parameters of perovskite nanocrystals to improve LCD color gamut, replacing color filters (CFs) with perovskite based subpixels. The optimization of the CFs has been enhanced 15.8% (98.33% of Rec.2020) in simulation and 13.8% experimentally, with 97.23% color gamut coverage.

WP20

Tunable Microwave Photonic Filter for Millimeter-Wave Mobile Fronthaul Systems, Run Kai Shiu, *National Taipei University of Technology, Taipei, Taiwan*, Siming Liu, *Georgia Institute of Technology, Atlanta, GA, USA*, Peng-Chun Peng, Wei-Chieh Tang, *National Taipei University of Technology, Taipei, Taiwan*, Shuyi Shen, Qi Zhou, and Gee-Kung Chang, *Georgia Institute of Technology, Atlanta, GA, USA*

In this paper, a tunable microwave photonic filter for millimeter-wave mobile fronthaul systems is proposed and experimentally demonstrated. With the aid of the proposed filter, we can improve and centrally control the system transmission efficiency and decrease the complexity of the mobile fronthaul systems.

WP21

Latency and Reliability Measurements for a 3.5 GHz Optical-Wireless WDM-PON Network Using SDR, Mónica Rico-Martínez, Margarita Varón, *Universidad Nacional de Colombia, Bogotá, Columbia*, Jesús Álvarez Guerrero, Ferney Amaya, *Universidad Pontificia Bolivariana, Medellín, Colombia*, and Idelfonso Tafur Monroy, *Eindhoven University of Technology, Eindhoven, The Netherlands*

This article presents a 3.5 GHz Radio-over-Fiber experimental setup by combining WDM-PON and Software Defined Radio (SDR) for 5G networks applications. We performed a measurement of latency in the order of 1 ms with a Bit Error Rate (BER) lower than 10^{-9}.

WP22

Effect of Base Parameters on the Gain Performance of Multiple-Quantum Well Heterojunction Phototransistor, Rikmantra Basu and Ankit Kumar Pandey, *National Institute of Technology, Delhi, India*

A multiple quantum well heterojunction phototransitor with $Ge_{0.91}Sn_{0.09}$ well and Ge barrier is presented. The work is focussed on effect of base doping and base thickness on the gain performance of device. The optimised base thickness and doping are presented.

WP23

Carrier Lifetime in Mid-Infrared Type-II Superlattice Photodetectors, Wenxiang Huang, L. Li, L. Lei, J. A. Massengale, H. Ye, Rui Q. Yang, T. D. Mishima, and M. B. Santos, *University of Oklahoma, Norman, OK, USA*

A simple and effective electrical method is developed to extract the minority carrier lifetime in type-II InAs/GaSb/Al(In)Sb superlattices by taking advantage of the features of interband cascade infrared photodetectors. This method considers parasitic resistances and is more generally applicable with various transport mechanisms.

WP24

Hybrid Integration of Black Phosphorus-WSe_2 Heterojunction Photodetector on Silicon Waveguide, Yi Wang, Beilei Sun, *Chinese University of Hong Kong, Shatin, Hong Kong*, Ming Feng, *Chinese University of Hong Kong, Shatin, Hong Kong and Nankai University, Tianjin, China*, and Jianbin Xu, Hon Ki Tsang, *Chinese University of Hong Kong, Shatin, Hong Kong*

We design and fabricate a photodetector based on integrated black phosphorus–WSe_2 on silicon waveguide hybrid structure. The device has a photoresponsivity of 16 mA/W at 1560 nm.

WP25

Novel Concept for Heterogeneously Integrated High-Speed III-V Photodetector on Silicon Nitride Waveguide, Shahram Keyvaninia, Patrick Runge, Alexander Schindler, Tobias Beckerwerth, and Martin Schell, *Fraunhofer Heinrich Hertz Institute HHI, Berlin, Germany*

A novel design for heterogeneously integrated high-speed III-V photodetectors on the Si_3N_4 platform is proposed. This new approach offers a new platform to merge III-V and Si3N4 for 3D integration. The design is shown to have a high tolerance to bonding and lithography misalignment.

WP26

Characterization of Distributed Bragg Reflectors Using Optical Frequency Domain Reflectometry, Dan Zhao, Dzmitry Pustakhod, Kevin Williams, and Xaveer Leijtens, *Eindhoven University of Technology, Eindhoven, The Netherlands*

We present a novel and accurate method for characterizing the reflection spectra of distributed Bragg reflectors (DBRs) using the optical frequency domain reflectometry (OFDR) method. A compact test structure with integrated reference mirror and photodetector is designed to overcome the dependence on the fiber coupling.

WP27

Hybrid Integration of Broadband Silicon Modulators and InGaAs Photodetectors, Utku Karaca, Alperen Govdeli, and Serdar Kocaman, *Middle East Technical University, Ankara, Turkey*

We present on-chip integration of silicon modulators and InGaAs photodetectors via flip-chip bonding. Modulators fabricated on silicon-on-insulator (SOI) and photodetectors grown on InP wafers were fabricated independently and the hybrid integration was achieved by the deposition of indium (In) bumps on both sides.

WP28

Fabrication-Tolerant Efficient Dual-Etch Grating Couplers with Low Back Reflections, Andrew Michaels, *University of California, Berkeley, Berkeley, CA, USA and Hewlett Packard Labs, Palo Alto, CA, USA*, Thomas Van Vaerenbergh, Tho Tran, Marco Fiorentino, and Raymond G. Beausoleil, *Hewlett Packard Labs, Palo Alto, CA, USA*

Using inverse electromagnetic design, we optimize dual-etch grating couplers with a 100 nm minimum feature size compatible with DUV lithography that achieve a record peak coupling efficiency of –0.7 dB and unprecedented low back reflection of < –40 dB.

WP29

Effect of Surface Plasmons on the Insulator to Metal Transition in Thin Film Vanadium Dioxide, Scott Madaras, Jason Creeden, *College of William and Mary, Williamsburg, VA, USA*, Salinporn Kittiwatanakul, Jiwei Lu, *University of Virginia, Charlottesville, VA, USA*, Irina Novikova, and Ale Lukaszew, *College of William and Mary, Williamsburg, VA, USA*

We report on a new mechanism capable of inducing the insulator metallic transition (IMT) in VO_2 via surface plasmon polariton (SPP) excitation and the corresponding effect that the IMT will have on the surface plasmon resonance (SPR).

WP30

Asymmetric Band Gaps in Amorphous Photonic Materials, Murat Can Sarihan, *Middle East Technical University, Ankara, Turkey and University of California, Los Angeles, Los Angeles, CA, USA*, Alperen Govdeli, *Middle East Technical University, Ankara, Turkey*, Mehmet Sirin Aras, *University of California, Los Angeles, Los Angeles, CA, USA*, Cenk Yanik, *Sabanci University, Istanbul, Turkey*, Chee Wei Wong, *University of California, Los Angeles, Los Angeles, CA, USA*, and Serdar Kocaman, *Middle East Technical University, Ankara, Turkey*

A Monte Carlo method based design guideline for 2-D amorphous photonic materials are presented. The parameters affecting band gap are analyzed numerically and experimentally for telecommunication wavelengths. Asymmetric nature of band gap is explained in analogy with solid-state electronics.

WP31

Microstructural Engineering of the Near-UV Photocurrent Production in VO_2 Thin Film Based Detectors, J. A. Creeden, S. E. Madaras, D. B. Beringer, M. R. Beebe, I. Novikova, and R. A. Lukaszew, *College of William and Mary, Williamsburg, VA, USA*

Vanadium Dioxide is a strongly correlated material that can exhibit photoelectric properties via substrate-film hole transfer. We study these photoelectric properties in epitaxially grown VO_2 thin films under near UV-light on various substrates, namely TiO_2(001), and TiO_2:Nb in development of new, fast UV photodetectors.

WP32

Employing GRIN PC-Inspired Approach for Building Invisibility Cloak Media from Photonic Crystals, Saeid Jamilan and Elena Semouchkina, *Michigan Technological University, Houghton, MI, USA*

Employing photonic crystals in transformation media requires realizing prescribed anisotropic spatial dispersions of refractive index components. We show that in invisibility cloaks, anisotropy can be provided by using crystals with rectangular lattices, while inspired by GRIN PCs approach can be employed to decrease scattering cross-section.

WP33

Shallow Surface Reliefs on Zn-Diffusion VCSELs for High-Speed and High-Power Single-Mode Performances, Zuhaib Khan, Chen-Lung Cheng, Kai-Lun Chi, and Jin-Wei Shi, *National Central University, Taoyuan, Taiwan*

By creating shallow surface relief patterns above the Zn-diffusion apertures of VCSELs, a significant reduction in optical linewidth, enhancement in output power, and improvement in high-speed transmission performance over multi-mode fiber (MMF) have been first demonstrated.

WP34

Transfer-Matrix Investigation of High Sensitivity Hybrid Glass/Polymer Long Period Fiber Gratings, Bjorn Paulson, Hojoong Jung, Seongjin Hong, Kyunghwan Oh, *Yonsei University, Seoul, South Korea,* Sanghwa Lee, and Jun Ki Kim, *Univerity of Ulsan and Asan Medical Center, Seoul, South Korea*

Long-period fiber gratings (LPFGs) were fabricated by self-annealing of a polymer-filled silica hollow optical fiber without an amplitude mask, and show high temperature sensitivity. The spectral characteristics are modeled using the transfer matrix method, achieving good match with experimental results, and making possible further application.