GOLD Session

Time: Tuesday, October 6, 2009 @ 12:00
Place: Ela Quality Resort in Belek-Antalya, Turkey

Schedule of Event

Welcome
Ju Han Lee, Gold Coordinator of IEEE Photonics Society

Invited Talk
Navigating a Career in Industry
Theodore J. Schmidt, Ph.D.
Director, Technology Development, Opnext Subsystems, Inc., USA

Poster Presentations
2009 IEEE Photonics Society Graduate Fellowship winners

1. **III-Nitride Optoelectronic Devices,** *Can Bayram; Northwestern University, USA*. The state-of-the-art III-Nitride work, realized in Center for Quantum Devices at Northwestern University, will be presented. High performance visible- and solar-blind ultraviolet avalanche and single photon detectors, super bright blue, green and novel green light emitting diodes, and near- to mid-infrared (from 1.4 μm up-to 5.3 μm) intersubband devices are among the foremost nitride optoelectronic devices to be reviewed.

2. **Long Wavelength Infrared Focal Plane Arrays based on Type-II InAs/GaSb superlattices**, *Pierre-Yves Delaunay; Northwestern University, USA*. Type-II superlattices, based on the repetition of nanometer thick InAs and GaSb layers, can perform infrared imaging between 3 and 30 μm. The flexibility of this novel material allowed the design and fabrication of high quality focal plane arrays in the middle and long infrared range. The array of detectors was able to measure temperature differences as low as 20 mK, with a photon to electron conversion efficiency up to 89%.

3. **Recent advances in Cr:Colquiriite laser technology,** *Umit Demirbas; MIT, USA*. We summarize recent progress in low-cost and highly-efficient Cr:Colquiriite laser technology. Pumping with inexpensive single-mode diodes, 270-mW of output power and a total tunability from 754 to 1042 nm were demonstrated in continuous-wave operation. In mode-locked operation, Cr:Colquiriite lasers produced 50-100 fs pulses with 1-2.5 nJ pulse energies at 100 MHz repetition rate. Upon cavity dumping, pulse energies can be scaled above 100 nJ, with peak powers approaching MW level.

4. **Trapped "rainbow" storage of light in a graded grating structure**, *Qiaoqiang Gan; Lehigh University, USA*. A graded metal grating structure is designed to slow or stop multi-wavelength light waves simultaneously. This achievement could open a door to the control of light waves on a chip that could help reduce the size of optical structures, enabling them to be integrated at the nanoscale with electronic devices.

5. **Multistable and excitable behavior in Semiconductor Ring Lasers,** *Lendert Gelens; Vrije Universiteit, Belgium.* We address the problem of multistability and excitability in semiconductor ring lasers (SRLs). We report the first experimental observation of multistable states and excitable excursions in a single-longitudinal mode SRL. Moreover, we provide theoretical insight into the observed dynamical complexity of SRLs by studying a two-dimensional SRL model, revealing mechanisms for the dynamical behavior, general for systems close to Z2 symmetry.

6. **Optical hyperspace metadevices**, *Zubin Jacob; Purdue University, USA*. We solve the long standing problem of the far-field diffraction limit which currently limits all conventional optical imaging systems using metamaterials with hyperbolic dispersion . The device, called the optical hyperlens, is capable of magnification and can resolve subwavelength features in the far-field. Furthermore, the hyperlens exhibits unique spiralling ray trajectories and supports interesting surface states called Dyakonov plasmons. Finally, we show how the spontaneous emission properties in the vicinity of a hyperbolic dispersion metamaterial gives the ability to harness a single photon from an isolated emitter.

7. **Emerging polymer-stabilized blue phase liquid crystal displays**, *Meizi Jiao; Central Florida university, USA*. Polymer-stabilized blue phase liquid crystal is a nano-composite Kerr medium. It exhibits some revolutionary advantages, e.g., no alignment layer is needed which greatly simplifies the display fabrication process, submillisecond response time for color sequential displays without using color filters, and cell gap insensitivity. However, the required operating voltage is still too high (~50V) to be addressed effectively by thin film transistors. In this paper, we develop a device model to reveal the physical mechanisms affecting the operating voltage and light transmittance. Optimized electrode structure and dimensions, as well as large Kerr constant play an important role to lower the operating voltage while keeping a high transmittance. The next wave LCD technology is emerging.

8. **Colloidal semiconductor nanocrystal integrated LEDs for efficient and high-quality white light generation,** *Sedat Nizamoglu; Bilkent University, Turkey***.** In this work, we present semiconductor nanocrystal quantum dot integrated LEDs for efficient and high-quality lighting. We demonstrate white-light generation with highly tunable optical properties such as tristimulus-color-coordinates, correlated-color-temperature, and color-rendering-index by integrating multiple assemblies of nanocrystals. We show proof-of-concept device demonstrations of nanocrystal integrated white light sources enhanced with nonradiative Förster resonance energy transfer (FRET).

9. **Tailoring Characteristics of Index-Guiding Microstructure Optical Fiber**, *Abdur Razzak; University of the Ryukyus, Japan.* This poster presents design and simulation of index-guiding microstructure optical fibers based on the finite difference method with perfectly matched boundary condition. Designs of dispersion-flat, highly nonlinear, and highly birefringent microstructure fibers and their simulated properties are presented. Microstructure fibers of these types are suitable for various optical devices.

10. **Optoelectronic Oscillator Tunable by an SOA Based Slow Light Element,** *Evgeny Shumakher; Technion University, Israel*. The field of optically controlled microwave waveform synthesis is a prime candidate for the yet untried usage of slow light elements. The present work demonstrates a 10 GHz OEO incorporating an intra cavity slow light element based on CPO in an SOA that enables a continuous tuning of the oscillator's frequency.

11. **All-fiber microwave arbitrary waveform generation and processing based on advanced FBG technology,** *Chao Wang; Ottawa University, Canada*. My research topic, microwave photonics, is an interdisciplinary area that studies the interaction between microwaves and lightwaves for applications such as wireless communications, radar, sensors and biomedical imaging. Specifically, my research is focused on investigating various photonics-assisted techniques to generate, distribute and process high-frequency and large bandwidth microwave and millimeter-wave signals which cannot be fulfilled by conventional electronic techniques. Fiber Bragg gratings (FBGs), which can perform different functions such as spectral filtering and dispersion management, play a key role in the optical-based microwave waveform generation and processing systems.

12. **Ultra-High-Speed Optical Technologies for Networking and Performance**, *Xiaoxia Wu; University of Southern California, USA*. Optical fiber communication systems are characterized by their extremely high transmission capacity. Optimization of network usage will require efficient sharing of this high bandwidth among lower-rate users. Optical techniques are preferred for handling ultra-high-bit-rate exceeding 100's of Gbit/s. We will show wavelength division multiplexing (WDM) to high-speed time division multiplexing (TDM) conversion and high-rate pseudo-random bit sequence (PRBS) generation using ultra-high-speed optical technologies.

Closing Remarks
Jose Azana, Gold Committee Member of IEEE Photonics Society