SPEAKER INFO:
Name: Liangyu Chen
Affiliation: Ohio Aerospace Institute/NASA GRC

TRACK:
Emerging Electronics and Microsystems

TITLE:
500°C Packaging Technology for SiC High Temperature Electronics – Most Recent Progress

ABSTRACT:
High-temperature environment operable sensors and electronics are required for long-term exploration of Venus and distributed control of next generation aeronautical engines. Various silicon carbide (SiC) high temperature sensors, actuators, and electronics have been demonstrated at and above 500°C. A compatible packaging system is essential for long-term testing and application of high temperature electronics and sensors in relevant environments. This talk will discuss a ceramic packaging system developed for high temperature electronics, and related testing results of SiC integrated circuits at 500°C facilitated by this high temperature packaging system, including the most recent progress.

BIO:
Liangyu Chen received his PhD in experimental solid state physics from Case Western Reserve University. Currently, he is a senior scientist at Ohio Aerospace Institute/NASA Glenn Research Center. His major research interests include materials, structure, process, and testing of high temperature electronic packaging, as well as high temperature passive components.

SPEAKER INFO:
Name: Jia Li
Email: li4@oakland.edu
Affiliation: Oakland University

TRACK:
Photonics and Electro-Optics

TITLE:
LiDAR and Indoor Localization System

ABSTRACT:
Smart mobile devices and consumer level LiDAR are becoming widely accessible in people's daily lives. Visual information based indoor localization has attracted lots of research attention in the computer vision community. In this talk, we present a 6-degree-of-freedom (6-DoF) pose estimation using a portable 3D visual sensor mounted on a mobile device. A detailed 3D model and a WiFi received signal strength model of the indoor environment are constructed in the offline training phase. During the online localization, WiFi signals are first used to locate the device in a 3D sub model. The initial pose is calculated through feature matching between the online captured 2D image and the key frame images used to build the 3D model. Then we employ iterative closest point (ICP) algorithm to estimate the rigid transform between online captured 3D point cloud and local 3D point cloud. The 6-DOF pose estimation is further refined by random sample consensus (RANSAC) algorithm. The system is implemented on an iOS platform. The experiments carried out in an indoor environment show promising result of our approach.

BIO:
Jia Li received her B.S. degree in electronics and information systems from Peking University, Beijing, China, in 1996, the M.S.E. degree, and the Ph.D. degree both in electrical engineering from the University of Michigan, Ann Arbor, MI, in 1997 and 2002, respectively. She has been a faculty member in the School of Engineering and Computer Science at Oakland University since 2002. Her research interests are in the areas of computer vision, statistical signal processing and its applications in communications and biomedical imaging. She is a senior member of IEEE.

SPEAKER INFO:
Name: Lei Liu
Email: lliu3@nd.edu
Affiliation: Dept. Electrical Engineering, University of Notre Dame

TRACK:
THz and Millimeter Wave Sensors

TITLE:
Optically-Controlled Tunable and Reconfigurable Terahertz Devices

ABSTRACT:
Tunable and reconfigurable millimeter-wave to terahertz (mmw-THz) devices such as modulators/variable attenuators, tunable filters, coded apertures, phase shifters and high-level switches (e.g., DPDT) that are required for advanced imaging and adaptive wireless communication applications are challenging to realize. We report a promising approach to develop the above mmw-THz devices based on spatially-resolved optical modulation (SROM) using photo-induced (PI) free carriers in semiconductors. The fundamental mechanism for this approach will first be introduced followed by prototype demonstrations for reconfigurable coded-aperture imaging masks, beam steering/forming antennas and waveguide-based tunable attenuators. The potential to develop more advanced tunable/reconfigurable mmw-THz devices (e.g., tunable delay lines, SPDT, DPDT switches) using optically-controlled waveguide architectures such as PI electromagnetic band gap (EBG) structures and dynamically-reconfigurable PI substrate-integrated waveguides (SIWs) will also be discussed on the basis of performance-improved SROM using the so-called mesa-array technique.

BIO:
Dr. Liu received the B.S. and M.S. degrees from Nanjing University, Nanjing, China, in 1998 and 2001, respectively, and the Ph.D. degree from the University of Virginia, Charlottesville, VA, USA, in 2007, all in electrical engineering. From 2007 to 2009, he was a Post-Doctoral Research Associate with the Department of Electrical and Computer Engineering, University of Virginia, Charlottesville, VA, USA. In September 2009, he joined the faculty of the University of Notre Dame, Notre Dame, IN, USA, where he is now an Assistant Professor of electrical engineering. His research interests include millimeter- and submillimeter-wave device and circuit design, modeling, and testing, quasi-optical techniques, terahertz detectors for imaging and spectroscopy, novel microwave materials and devices, superconducting electronics, micro-fabrication and processing.

SPEAKER INFO:
Name: Dr. Arjuna Madanayake
Email: arjuna@uakron.edu
Affiliation: University of Akron

TRACK:
Emerging Electronics and Microsystems

TITLE:
Design and Prototype Implementation of an 8-Beam 2.4 GHz Array Receiver for Digital Beamforming using Multiplierless DFT Approximation Algorithms
Authors: Arjuna Madanayake, Viduneth Ariyarathna, Sravan Pulipati, and Renato Cintra

ABSTRACT:
The design and laboratory-scale implementation of a direct-conversion digital multi-beamformer operating at 2.4 GHz is described. The proposed digital beamformer consists of an 8-element array with individual radio-frequency (RF) front-ends and in-phase/quadrature (I/Q) channels per antenna, each processed in real-time using Xilinx FPGA technology. The digital beamformer realizes eight simultaneous RF beams using low-complexity approximations of the discrete Fourier transform (DFT). The multi-beamformer is multiplier free and is also of very low in adder complexity. Design of the beamforming algorithm, antenna design and receiver electronics, digital signal processing, FPGA system design and implementation details, details of the test and measurement system as well as calibration, error metrics and beam quality will be discussed in the paper.

BIO:
Dr. Arjuna Madanayake completed the B.Sc. in Electronic and Telecommunication Engineering from the University of Moratuwa, Sri Lanka, with first class honors, and the MS and Ph.D. degrees, both in Electrical Engineering, from the University of Calgary, Canada. He joined the Department of Electrical and Computer Engineering at the University of Akron (UA) as a tenure-track Assistant Professor in 2010. He is now an Associate Professor, and leads the Advanced Signal Processing Circuits Group. His research interests are in multi-dimensional signal processing, digital and analog circuits and systems, wireless communications, antenna arrays, and FPGA/VLSI systems for real-time digital signal processing. His research is currently supported by two awards from DARPA, an award from Office of Naval Research, and three awards from the National Science Foundation. His is the university PI of an STTR Phase-II (due to start in Fall 2017) from the DARPA ACCESS Program (Defense Sciences Office).

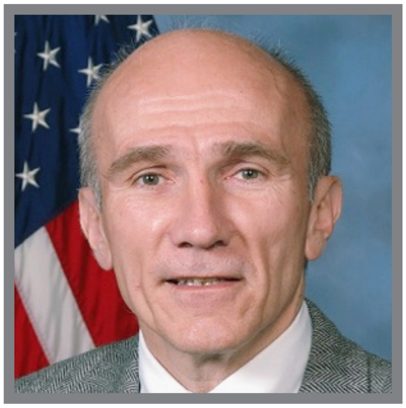
SPEAKER INFO:
Name: Dr. Richard M. Marino
Email: marino@ll.mit.edu
Affiliation: MIT Lincoln Laboratory

TRACK:
Photonics and Electro-Optics

TITLE:
3D Mapping Performance Estimates of Integrated Photonic Phased Array Lidar

ABSTRACT:
There are currently DoD efforts to develop planar non-mechanically-steered optical transmitters using integrated photonic optical phased arrays. One of the goals is to demonstrate a low-SWaP, rapidly steerable, wide field-of-view lidar. In this presentation we will describe 3D mapping performance estimates for such a lidar.

BIO:
Dr. Richard M. Marino is a member of the technical staff in the Active Optical Systems group. He received a B.S. degree in physics from Cleveland State University, and an M.S. degree in physics and a Ph.D. degree in high-energy physics from Case Western Reserve University. He joined Lincoln Laboratory in 1985 as a staff member in the Laser Radar Measurements group, and later joined the Systems and Analysis group. One of his most significant achievements has been his pioneering leadership in the development of a 3D imaging laser radar with photon-counting sensitivity. This novel sensor technology has proven to enable remarkable capabilities in several mission areas, including as demonstrated in Jigsaw, ALIRT, and MACHETE airborne ladar programs. He has also worked at the Millimeter Wave Radar (MMW) and the ARPA-Lincoln C-band Observables Radar at the Kwajalein Missile Range in the Marshall Islands. While there, he was a mission test director at MMW and worked on range modernization plans. In 1997 he joined the Sensor Technology and Systems group of the Aerospace division and relocated its Silver Spring, Maryland, location to join the National Polar-Orbiting Operational Environmental Satellite System (NPOESS)/Integrated Program Office (IPO). At the IPO, he was lead technical advisor for the NPOESS Cross-Track Infrared Atmospheric Sounder Instrument (CrIS). He returned to Lincoln Laboratory in Lexington in 1999 to continue development and demonstration of novel 3D imaging laser-radar technology and systems. He continues exploring new applications and system capabilities using advanced photonic sensing.



SPEAKER INFO:
Name: Dr. Paul F McManamon
Email: Paul@excitingtechnology.com
Affiliation: Exciting Technology LLC, and University of Dayton

TRACK:
Photonics and Electro-Optics

TITLE:
Lidar and Non-Mechanical Beam Steering

ABSTRACT:
Dr McManamon will summarize lidar state of the art for various applications from auto lidar to synthetic aperture lidar, and he will discuss the current state of the art in beam steering for a couple applications. For example the auto lidar case is currently using mechanical steering, but all of the auto lidar contenders are searching for an inexpensive and capable solid state, non mechanical solution. This talk will serve as context for talks coming shortly after it.

BIO:
Dr. Paul F. McManamon started Exciting Technology LLC I after he retired in 2008 from being Chief Scientist for the Air Force Research Lab, AFRL, Sensors Directorate. At AFRL, he was responsible for the technical aspects of all AFRL sensing technologies, including RF and EO sensing, automatic object recognition, IRCM, electronic warfare, and device technologies. He currently also works part time as the Technical Director LOCI, at the University of Dayton. In 2006 he received the Meritorious Presidential Rank Award.
Dr McManamon is a Fellow of SPIE (the International Society for Optics and Photonics), IEEE (the Institute of Electrical and Electronic Engineers), OSA (the Optical Society of America), AFRL (Air Force Research Laboratory), DEPs (the Directed Energy Professional society), MSS (the Military Sensing Symposia), and AIAA (the American Institute of Aeronautics and Astronautics).

SPEAKER INFO:
Name: Dr. Daniel L. Schweickart
Email: daniel.schweickart@us.af.mil
Affiliation: Air Force Research Laboratory/Aerospace Systems Directorate
Power and Control Division/ Electrical Systems Branch

TRACK:
Aerospace Power Systems and Power Electronics

TITLE:
Considerations for Failure Prevention in Aerospace Electrical Power Systems Utilizing Higher Voltages

ABSTRACT:
Electrical power systems for advanced aircraft now utilize voltages well above the traditional levels of 12 to 42 Vdc and 115/200 Vac, 400 Hz. Current airborne systems can contain 270 Vdc, and bipolar systems with a 540 V differential are appearing in certain flight vehicles. This presentation will address the development of a guideline document containing methods of managing higher voltages in aerospace vehicles. Based upon both current and archival work, the design guidance provides a basis for identifying high voltage design risks, defines areas of concern as a function of environment, potential risk mitigation methods and test and evaluation techniques. It is intended for application to higher voltage systems used in aerospace vehicles operating to a maximum altitude of 30,000 m. (approximately 100,000 ft.), and maximum operating voltages of below 1500 Volts-RMS. Fundamental issues addressing some of the key areas will be described and discussed.

BIO:
Dr. Schweickart received the B.E.E. from the University of Dayton, the M.S.E.E. degree from the Ohio State University, and the Ph.D. degree in Electrical Engineering from the University of Texas at Arlington. He is a registered Professional Engineer in Ohio. Prior to joining AFRL, he held positions with utility equipment manufacturers, the Department of Energy, and a consulting engineering firm. In his 30+ years at AFRL, his research has included partial discharge phenomena and insulation testing, advanced insulation systems for airborne power applications, and detection and mitigation of insulation breakdown events in aircraft power systems. Most recently, his expertise has been focused on investigations to support the development of international guidelines for safe and reliable designs, as well as performance validation of certain 270 Vdc powered equipment in aerospace vehicles. In 2012, Dr. Schweickart was recognized as a Fellow of the Institute of Electrical and Electronic Engineers.

SPEAKER INFO:
Name: Sherri Sparks
Affiliation: Clear Hat Consulting, Inc.

TRACK:
Deep Learning, Artificial Intelligence and Cyber Security

TITLE:
Are We At A Crossroads? Exploring A Future Convergence of Philosophy, Neuroscience, Computing, and Cyber Security.

ABSTRACT:
This multi-disciplinary talk will explore some thoughts about how the fields of philosophy, neuroscience, computing and cyber security may converge in the future. It will attempt to show how our understanding of ourselves needs to expand because at a fundamental level we are not separate from the systems that we design. As researchers and developers, we currently wield the power to shape the evolution of the global computing infrastructure, but we need to consider that in that process we may also be shaping our own minds.

BIO:
Sherri Sparks is the President and Research Director of Clear Hat Consulting, Inc. She holds a Bachelor's degree in Computer Engineering, a Graduate Certificate in Computer Forensics, and a Master's degree in Computer Science. Ms. Sparks has been involved in the software security space for the past 15 years. In early 2007, Ms. Sparks co-founded the Florida company, Clear Hat Consulting, Inc. Since then the company has successfully completed several Phase I and Phase II SBIRS sponsored by AFRL and OSD.

SPEAKER INFO:
Name: Nian Sun
Email: nian@ece.neu.edu; n.sun@northeastern.edu
Affiliation: Northeastern University

TRACK:
Emerging Electronics and Microsystems

TITLE:
Integrated Ferroics for Sensing, Power, RF, Microwave and mm-wave Tunable Electronics

ABSTRACT:
The coexistence of electric polarization and magnetization in multiferroic materials provides great opportunities for realizing magnetoelectric coupling, including electric field control of magnetism, or vice versa, through a strain mediated magnetoelectric coupling in layered magnetic/ferroelectric multiferroic heterostructures [1-8]. Strong magnetoelectric coupling has been the enabling factor for different multiferroic devices, which however has been elusive, particularly at RF/microwave frequencies. In this presentation, I will cover the most recent progress on new integrated multiferroic devices for sensing, memory, RF and microwave electronics. Specifically, we will introduce magnetoelectric multiferroic materials, and their applications in different devices, including: (1) ultra-sensitive magnetometers based on RF NEMS magnetoelectric sensors with picoTesla sensitivity for DC and AC magnetic fields, which are the best room temperature nano-scale magnetometers; (2) novel ultra-compact multiferroic antennas with 200μm × 1μm or 0/600 in size, -18dBi gain, ~0.2% bandwidth, self-biased operation and 1~2% voltage tunable operation frequency; and (3) novel GHz magnetic and multiferroic inductors with a wide operation frequency range of 0.3~3GHz, and a high quality factor of close to 20, and a voltage tunable inductance of 50%~150%. At the same time, I will also demonstrate other voltage tunable multiferroic devices, including tunable isolating bandpass filters, tunable bandstop filters, tunable phase shifters, magnetoelectric random access memory, etc. These novel integrated multiferroic devices show great promise for applications in compact, lightweight and power efficient sensing, power, RF, microwave and mm-wave integrated electronics.

Reference: 1. N.X. Sun and G. Srinivasan, SPIN, 02, 1240004 (2012); 2. J. Lou, et al., Advanced Materials, 21, 4711 (2009); 3. J. Lou, et al. Appl. Phys. Lett. 94, 112508 (2009); 4. M. Liu, et al. Advanced Functional Materials, 21, 2593 (2011); 5. T. Nan, et al. Scientific Reports, 3, 1985 (2013); 6. M. Liu, et al. Advanced Materials, 25, 1435 (2013); 7. M. Liu, et al. Advanced Functional Materials, 19, 1826 (2009); 8. Ziyao Zhou, et al. Nature Communications, 6, 6082 (2015).

Nian Sun (continued)

BIO:

Nian Sun is professor at the Electrical and Computer Engineering Department, and Director of the W.M. Keck Laboratory for Integrated Ferroics, Northeastern University. He received his Ph.D. degree from Stanford University. Prior to joining Northeastern University, he was a Scientist at IBM and Hitachi Global Storage Technologies. Dr. Sun was the recipient of the NSF CAREER Award, ONR Young Investigator Award, the Søren Buus Outstanding Research Award, etc. His research interests include novel magnetic, ferroelectric and multiferroic materials, devices and subsystems. He has over 200 publications and over 20 patents and patent applications. One of his papers was selected as the "ten most outstanding full papers in the past decade (2001~2010) in Advanced Functional Materials". Dr. Sun has given over 100 plenary or invited presentations and seminars in national and international conferences and universities. He is an editor of IEEE Transactions on Magnetics, and of Sensors, and a fellow of the Institute of Physics, and of the Institution of Engineering and Technology.

SPEAKER INFO:
Name: Dr. Paul Suni
Affiliation: Lockheed Martin Coherent Technologies

TRACK:
Photonics and Electro-Optics

TITLE:
Coherent Lidar System on a Chip

ABSTRACT:
Rapid and revolutionary development of silicon photonics is bringing the long sought concept of lidar-on-a-chip to reality. Developing tool boxes enable integration of active and passive photonic integrated circuit components into full coherent lidar systems at the chip level. In this talk we highlight our current component and systems work.

BIO:
Dr. Paul Suni is a Technical Fellow with Lockheed Martin Coherent Technologies (LMCT) in Louisville, CO where he leads multiple efforts to develop laser radar systems, subsystems, and components, including his current role as Principal Investigator on the DARPA MOABB program. Since receiving his Ph. D. in non-linear optics he has worked in numerous photonics related areas for government use, including lasers, optical receivers, coherent and direct detection lidar, digital holography, fiber optics, and high speed data acquisition systems. While operating his own small business he also developed optical sensors and machine vision systems for industrial applications.

SPEAKER INFO:
Name: George H. Sutton, Jr
Email: George.sutton@motoman.com
Affiliation: Yaskawa America – Motoman Robotics

TRACK:
Guidance and Control

TITLE:
Robotic Technology – A Merging of Engineering Disciplines

ABSTRACT:
Robots were first introduced as Science Fiction characters, and as with many science fiction technologies introduced in the 19th and 20th centuries, they soon became part of reality. Over the past 40+ years, robots have mostly been deployed to perform repetitive and dangerous industrial tasks. This has resulted in significant growth in worker productivity/ safety, and product quality. The traditional industrial robotic application includes the robot and peripheral equipment configured and taught to perform a single or similar jobs many times over, otherwise known as High Volume – Low Mix applications. Dramatic improvements in computational power, sensor technology, and supporting software give promise to deploy robots for High Mix-Low Volume industrial applications. This fusion will enable robot applications to expand beyond traditional industrial applications, and beyond the factory itself.

BIO:
George H. Sutton, Jr, Chief Engineer, Yaskawa America, Inc – Motoman Robotics

Education:
1986 University of California/ Mechanical Engineering, Santa Barbara, CA
- MSME - Robotics, Controls, and Dynamic Systems

1991 Ohio State Professional Engineer

Work Background:
Over 30 years experience developing automated manufacturing processes, specifically:
Motoman, Inc.:

Developing standard robotic systems and peripheral equipment for the life sciences, robotic welding, and material handling markets. Developed: analytical tools for servo-mechanism design, testing protocols, robot performance enhancement, and novel robot calibration techniques.

Rohr Industries:

Developing automated manufacturing processes for composite fiber placement, including robotic tape laying techniques, CNC filament winding, and laser based metrology for tool inspection.

Patents:

Motoman, Inc.:

1 Granted for MotoMount® compliant tool mounting system
1 Granted for automated test tube de-capping system
1 Granted for torque coupler with servo controlled torsional stiffness

General Electric Aircraft Engines:

2 Granted for Eddy Current Array Probe (ECAP) inspection devices

SPEAKER INFO:
Name: Nicholas Usechak
Affiliation: Air Force Research Laboratory

TRACK:
Photonics and Electro-Optics

TITLE:
Integrated Photonics in the U.S.

ABSTRACT:
An overview of integrated photonics will be presented including comments on submitting integrated photonic circuit designs to the American Institute for Manufacturing Integrated Photonics (AIM Photonics). This talk will conclude with a quick review of some of DARPA's recent integrated photonics programs.

BIO:
Nicholas G. Usechak was born in Long Branch, NJ, in 1976. He received B.S. degrees with high honors in both electrical engineering and engineering physics from Lehigh University, Bethlehem, PA, in 2000. In 2003 he received an M.S. degree and in 2006 a Ph.D. both in optical engineering from the Institute of Optics, University of Rochester, Rochester NY where his dissertation focused on experiments, simulations, and the theory of FM mode-locked fiber lasers.

He worked at Trumpf Photonics in Cranbury NJ as a Senior Engineer for a year following graduation characterizing high-power semiconductor laser arrays, automating experiments, and modeling the thermal effects of solder interfaces using transient temperature-extraction experiments to ground those models. After Trumpf he joined the Air Force Research Laboratory at Wright–Patterson Air Force Base where he is currently employed as a Senior Electronics Engineer. In addition to his research activities at AFRL Dr. Usechak also serves as the Government's Chief Technology Officer for AIM Photonics and supports DARPA on a number of programs.

At Lehigh he was a presidential scholar during the academic year 1999-2000. At the University of Rochester he conducted his experimental work in the Laboratory for Laser Energetics where he was a Frank J. Horton Fellow. His research interests include integrated photonics, integrated photonic circuits, nonlinear fiber optics, fiber lasers, ultrafast optics, high-speed test and measurement, high-power semiconductor lasers, mode-locked lasers, parametric processes, optical clock generation, novel gain media, diverse waveform generation, partial differential equations, delay differential equations, and numerical modeling.

Dr. Usechak is a member of the OSA, Tau Beta Pi, Sigma Xi, and a Senior Member of the IEEE.