**Department of Electrical Engineering 2013 Annual Report**

# Department Personnel

### Tenured and Tenure Track Faculty

**Kultegin Aydin** [**(Ph.D. METU, Ankara)**](http://130.203.201.244/Directory/FacultyInfo/Aydin/AydinProfilePage.aspx)
Professor of Electrical Engineering and Department Head
Radar remote sensing, radar meteorology, radiowave propagation, electromagnetic scattering, and computational modeling.
IEEE Fellow

**Sven Bilén** [**(Ph.D. University of Michigan)**](http://130.203.201.244/Directory/FacultyInfo/Bilen/BilenProfilePage.aspx)
Associate Professor of Engineering Design, Electrical Engineering, and Aerospace Engineering
Electrodynamic tethers, plasma diagnostics, spacecraft-plasma interactions, spacecraft systems, software-defined radio, wireless sensor networks, innovation in engineering design, and systems engineering.

[**James Breakall (Ph.D. Case Western Reserve University)**](http://130.203.201.244/Directory/FacultyInfo/Breakall/BreakallProfilePage.aspx)
Professor of Electrical Engineering
Antenna modeling and design, numerical modeling, computational and experimental electromagnetic, and ionospheric radio wave propagation and probing.

[**Suman Datta (Ph.D. University of Cincinnati)**](http://130.203.201.244/Directory/FacultyInfo/Datta/DattaProfilePage.aspx)Professor of Electrical Engineering and Material Research Institute Affiliate
Device modeling, nanofabrication and characterization specializing in advanced silicon and non-silicon semiconductor based devices for ultra low-power logic and embedded memory applications.
IEEE fellow

[**John Doherty (Ph.D. Rutgers University)**](http://130.203.201.244/Directory/FacultyInfo/Doherty/DohertyProfilePage.aspx)
Professor of Electrical Engineering
Signal processing and communications, which includes specific applications to remote sensing, electronic intelligence, and biomedical engineering.

**Noel Christopher Giebink (Ph.D. Princeton University)**
Assistant Professor of Electrical Engineering
organic and inorganic optoelectronic and photonic devices, with a particular emphasis on applications for solar energy conversion and storage

[**William E. Higgins (Ph.D. University of Illinois – Urbana-Champaign)**](http://130.203.201.244/Directory/FacultyInfo/Higgins/HigginsProfilePage.aspx)
Distinguished Professor of Electrical Engineering and Computer Science and Engineering
Image processing, computer vision, scientific visualization, computer graphics, medical imaging, and graphical user interfaces.
IEEE Fellow

[**Thomas Jackson (Ph.D. University of Michigan)**](http://130.203.201.244/Directory/FacultyInfo/Jackson/JacksonProfilePage.aspx)Robert E. Kirby Chair Professor of Electrical Engineering and Material Research Institute Affiliate
Exploratory electronic devices and microfabrication techniques. Thin film electronics, organic semiconductors, oxide semiconductors, biomolecular motors, biodevices, microelectromechanical systems, and display technology.
IEEE Fellow

[**Kenneth Jenkins (Ph.D. Purdue University)**](http://130.203.201.244/Directory/FacultyInfo/Jenkins/JenkinsProfilePage.aspx)Professor of Electrical Engineering
Digital filtering, signal processing algorithms, multidimensional array processing, computer imaging, one and two-dimensional adaptive digital filtering, and VLSI architecture for signal processing.
IEEE Fellow

[**Timothy Kane (Ph.D. University of Illinois – Urbana-Champaign)**](http://130.203.201.244/Directory/FacultyInfo/Kane/KaneProfilePage.aspx)Professor of Electrical Engineering, Adjunct Professor of Meteorology, and Research Associate at the Applied Research Laboratory
Optical remote sensing (specifically laser radar or LIDAR) atmospheric and oceanic measurements and modeling, data analysis, and interpretation.

[**Mohsen Kavehrad (Ph.D. Polytechnic Institute of New York University)**](http://www.ee.psu.edu/Directory/FacultyInfo/Kavehrad/KavehradProfilePage.aspx)W.L. Weiss Chair Professor of Electrical Engineering
Wireless communications and networking RF and optical, communications and signal processing systems and networks, optical fiber communications and networks, and optical network components.
IEEE Fellow

[**George Kesidis (Ph.D. University of California – Berkeley)**](http://www.ee.psu.edu/Directory/FacultyInfo/Kesidis/KesidisProfilePage.aspx)Professor of Computer Science and Engineering and Electrical Engineering
High-speed communication/computer networks; traffic engineering including shaping, routing and scheduling; network security; overlay systems; and performance evaluation including modeling, simulation and emulation.

[**Iam-Choon Khoo (Ph.D. University of Rochester)**](http://www.ee.psu.edu/Directory/FacultyInfo/Khoo/KhooProfilePage.aspx)
William E. Leonhard Professor Electrical Engineering
Theories and experiments in photonic devices, nonlinear- and electro- optics materials such as liquid crystals, fibers and nano-structured, and novel refractive matamaterials.
IEEE Fellow; Optical Society of America Fellow; United Kingdom Institute of Physics Fellow

[**Constantino Lagoa (Ph.D. University of Wisconsin)**](http://www.ee.psu.edu/Directory/FacultyInfo/Lagoa/LagoaProfilePage.aspx)Professor of Electrical Engineering
Robust control, controller design under risk specifications, system identification, robust and chance constrained optimization, control of computer networks, and discrete event dynamical systems.

[**Yanxi Liu (Ph.D. University of Massachusetts – Amherst)**](http://www.ee.psu.edu/Directory/FacultyInfo/Liu_Y/Liu_YProfilePage.aspx)Associate Professor of Computer Science and Engineering and Electrical Engineering
Computational symmetry group theory and application, machine learning (particularly low-dimensional subspace learning from very large, multi-modality feature set), computer-aided diagnosis, computer vision, computer graphics, biomedical image analysis/indexing/retrieval, and robotics.

[**Zhiwen Liu (Ph.D. California Institute of Technology)**](http://www.ee.psu.edu/Directory/FacultyInfo/Liu_Z/Liu_ZProfilePage.aspx)Associate Professor of Electrical Engineering
Ultrafast and nonlinear optics, optical imaging, nonlinear spectroscopy, and holography.

[**John Mathews (Ph.D. Case Western Reserve University)**](http://www.ee.psu.edu/Directory/FacultyInfo/Mathews/MathewsProfilePage.aspx)Professor of Electrical Engineering
Radar remote sensing, digital signal processing, ionospheric physical and chemical processes, and radar codes.
IEEE fellow

## [Jeffrey Mayer (Ph.D. Purdue University)](http://www.ee.psu.edu/Directory/FacultyInfo/Mayer_J/Mayer_JProfilePage.aspx)Associate Professor of Electrical Engineering Power systems dynamics, electrical machinery, drive systems, energy conversion, and controls.

## [Theresa Mayer (Ph.D. Purdue University)](http://www.ee.psu.edu/Directory/FacultyInfo/Mayer_T/Mayer_TProfilePage.aspx)Distinguished Professor of Electrical Engineering and Associate Director of Material Research InstituteIII-V and novel semiconductor material systems, molecular beam epitaxy, device fabrication, and modeling.

[**John Metzner (Ph.D. New York University)**](http://www.ee.psu.edu/Directory/FacultyInfo/Metzner/MetznerProfilePage.aspx)Professor of Computer Science and Engineering and Electrical Engineering
Data and computer communication, error correcting codes, and information theory.
IEEE Fellow

[**David Miller (Ph.D. University of California – Santa Barbara)**](http://www.ee.psu.edu/Directory/FacultyInfo/Miller/MillerProfilePage.aspx)Professor of Electrical Engineering
Pattern recognition, machine learning, source coding, joint source-channel coding, bioinformatics, networking and network intrusion detection, and image segmentation.

**Ahmad Mirzaei (Ph.D. University of California, Los Angeles)**
Charles H. Fetter Associate Professor of Electrical Engineering
RF-analog and mixed-mode integrated circuits and systems for broad range applications, such as wireless communications, sensors, medical devices, etc.

[**John Mitchell (Ph.D. Penn State)**](http://www.ee.psu.edu/Directory/FacultyInfo/Mitchell/MitchellProfilePage.aspx)Professor of Electrical Engineering
Electronics, instrumentation, and aeronomy.

[**Raj Mittra (Ph.D. University of Toronto)**](http://www.ee.psu.edu/Directory/FacultyInfo/Mittra/MittraProfilePage.aspx)Professor of Electrical Engineering
Computational electromagnetic, EMI/EMC electromagnetic modeling and simulation of electronic packages, RF and wireless systems analysis and design, and communication antenna design.
IEEE Fellow

[**Vishal Monga (Ph.D. University of Texas – Austin)**](http://www.ee.psu.edu/Directory/FacultyInfo/Monga/MongaProfilePage.aspx)
Monkowski Assistant Professor of Electrical Engineering
Detection theory, lattice theory, optimization and their applications to multimedia security and mining, color image processing and statistical learning for multimedia, document processing, and genomics.

[**Ram Narayanan, (Ph.D. University of Massachusetts – Amherst)**](http://www.ee.psu.edu/Directory/FacultyInfo/Narayanan/NarayananProfilePage.aspx)Professor of Electrical Engineering
Antenna characterization and measurements, microwave radar and communications system design and development, radar remote sensing theory and applications, remote sensing image analysis, multifunctional sensors and networking..
IEEE Fellow, SPIE Fellow, and IETE Fellow

[**Victor Pasko (Ph.D. Stanford University)**](http://www.ee.psu.edu/Directory/FacultyInfo/Pasko/PaskoProfilePage.aspx)Professor of Electrical Engineering
Atmospheric electrodynamics, atmospheric acoustic-gravity waves, gas discharge phenomena, computational plasma physics, and electromagnetics.

[**Jerzy Ruzyllo (Ph.D. Warsaw University of Technology, Poland)**](http://www.ee.psu.edu/Directory/FacultyInfo/Ruzyllo/RuzylloProfilePage.aspx)Distinguished Professor of Electrical Engineering
Semiconductor materials and devices; integrated circuits manufacturing science and engineering; semiconductor surface modification processes and characterization; gate dielectric processing in advanced CMOS technology; and methods of semiconductor, including semiconductor quantum dots, and dielectric thin film formation.
IEEE Fellow and Electrochemical Society Fellow

[**Jeffrey Schiano (Ph.D. University of Illinois – Urbana-Champaign)**](http://www.ee.psu.edu/Directory/FacultyInfo/Schiano/SchianoProfilePage.aspx)Associate Professor of Electrical Engineering
Control systems and feedback control of quantum mechanical processes.

[**Srinivas Tadigadapa (Ph.D. Cambridge University, United Kingdom)**](http://www.ee.psu.edu/Directory/FacultyInfo/Tadigadapa/TadigadapaProfilePage.aspx)Professor of Electrical Engineering and Material Research Institute Affiliate
Design, fabrication, and characterization of microelectromechanical systems (MEMS), integration of smart materials into MEMS devices, biological MEMS, inertial MEMS, and RF MEMS devices.
IEEE fellow

[**Kenji Uchino (Ph.D. Tokyo Institute of Technology, Japan)**](http://www.ee.psu.edu/Directory/FacultyInfo/Uchino/UchinoProfilePage.aspx)Professor of Electrical Engineering and Material Research Institute Affiliate
Dielectrics/ferroelectrics/piezoelectrics, high-power materials and device design/fabrication, solid state actuators, transducers, positioners, ultrasonic motors/transformers, renewable energy harvesting, entrepreneurship for engineers, and politico-engineering/global regime on science & technology.
IEEE Fellow and American Ceramic Society Fellow.

[**Julio Urbina (Ph.D. University of Illinois – Urbana-Champaign)**](http://www.ee.psu.edu/Directory/FacultyInfo/Urbina/UrbinaProfilePage.aspx)Associate Professor of Electrical Engineering
Radar design, digital systems and space instrumentation, analog design, software designed radio and radars, radio wave propagation, meteor detection, system integration, radio wave remote sensing, and radar studies of the atmosphere and ionosphere.

[**Douglas Werner (Ph.D. Penn State)**](http://www.ee.psu.edu/Directory/FacultyInfo/Werner/WernerProfilePage.aspx)John L. and Genevieve H. McCain Chair Professor of Electrical Engineering
Theoretical and computational electromagnetics, antenna analysis and design, electromagnetic wave interaction with complex materials, fractal and knot electrodynamics, and genetic algorithms in electromagnetics.
IEEE Fellow, IET Fellow, and ACES Fellow

[**Aylin Yener (Ph.D. Rutgers University)**](http://www.ee.psu.edu/Directory/FacultyInfo/Yener/YenerProfilePage.aspx)Professor of Electrical Engineering
Wireless communications and networking, information theory, information security, communication theory, network science. Fundamental performance limits and system level design for wireless systems with emphasis on green communications and information security guarantees.

[**Shizhuo Yin (Ph.D. Penn State)**](http://www.ee.psu.edu/Directory/FacultyInfo/Yin/YinProfilePage.aspx)Professor of Electrical Engineering
Massive optical memories, medical optics, photo refractive materials, optical computing, and fiber-optic communications.
Optical Society of America Fellow and International Society for Optical Engineering Fellow

[**Qiming Zhang (Ph.D. Penn State)**](http://www.ee.psu.edu/Directory/FacultyInfo/Zhang/ZhangProfilePage.aspx)Distinguished Professor of Electrical Engineering and Material Research Institute Affiliate
Integrated micro-actuators and microsensors, electroactive polymer and nanomaterial system energy devices for electrical energy storage and conversion, ferroelectric/piezoelectric polymer thin film fabrication and thin film devices, and theory and modeling of electroactive polymers and nanomaterial systems based on them.
IEEE Fellow

**Minghui Zhu (Ph.D. University of California, San Diego)**
Dorothy Quiggle Assistant Professor of Electrical Engineering
design, analysis and control of multi-agent networks with applications in multi-vehicle networks, transportation networks and the smart grid

### Non-Tenure Track Teaching Faculty

[**Salvatore Riggio (Ph.D. Florida Atlantic University)**](http://www.ee.psu.edu/Directory/FacultyInfo/Riggio/RiggioProfilePage.aspx)Associate Professor of Electrical Engineering
Discrete and integrated analog and digital circuits and devices, microcontrollers, power electronics, motors and generators, communications, controls, amateur radio and television systems.

[**David Salvia (M.S. Penn State)**](http://www.ee.psu.edu/Directory/FacultyInfo/Salvia/SalviaProfilePage.aspx)
Assistant Professor of Electrical Engineering and Undergraduate Program Coordinator
Teaches courses in the areas of circuit analysis, digital signal processing, communications, and signals/systems..

[**Mark Wharton (M.S. University of Colorado)**](http://www.ee.psu.edu/Directory/FacultyInfo/Wharton/WhartonProfilePage.aspx)Associate Professor of Electrical Engineering
Baseband, IF, RF, and microwave circuit design.
Teaches undergraduate-level courses in electronics, microwave and RF design and senior project design.

[**Timothy Wheeler (M.S. Penn State)**](http://www.ee.psu.edu/Directory/FacultyInfo/Wheeler/WheelerProfilePage.aspx)Assistant Professor of Electrical Engineering
Teaches design process and project courses, including professionalism topics such as engineering ethics, teaming, conflict resolution and technical writing.

1. **Additional Faculty Appointments**
2. **Courtesy title**
Mary Jane Irwin, Robert E. Noll Professor, Computer Science and Engineering

Thomas Laporta, Distinguished Professor, Computer Science and Engineering

Suzanne Mohney, Professor, Materials Science and Engineering

Vijaykrishnan Narayanan, Professor, Computer Science and Engineering

[Joan Redwing**,**](http://www.ee.psu.edu/Directory/FacultyInfo/Redwing/RedwingProfilePage.aspx) Professor, Materials Science and Engineering

1. **Adjunct title**

Lars Dyrud, John Hopkins University, Applied Physics Laboratory

Kwang Lee, Baylor University
David Machuga, Northrup Grumman Corporation

Robert Nickel, Bucknell University

Thomas Seliga, consultant

### Instructors

Mark Bregar, Penn State Applied Research Laboratory
Eli Hughes, Penn State Applied Research Laboratory
David Jenkins, Penn State Applied Research Laboratory
Svetla Jivkova,
Andy Mayers, Department of Electrical Engineering

1. **Emeritus Faculty**William Adams, Professor Emeritus

Larry Burton, Associate Dean Emeritus
Lynn Carpenter, Associate Professor Emeritus
Charles Croskey, Professor Emeritus
L. Eric Cross, Evan Pugh Professor Emeritus
Anthony Ferraro, Distinguished Professor Emeritus
Dale Grimes, Professor Emeritus
Paul Hulina, Associate Professor Emeritus
Stewart Kurtz, Professor Emeritus
Kwang Lee, Professor Emeritus
John Lewis, Professor Emeritus
George McMurtry, Professor Emeritus
John Nisbet, Alumni Professor Emeritus
Russell Philbrick, Professor Emeritus
James Robinson, Professor Emeritus
William Ross, Professor Emeritus
Christopher Wronski, Professor Emeritus
Francis Yu, Evan Pugh Professor Emeritus

1. **Visiting Scholars**

Chen, Ming-yuan – Lagoa

Degiorgi, Marco - Mittra

Dong, Tianyu – Mittra

Gu, Xiang – Mittra

Koo, Insoo – Yener

Lin, Xiaoyan - Yin

Wang, Weibo – Mittra

Xiang, Yang – Kavehrad

Yang, Caihong – Kavehrad

Yuan, Chengxun - Yin

1. **Post-doctoral Scholars**
Basham, James – Jackson

DasGupta, Sandeepan- Datta
Deng, Peng – Kavehrad
Ghosh, Ramkrishna – Datta

Gregory, Micah - Werner

Jain, Sidharath – Mittra

Jiang, Zhihao - Werner
Kar, Ayan - Datta
Kovtyukhova, Nina – Mayer
Li, Jie – Mayer
Liu, Xiaoming – Mayer

Liu, Yinghui -Aydin
Panaretos, Anastas – Werner
Pogrebnyakov, Ale– Mayer
Sarkhel, Sumanta – Mathews

1. **Staff**Connie Burger, Facilities Assistant
Marsha Church, Senior IT Systems Analyst
Jennifer Colwell, Financial Assistant
Julie Corl, Fixed Term and Visa Administrative Support Assistant
Dave DeCapria, Engineering Lab Manager, Safety Officer
Lena Getman, Staff Assistant
Mike Hand, Senior IT Systems Analyst
Mary Ann Henderson, CSSL/EO Administrative Support Assistant
SherryDawn Jackson, Graduate Program Staff Assistant/Manager of Academic Affairs
Debra Lauder, Signal and Systems Area Administrative Support Assistant
Dawn Nelson, Department Head Administrative Support Assistant
Donna O’Shea, IT Systems Administrator
Gabriele Rhinehart, Undergraduate Administrative Support Assistant
Erin Rogers, Proposal and Grant Generalist

Catherine Schultz, Public Relations Specialist
Pam Stauffer, Administrative Support Coordinator
Lisa Timko, Graduate Admissions Administrative Support Assistant

# Academic Programs

### Undergraduate Program (juniors and seniors)

1. **Enrollment**
Fall 2013: 522
2. **Enrollment trends**

Note: Enrollment follows national trends. These numbers include juniors and seniors only.

1. **Bachelor’s Degrees Conferred 2013**

Spring: 104
Summer: 16
Fall: 34

1. **Undergraduate Scholarships and Fellowships**

*Larry C. and Barbara A. Burton Student Award in Electrical Engineering*
Michael Gidaro

*Cobham plc Trustee Scholarship in the College of Engineering*Sydney McMullen

*College of Engineering, Diversity Scholarship*Kimberly Clemonts
Omar Fernandes
Carol Tadros-Moussa
Joseph Thomas

*College of Engineering, Excellence Scholarship*Matthew Toporcer

*College of Engineering, General Scholarship*Timothy Hackett
Landon Hernandez

*College of Engineering, Underrepresented Program
Kimberly Clemonts
Landon Hernandez
Alexis Jackson
Jarell Mason
Adriyel Nieves*

*Department of Electrical Engineering General Scholarship*Matthew Ceonzo
Matthew Williamson

*Donald and Nancy Devorris Scholarship in Electrical Engineering*
Kyle Emerson

*Ron Finafrock Memorial Scholarship*
Kyle Sibert

*Frank Gabron Scholarship in Electrical Engineering*
Dominic Mirabile

Priscilla E. Guthrie Scholarship in Electrical Engineering
Jin Xu
Adam Sidehamer

*Louis Harding Scholarship*Fei Bu

*Donald W. Hamer Scholarship in Electrical Engineering*Patrick Barnett
Kyle Casterline

Janet and Jennifer Hemler Women in Engineering Scholarship
Sydney McMullen

*Clifford B. Holt, Jr. Memorial Scholarship in Electrical Engineering*Kapil Inamdar
Molly Obrien

*Walt Jaunzemis Memorial Scholarship*Peter Lin

*Robert C. Kieffer Memorial Scholarship in Electrical Engineering*Zachary Reed

*James R. Kruest Scholarship in Electrical Engineering*
Lauren Donohoe

*Langdon Experiential Learning Endowment*Sanjar Tolendi

*Hai-Sup Lee Memorial Scholarship in Electrical & Computer Engineering*
Timothy Hackett

*Kwang Y. and Sangwol Lee Trustee Scholarship in the College of Engineering*
Pooja Pathak
George Asbeck
Steven Choromanski
Michael McNamara
Jin Xu

*William and Wyllis Leonhard Honors Program Endowment*Timothy Hackett

*Morris S. Levin Memorial Scholarship*Peter Wu

*William J. Madden and Ethel Harer Madden Memorial Honors Scholarship in Engineering*
Matthew Baranoski
Michael Bilyk
Ronald Caccese
Kyle Casterline
Austin Crain
Sean Elward
Sean McGowan
Beverly Post
Bradley Sherman
Adam Sidehamer

*William J. Madden and Ethel Harer Madden Memorial Scholarship in Engineering*
*Patrick Barnett
Eric Besso
Sean Elward
Kyle Emerson
Maxine Fox
Stephan Frisbie
Evan Gebhardt
Sean Irvine
Alexis Jackson
James Jones
Anthony Kashiwsky
John Klinar
Brad Ledonne
Joshua Markle
Jarell Mason
Thomas McInerney
Nicholas Moore
Erin Motto
Theodore Nitz
Tyler O’Hara
Alexander Pleim
Zachary Prawucki
Zachary Reed
Jeremy Schrack
Tyler Smith
Andew Vack*

*William J. Madden and Ethel Harer Madden Memorial Trustee Scholarship in Engineering*Nathan Ayers
William Baker
Alex Camara
David Carulli
Kyle Casterline
Frederick Chache
Jesse Conklin
Robert Damico
Michelle Donze
George Fanala
Omar Fernandes
Johnathon Forgione
Jeffrey George
Philip Herr
Marc Hollman
Nathan Lafevers
Matthew Lathrop
Brad Ledonne
Ryan McCabe
Daniel Morris
John Moses
Patrick Nguepdo
Joshua Noble
Corbin Reeder
Nikil Sadanandan
Cameron Steiger
Vitalii Vasyliev
Edward Weinrich
Jayme Wilt
Weilin Xue
Diana Zhang

*Joseph Marin Memorial Scholarship Fund*Beverly Post

*Steven Messori Memorial Scholarship*
Christian Pastor

*The Shuman H. & Elizabeth B. Moore Engineering Scholarship*
Diana Zhang
Jinhuang Lu

*Paul Morrow Endowed Scholarship*Dominic Mirabile
Brian Pugh

*Fred A. Pechter Scholarship*Philip Herr
Andrew Vack
Vitalii Vasyliev
Bradley Sherman
Anthony Mazzenga

*John A. Tague Scholarship in Electrical Engineering*Anthony Mazzenga

*Harold I. Tarpley Memorial Scholarship Fund*
Michael Bilyk

*Triangle Fraternity Academic Excellence Scholarship
Conrad Paul*

*Christopher M. Wharton Trustee Scholarship*Garrett Covalt

*Wormley Family Scholarship in Engineering*Jarell Mason

1. **Undergraduate Awards***James M. Barnak/Eta Kappa Nu Outstanding Senior Award*
 Rebecca Ripley

*Eta Kappa Nu Outstanding Junior Award*
Alexis Jackson

*Electrical Engineering student marshal*
Spring: Dominique Zwiebel

### Graduate Program

1. **Enrollment**Fall 2013 M.S.: 81

Fall 2013 Ph.D.: 136

1. **Enrollment trends**
2. **Master’s Degrees Conferred - total 32**
	1. **Spring 2013**

Gaurab Basu (paper option) supervised by Kesidis, George

Quinn Burlingame (paper option) supervised by Zhang, Qiming

Chen Cheng (paper option) supervised by Kavehrad, Mohsen

Kyle Gallagher “Simultaneous Human Detection and Ranging Using a Millimeter-Wave Radar System with an Embedded Tone” supervised by Narayanan, Ram M. and Kane, Timothy

Divya Ganti (paper option) supervised by Kavehrad, Mohsen

Ibrahim Khawaji (paper option) supervised by Ruzyllo, Jerzy

Kaiming Li “Impedance Matching Optimization Based on MATLAB” supervised by Breakall, James K.

Yang Lin (paper option) supervised By Yin, Shizhuo

Xi Luo (paper option) supervised by Yin, Shizhuo

Andrew Meehan “Digital Control of Hybrid Power for Unmanned Ground Vehicles” supervised by Mayer, Jeffrey S.

Amanda Mills “A New UHF High Dynamic Range Receiver for the Aercibo Observatory” supervised by Urbina, Julio

Sheng Qu (paper option) supervised by Mayer, Jeffrey S.

Ala Sabeeh (paper option) supervised by Ruzyllo, Jerzy

Sonny Smith “Design, Analysis and Performance of Ultra-Wide S-Band, Through-Wall Noise Radar” supervised by Narayanan, Ram M.

Ying Sun “A Mixed Markov Model Approach to Predict Future Points of Interest in Indoor Space” supervised by Miller, David J.

* 1. **Summer 2013**

Tyler Boehmer “Design and Verification of a Low-Power GPS-Disciplined Oscillator for Use in Distributed Sensor Arrays” supervised By Bilen, Sven

Ravi Chaudhary (paper option) supervised by Jenkins, Kenneth

Rijul Dhanker (paper option) supervised by Giebink, Noel

Alexander Hackett “On the Development of Modern Ionospheric Sensors Using Software- Defined Radio Techniques” supervised by Urbina, Julio

Brian Herrold “Complete Vector Network Analyzer Approach to Ice Penetrating Radar System” supervised by Bilen, Sven

Indranil Roy (paper option) supervised by Mayer, Jeffrey S.

Jinhyun So “Comparison of Cat Swarm Optimization with Particle Swarm Optimization For IIR System Identification” supervised by Jenkins, Kenneth

Siddharth Sonti (paper option) supervised by Jenkins, Kenneth

Joseph Tucker (paper option) supervised by Pasko, Victor

Akshay Virdhe (paper option) supervised by Jenkins, Kenneth

1. **Fall 2013**

Ju-Hung Chao “Surface Processing for Area Selective Mist Deposition of Nano- Crystalline Quantum Dot Films” supervised by Ruzyllo, Jerzy

Eugene Freeman “Vanadium Dioxide Tunnel Junctions and Structural Evolution of Electrically Driven Insulator of Metal Transition” supervised by Datta, Suman

Boyi Gao “High-Altitude Meteor Events and Phase Calibration of the Jicamarca Radar Using Satellites” supervised by Mathews, John D.

Runkun Jiang (paper option) supervised by Ruzyllo, Jerzy

Son Lai “Thermal Biosensor Based Micromachined Y-Cut Quartz Resonators” supervised by Tadigadapa, Srinivas

Rohit Ranade “Image Processing Using Coupled Oscillators“ supervised by Jenkins, Kenneth

Amruta Saraf (paper option) supervised by Miller, David J

1. **Doctoral Degrees Conferred – total 25**
	1. **Spring 2013**

Gregory Bower “Diagnostics and Health Monitoring of a dc-dc Forward Converter through Time Series Analysis” supervised by Mayer, Jeffrey S.

Ho Him Fok “Integrated Electronics and Fluidic MEMS for Bioengineering” supervised by Jackson, Thomas N.

Ming Shih Huang “Trilateration-Based Localization Algorithm for ADS-B Radar Systems” supervised by Narayanan, Ram M.

Yi Ma “Electro-optics and nonlinear optics of liquid crystal-plasmonic materials and structures” supervised by Khoo, Iam-Choon

Dheeraj Mohata “Arsendie-Antmonide Tunnel Transistors for Low Power Logic Applications” supervised by Datta, Suman

Kadappan Panayappan “Novel Frequency Domain Techniques and Advances in Finite Difference Time Domain (FDTD) Method for Efficient Solution of Multiscale Electromagnetic Problems” supervised by Mittra, Raj

Jianqi Qin “Numerical Modeling of the Inception, Morphology and Radio Signals of Sprites Produced by Lightning Discharges with Positive and Negative Polarity” supervised by Pasko, Victor P.

Ye Tian “Cooperation and Interference in Wireless Networks” supervised by Yener, Aylin

Burak Tuysuz “Development and Implementation of a Passive Vhf Radar System Using Software Defined Radio Techniques to Study Equatorial Plasma Instabilities near the Peruvian Andes” supervised by Urbina, Julio

* 1. **Summer 2013**

Supratim Ghosh “Teams and Games for Distributed Consensus” supervised by Lee, Ji-Woong

Micah Gregory “New Methods in Ultra-Wideband Array Design and Finite-Difference Time- Domain in Modeling of Memristive Devices” supervised by Werner, Douglas H.

Kuan-Lun Hong “All-Optical Image Processing with Nonlinear Liquid Crystals” supervised by Khoo, Iam-Choon

Zhihao Jiang “Anisotropic Metamaterials for Microwave Antennas and Infrared Nano- structured Thin Films” supervised by Werner, Douglas H.

Meng-Wei Kuo “Bottom-up and Top-down Fabrication of Nanowire-Based Electronic Devices: In Situ Doping of Vapor Liquid Solid Grown Silicon Nanowires and Etch-dependent Leakage Current in InGASs Tunnel Junctions” supervised by Mayer, Theresa

Yuanyuan Li “Plasma Enhanced Atomic Layer Deposition ZnO Thin Film Transistors for Large Area Circuit Applications” supervised by Jackson, Thomas N.

Sanam Mirzazad Barijough “On Analysis of Discrete-Time Piecewise Affine Systems” supervised by Lagoa, Constantino

Mahesh Shastry “Compressively Sampled Radar Using Random Waveforms” supervised by Narayanan, Ram M.

Umamahesh Srinivas “Discriminative Models for Robust Image Classification” supervised by Monga, Vishal

Chuan Yang “Nonlinear Optical Imaging and Spectroscopy with Ultrafast Laser Pulses” supervised by Liu, Zhiwen

* 1. **Fall 2013**

Abdullah Almahri “QR Signal Detection in the Presence of AM Noise” supervised by Lagoa, Constantino

Dustin Fairchild “Classification and Modeling of Human Activities Using Empirical Mode Decomposition with S-Band and Millimeter-Wave Micro-Doppler Radars” supervised by Narayanan, Ram M.

Aditya Kurve “Novel Task Decomposition and Aggregation Methods for Knowledge Discovery in Multi-Agent Systems” supervised by Kesidis, George

Xinyu Li “Electrocaloric Effect in Relaxor Ferroelectric Materials” supervised by Zhang, Qiming

Brian Thomson “Estimation and Reduction of Temporal Magnetic Field Fluctuations in Powered Magnets Using Inductive and NMR Feedback Control” supervised by Schiano, Jeffrey

Zhou Zhou “Broadband Optical Wireless Communications” supervised by Kavehrad, Mohsen

 **5. Graduate Scholarships and Fellowships**

*Paul F. Anderson Graduate Fellowship in Electrical Engineering* Matthew Brandsema
 Idellyse Martinez
 Benjamin McPheron
 Sonny Smith

*Harry L. Bell Graduate Fellowship in Electrical Engineering*Alyssa Brigeman
Scott Wilson

*Luther B. and Patricia A. Brown Graduate Fellowship*Jared Price
Sonny Smith
Robert Sorbello

*Joseph R. and Janice M. Monkowski Graduate Fellowship in EE*
Christopher Payne
Clinton Scarborough
Sonny Smith
Chad Welsh

*James R. and Barbara R. Palmer Fellowship in Electrical Engineering*Travis Bufler
Sonny Smith
Jeremiah Turpin

Pontano Family Scholarship in Electrical Engineering
Clinton Scarborough

*Fred C. and M. Joan Thompson Graduate Fellowship in Electrical Engineering*
Matthew Jerry
Scott Wilson
Donovan Brocker

*Penn State Electrical Engineering Society Graduate Fellowship*
Yolian Amaro-Rivera
Matthew Hollander
Matthew Jerry
Brian Phelan
Jose Ramirez
Andrew Swisher

*Bess L. and Mylan R. Watkins Graduate Fellowship in Electrical Engineering*
Patrick Byrnes
Matthew Jerry
Benjamin McPheron

1. **Graduate Awards**

*Melvin P. Bloom Memorial Outstanding Doctoral Research Award* Jeremiah Turpin
 Shan Wu

*Nirmal K. Bose Dissertation Excellence Award* Huichu Liu
 Xiaoshi Qian

*The A. J. Ferraro Graduate Research Award*
Caitano Da Silva
Jeremiah Turpin

1. **Courses**

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| **First Year Seminars:** **EE008**Digital Music**EE009 EE009**Intro to Ham Radio This is Rocket Science  |
| **EE200**Design Tools | **EE210**Circuits and Devices |
| **EE211**Electrical Circuits and Power Distribution (non majors) | **EE212**Introduction to Electronic Measuring Systems (non majors) |
| **EE300W**Design Process | **EE310**Electronic Circuit Design I |
| **EE311**Electronic Circuit Design II | **EE320****Introduction to Electro-Optical Engineering** |
| **EE330****Engineering Electromagnetics** | **EE340**Introduction to Nanoelectronics |
| **EE350****Continuous-Time Linear Systems** | **EE351****Discrete-Time Linear Systems** |
| **EE353**Signals and Systems (non majors) | **EE360****Communications Systems I** |
| **EE362**Communication Networks | **EE380**Linear Control Systems |
| **EE387****Energy Conversion** | **EE403W**Senior Project Design |
| **EE410**Linear Electronic Design | **EE413**Power Electronics |
| **EE416**Digital Integrated Circuits | **EE417**Digital Design Using Field Programmable Devices |
| **EE420**Electro-optics: Principles and Devices | **EE421**Optical Fiber Communications |
| **EE422**Optical Engineering Laboratory | **EE424**Principles and Applications of Lasers |
| **EE430**Principles of Electromagnetic Fields | **EE432**UHF and Microwave Engineering |
| **EE438**Antenna Engineering | **EE439**Radiowave Propagation in Communications |
| **EE441****Semiconductor Integrated Circuit Technology** | **EE442**Solid State Devices |
| **EE453****Fundamentals of Digital Signal Processing** | **EE454****Fundamentals of Computer Vision** |
| **EE455**An Introduction to Digital Image Processing | **EE460**Communication Systems II |
| **EE466**Software-Defined Radio | **EE471**Introduction to Plasmas |
| **EE472**Space Astronomy and Introduction to Space Science | **EE474**Satellite Communications Systems |
| **EE477**Fundamentals of Remote Sensing Systems | **EE482**Introduction to Digital Control Systems |
| **EE487**Electric Machinery and Drives | **EE488**Power Systems Analysis I |
| **EE 497**Probability and Random Processes for Electrical Engineers | **EE500**Graduate Colloquium |
| **EE510**Linear Integrated Circuits | **EE520**Electro Optics--Systems and Computing |
| **EE521**Fiber Optics and Integrated Optics | **EE522**Electro-Optics Laboratory |
| **EE524**Lasers and Optical Electronics | **EE526**Nonlinear Optical Materials |
| **EE531**Engineering Electromagnetics | **EE534**Conformal Antennas |
| **EE535**Boundary Value Methods of Electromagnetics | **EE537**Numerical and Asymptotic Methods of Electromagnetics |
| **EE538**Antenna Engineering | **EE541**Manufacturing Methods in Microelectronics |
| **EE542**Semiconductor Devices | **EE543**Ferroelectric Devices |
| **EE544**Micromechatronics | **EE545**Semiconductor Device Reliability |
| **EE546**Field-Effect Devices | **EE547**Dielectric Devices |
| **EE549**Acoustic Wave Devices | **EE551**Wavelets, Filter Banks And Multi-Resolution Analysis |
| **EE552**Pattern Recognition--Principles and Applications | **EE553**Topics in Digital Signal Processing |
| **EE554**Topics in Computer Vision | **EE555**Digital Image Processing II |
| **EE556**Graphs, Algorithms and Neural Networks | **EE557**Multidimensional Signal Processing |
| **EE560**Probability, Random Variables, and Stochastic Processes | **EE561**Information Theory |
| **EE562**Detection and Estimation Theory | **EE564**Error Correcting Codes for Computers and Communication |
| **EE567**Wireless and Mobile Communications | **EE568**Digital Communications I |
| **EE569**Digital Communications II | **EE574**Propagation Through Random Media |
| **EE576**Inversion Techniques in Remote Sensing | **EE579**Microwave Radar Remote Sensing |
| **EE580**Linear Control Systems | **EE581**Optimal Control |
| **EE582**Adaptive and Learning Systems | **EE584**Robust Control Theory |
| **EE587**Nonlinear Control and Stability | **EE588**Power Systems Control and Operation |
| **EE597** Special Topics CoursesAdaptive Signal ProcessingCompound SemiconductorsEmerging Networks SystemsNanophotonics and PlasmonicsRadar ScatteringSemiconductor Material Systems |

# Department Research

### Research Areas

### [Communications and Networking](http://www.ee.psu.edu/Research/Communicationsandnetworking.aspx)Digital communications, computer networking, intelligent networks, multimedia communications, mobile computing, local area wireless networks (RF and optical), portable and mobile communications, optical fiber communications, optical networking, coding and information theory, satellite communications, and propagation measurements and modeling

*Faculty members: John Doherty, Mohsen Kavehrad, George Kesidis, John Metzner, and Aylin Yener*

[**Control Systems**](http://www.ee.psu.edu/Research/Controlsystems.aspx)
Multiobjective and probabilistic robust control, nonlinear systems, intelligent distributed control, adaptive control, active vision, and quantum control
*Faculty members: Constantino Lagoa, Jeffrey Schiano, and Minghui Zhu*

[**Electromagnetics**](http://www.ee.psu.edu/Research/Electromagnetics.aspx)
Computational electromagnetics, wave scattering and propagation, interactions with complex media and novel materials, electrodynamics, antenna analysis and design, scattering cross section and antenna measurements, computer visualization, RF and microwave systems, MMIC, EMI, and EMC, and electronic packaging
*Faculty members: James Breakall, Raj Mittra, and Douglas Werner*

[**Electronic Materials and Devices**](http://www.ee.psu.edu/Research/Electronicmaterialsanddevices.aspx)
Materials and devices for electronic, photonic, bioelectronic and MEMS applications: amorphous and crystalline silicon, III-V compounds, organic thin films, ferroelectric and piezo-electric; development of novel device structures and manufacturing methods, device and circuit simulation and modeling, and device and material characterization
*Faculty members: Suman Datta, Chris Giebink, Thomas Jackson, Theresa Mayer, Jerzy Ruzyllo, Srinivas Tadigadapa, Kenji Uchino, and Qiming Zhang*

[**Optical Materials and Devices**](http://www.ee.psu.edu/Research/Opticalmaterialsanddevices.aspx)Electro-optics, photonic and nonlinear optical materials, devices and applications; tunable photonic crystals; laser switching and optical information processing; liquid crystalline materials and devices; fiber optics and waveguides, holography
*Faculty members: Iam-Choon Khoo, Zhiwen Liu, and Shizhuo Yin*

[**Power Systems**](http://www.ee.psu.edu/Research/Powersystems.aspx)
Power system planning, operation, and control, intelligent system applications to power systems, computational tools for power electronic design, and quiet motor drives
*Faculty members: Jeffrey Mayer*

[**Remote Sensing and Space Systems**](http://www.ee.psu.edu/Research/Remotesensingandspacesystems.aspx)Active (radar and LIDAR) and passive (radiometry) remote sensing of the atmosphere; radar, radiometer, and LIDAR systems; rocket and satellite instrumentation; atmospheric electrodynamics; meteoric effects in the ionosphere; modeling of atmospheric processes; and plasma physics
*Faculty members: Kultegin Aydin, Sven Bilén, Timothy Kane, John Mathews, John Mitchell, Ram Narayanan, Victor Pasko, and Julio Urbina*

[**Signal and Image Processing**](http://www.ee.psu.edu/Research/Signalandimageprocessing.aspx)
Multidimensional signal processing, signal reconstruction theory and algorithms, signal compression, spectral estimation, image processing, medical image analysis, neural networks, multiple target tracking in clutter, adaptive filtering, and data fusion
*Faculty members: William Higgins, Kenneth Jenkins, Yanxi Liu, David Miller, and Vishal Monga*

## Articles Published in Refereed Journals

***Listed by author, title, journal, and date.***

## G. Botta, K. Aydin, and J. Verlinde, “Variability in Millimeter Wave Scattering Properties Of Dendritic Ice Crystals,” Journal of Quantitative Spectroscopy and Radiative Transfer (JQSRT), December 2013.

## Y. Lu, E. Clothiaux, K. Aydin, G. Botta, and J. Verlinde, “Modeling Variability in Dendritic Ice Crystal Backscattering Cross Sections at Millimeter Wavelengths Using a Modified Rayleigh-Gans Theory,” Journal of Quantitative Spectroscopy and Radiative Transfer (JQSRT),  December 2013.

Okhtay Azarmanesh and Sven **G Bilén**, "I-Q diagram utilization in a novel modulation classification technique for cognitive radio applications," EURASIP Journal on Wireless Communications and Networking, December 2013.

Rachel Dzombak, Chanakya Mehta, Khanjan Mehta, and **Sven G. Bilén**, "The Relevance of Systems Thinking in the Quest for Multifinal Social Enterprises," Systemic Practice and Action Research, December 2013.

L. Liu, V. Narayanan, and **S.Datta** "A programmable ferroelectric single electron transistor" Appl. Phys. Lett. 102, 053505 February 2013

Y. Zhu, N. Jain, S. Vijayaraghavan, D. K. Mohata, **S. Datta**, D. Lubyshev, J. M. Fastenau, A. K. Liu, , and M. K. Hudait "Band offset determination of mixed As/Sb type-II staggered gap heterostructure for n-channel tunnel field effect transistor application" J. Appl. Phys. 113, 024319 January 2013

Ayan Kar, Nikhil Shukla, Eugene Freeman, Hanjong Paik, Huichu Liu, Roman Engel-Herbert,S. S. N. Bhardwaja, Darrell G. Schlom, and **Suman Datta** "Intrinsic electronic switching time in ultrathin epitaxial vanadium dioxide thin film" Appl. Phys. Lett. 102, 072106 February 2013

YC Chen, S Eachempati, CY Wang, **S Datta,** Y Xie, V. Narayanan "A Synthesis Algorithm for Reconfigurable Single-Electron Transistor Arrays" CM Journal on Emerging Technologies in Computing Systems (JETC) Volume 9 Issue 1, February 2013 Article No. 5

A Ali, H. Madan, M. Barth, J. B. Boos, B. R. Bennett, and **S. Datta** "Effect of Interface States on the Performance of Antimonide nMOSFETs" IEEE Electron Device Letters Vol. 34. NO. 3, March 2013

R. Bijesh, D. Mohata, A. Ali, and **Suman Datta** "Insight into the output characteristics of III-V tunneling field effect transistors " Appl. Phys. Lett. 102, 092105 March 2013

Yan Zhu, Mantu K. Hudait Dheeraj K. Mohata, Bijesh Rajamohanan, **Suman Datta**, Dmitri Lubyshev, Joel M. Fastenau, and Amy K. Liu "Structural, morphological, and defect properties of metamorphic In0.7Ga0.3As/GaAs0.35Sb0.65 p-type tunnel field effect transistor structure grown by molecular beam epitaxy" J. Vac. Sci. Technol. B 31(4), pp 041203-1, Jul/August 2013

Karthik Swaminathan, Emre Kultursay, Vinay Saripalli, Vijaykrishnan Narayanan, Mahmut Kandemir, **Suman Datta,** "Steep Slope Devices: From Dark to Dim Silicon," IEEE Micro, vol. 33, no. 5, pp. 50-59, Sept.-Oct. 2013

C. Cress and **S. Datta**, "Nanoscale transistor - Just around the gate?", Science, vol. 341, pp. 140-141 (2013)

B. Rajamohanan, D. Mohata, D. Zhernokletov, B. Brennan, R. M. Wallace, R. Engel-Herbert, and **S. Datta,** "Low-Temperature Atomic-Layer-Deposited High-k Dielectric for p-Channel In0.7Ga0.3As/GaAs0.35Sb0.65 Heterojunction Tunneling Field-Effect Transistor", Appl. Phys. Express, 6, 101201 (2013).

N. Agrawal, Y, Kimura, R. Arghavani, and **S. Datta**, "Impact of Transistor Architecture (Bulk Planar, Trigate on Bulk, Ultrathin-Body Planar SOI) and Material (Silicon or III Semiconductor) on Variation for Logic and SRAM Applications", IEEE Transactions on Electron Devices, vol. 60, no.10, pp: 3298-3304, October 2013

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Scott M. Merritt, Rahul Khare, Rebecca Bascom, and **W.E. Higgins**, ``Real-time CT-Video registration for the continuous guidance of bronchoscopy," IEEE Transactions on Medical Imaging, vol. 32, no. 8, pp. 1376-1396, , doi: 10.1109/TMI.2013.2252361, August 2013

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Y. V. Li, J. I. Ramirez, K. G. Sun, and **T. N. Jackson**, "Low-Voltage Double-Gate ZnO Thin-Film Transistor Circuits," IEEE Electron Device Letters, 34, pp. 91-3 (July 2013).

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Huang, T.-Y. and **T.J. Kane**, Examining methods used in extracting long-term thermospheric density trends, Journal of Atmospheric and Solar-Terrestrial Physics, Volume 97, Pages 115-124, May 2013.

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**Iam Choon Khoo**, Kuan Lung Hong, Shuo Zhao, Ding Ma, and Tsung-Hsien Lin “Blue-phase liquid crystal cored optical fiber array with photonic bandgaps and nonlinear transmission properties,” Optics Express Vol. 21 Issue 4, pp.4319-4327 (2013)

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Joanna Ptasinski, Sung W. Kim, Lin Pang, **Iam-Choon Khoo**, and Yeshaiahu Fainman, "Optical tuning of silicon photonic structures with nematic liquid crystal claddings," Optics Letters Vol. 38, Iss. 12, pp. 2008-2010 (2013)

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Yun, S., F. Namin, **D. H. Werner, T. S. Mayer**, C. Bungay, C. Rivero-Baleine, and L. Zhang, “Demonstration of a Nearly Ideal Wavelength-Selective Optical Mirror using a Metamaterial-Enabled Dielectric Coating,” Applied Physics Letters, 102(17), pp. 171114 (2013).

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opaque column names and mixed continuous and discrete-valued data fields,” ACM Transactions on Database Systems, vol. 38, pages 1-34, April 2013

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**Z. Liu** (editor), “Ultrafast Imaging and Spectroscopy” (Proceedings of SPIE), SPIE Press, Release date October 30, 2013

**R. Mittra**, Computational Electromagnetics--Recent Advances and Engineering Applications, (Ed.), Springer, July 2013.

**K. Uchino**, "Photostrictive Microactuators", Chapter 5 of "Optical Nano and Micro Actuator Technology" Edited by George K. Knopf and Yukitoshi Otani, CRC Press, Boca Raton, FL (2013).

**K. Uchino**, "Introduction to the ATILA Finite Element Method (FEM) Software" and "Loss Integration in ATILA Software", Chapter 1 and Chapter 3 of "Applications of ATILA FEM Software to Smart Materials", Edited by Kenji Uchino and Jean-Claude Debus, Woodhead Publishing, Cambridge, UK (2013).

**D.H. Werner**, and D.-H. Kwon, Editors, Transformation Electromagnetics and Metamaterials: Fundamental Principles and Applications, 2014, Springer, 499 pages with 149 color figures.

X. Wang, **D. H. Werner**, J. P. Turpin, and P. L. Werner "Efficient Hybrid Algorithms for Characterizing 3-D Doubly Periodic Structures, Finite Periodic Microstrip Patch Arrays, and Aperiodic Tilings," Chapter in Computational Electromagnetics: Recent Advances and Engineering Applications, editted by Raj Mittra, Springer, pp 445-486, 2013.

**D. H. Werner**, J. A. Bossard, Z. Bayraktar, Z. H. Zhang, M. D. Gregory, and P. L. Werner, "Nature Inspired Optimization Techniques for Metamaterial Design," Chapter in Numerical Methods for Metamaterial Design, edited by Kenneth Diest, Springer, pp 97-146, 2013.

D.-H. Kwon, Q. Wu, and **D. H. Werner**, "Transformation Electromagnetics for Cloaking, Lensing, and Radiation Applications," Chapter in Transformation Electromagnetics and Metamaterials: Fundamental Principles and Applications, Springer, pp. 33-81, 2014.

**D. H. Werner**, Z. H. Jiang, J. P. Turpin, Q. Wu, and M. D. Gregory, "Transformation Electromagnetics Inspired Lens Designs and Associated Metamaterial Implementations for Highly Directive Radiation," Chapter in Transformation Electromagnetics and Metamaterials: Fundamental Principles and Applications, Springer, pp. 221-261, 2014.

1. **Papers Presented at Technical and Professional Meetings**

***Listed by author, title, meeting, location, and date***

**Y. Lu, E. E. Clothiaux, K. Aydin, and J. Verlinde, “Estimating Radar Backscattering Cross Sections of Ice Crystals at Millimeter Wavelengths Using a Modified Rayleigh-Gans Theory,” 36th  Conf. On Radar Meteorology, Breckenridge, CO, paper 14 A.7, 16-20 September 2013.**

**K. Aydin, Y. Lu, G. Botta, E. Clothiaux, and J. Verlinde, “Modeling Ice Crystals and Aggregates and their Radar Scattering Characteristics,” USNC-URSI National Radio Science Meeting, Boulder, CO, January 9-13, 2013.**

**Y. Lu, E. Clothiaux, K. Aydin, G. Botta, and J. Verlinde, “Exploring Variability of Radar Backscattering Cross Sections of Dendrites,” USNC-URSI National Radio Science Meeting, Boulder, CO, January 9-13, 2013.**

Mohamed Khalil, **James K. Breakall**, Glenn Minko, Paul Parsons, Kate J Duncan, “Simulation and Experimental Results for a Planar Strip Dipole over PEC and Ferrite Nanoparticle Composite Ground Planes,” 2013 IEEE International Symposium on Antennas and Propagation and CNC/USNC/URSI National Radio Science Meeting, Orlando, FL July 2013.

Kate J Duncan, **James K Breakall**, Rex Hall, Gary Katulka, “Screen Printed Dipole Antenna for Army Textile Platforms,” IEEE International Symposium on Antennas and Propagation and CNC/USNC/URSI National Radio Science Meeting, Orlando, FL July, 2013.

Mohamed Khalil, **James K Breakall**, Kate J Duncan, Glenn Minko, “Simulation and Experimental Results for a Planar Strip Dipole Over PEC and Ferrite-Metmaterial Ground Planes," 2013 USNC-URSI National Radio Science Meeting, Boulder, Colorado, January 9-12, 2013.

**James Breakall**, Dinesh Agrawal, Tania Slawecki, “Materials Processing in E and H Fields at Microwave Frequencies,” 2013 Materials in Extreme Environments Conference, Towson, MD, December 10-11, 2013, Invited

**James Breakall**, Dinesh Agrawal, Tania Slawecki, “Burning Water with High Power High Frequency (HF) Energy,” 2013 Materials in Extreme Environments Conference, Towson, MD, December 10-11, 2013, Invited

**James K. Breakall,** “The New Arecibo HF Facility Dual Array Cassegrain Antenna,” 50th Anniversary of Arecibo Observatory, Arecibo, PR October-November, 2013 Invited

Daniel Park and **John F. Doherty**, "A Track-Before-Detect Method with Motion Model," IEEE Underwater Acoustic Signal Processing Workshop, West Greenwich, Rhode Island, October 13-16, 2013

H. Qian, **N. C. Giebink** “Organic microlasers with azimuthally polarized vortex beam emission,” MRS Fall Meeting, Boston, MA, December 2013

Y. Yan, **N. C. Giebink** “Passive PT symmetry in organic composite films via complex index modulation,” MRS Fall Meeting, Boston, MA. December 2013

J. Price, **N. C. Giebink**, “Wide angle planar microtracking for high efficiency microcell concentrating photovoltaics” OSA Optics & Photonics Congress: Renewable Energy and the Environment, Tuscon, AZ November 2013

T. Kim, **N. C. Giebink**, “Exploring theoretical predictions of the organic solar cell ideal diode equation,” Electronic Materials Conference, University of Notre Dame, Southbend, IN. June 2013

**N. C. Giebink**, “Concentrating sunlight without tracking the Sun,” AVS meeting - Florida chapter, Orlando, FL. March 2013. Invited

R. Dhanker and **N. C. Giebink,** “Plasmonic photoinjection spectroscopy: Unraveling charge carrier injection in organic electronic devices,” Electrochemical Society Meeting, Toronto, Canada. May. 2013 Invited

**N. C. Giebink**, “The intersection of photonics and nonimaging optics in luminescent solar concentration” SPIE, San Diego, CA. Aug. 2013 Invited

**N. C. Giebink**, “Plasmonic photoinjection spectroscopy: Unraveling charge carrier injection and transport in organic light emitting diodes” SPIE, San Diego, CA. August 2013 Invited

**N. C. Giebink**, “Luminescent manipulation of sunlight for photovoltaics and biofuels,” OSA Optics & Photonics Congress: Renewable Energy and the Environment, Tuscon, AZ. November 2013 Invited

**N. C. Giebink**, “Complex index modulation and orbital angular momentum in organic microlasers,” MRS Fall Meeting, Boston, MA. December 2013 Invited

**N. C. Giebink,** “Luminescent manipulation of sunlight for photovoltaics and biofuels,” MRS Fall Meeting, Boston, MA. December 2013 Invited

Xiaonan Zang and **William E. Higgins**, "3D Segmentation and Reconstruction of Endobronchial Ultrasound,'' oral presentation, SPIE Medical Imaging 2013: Ultrasonic Imaging,Tomography, and Therapy, Orlando, FL, 9-14 February 2013.

Rahul Khare, Rebecca Bascom, and **William E. Higgins,** "Technician-free system for image-guided bronchoscopy,'' oral presentation, SPIE Medical Imaging 2013: Image-Guided Procedures, Robotic Interventions, and Modeling, Orlando, FL, 9-14 February 2013.

Ronnarit Cheirsilp and **William E. Higgins**, "Multimodal 3D PET/CT System for Bronchoscopic Procedure Planning,'' poster presentation, SPIE Medical Imaging 2013: Computer-Aided Diagnosis, Orlando, FL, 9-14 February 2013.

H. Shen, Y. Yuwen, X. Wang, J. I. Ramirez, Y. V. Li, K. Yue, C. E. Kendrick, N. J. Podraza, **T. N. Jackson**, E. C. Dickey, T. S. Mayer, and J. M. Redwing, "Effect of c-Si Doping Density on Heterojunction with Intrinsic Thin Layer (HIT) Radial Junction Solar Cells," 2013 IEEE 39th Photovoltaic Specialists Conference (PVSC), pp. 2466-9 (2013).

Y. V. Li, K. G. Sun, J. I. Ramirez, and **T. N. Jackson**, "Tri-Layer PEALD ZnO Thin Film Transistors and Circuits," 2103 71st Device Research Conference Technical Digest, pp. 167-8, June 2013.

J. I. Ramirez, Y. V. Li, H. A. Basantani, and **T. N. Jackson**, "Effects of Gamma-Ray Irradiation and Electrical Stress on ZnO Thin Film Transistors," 2103 71st Device Research Conference Technical Digest, pp. 171-2, June 2013.

Y.-C. Liu, Y. V. Li, and **T. N. Jackson**, "Contact Barriers and Traps in PEALD ZnO TFTs," 2013 Electronic Materials Conference Digest, paper M3, p. 44, June 2013.

Y. V. Li, J. I. Ramirez, and **T. N. Jackson**, "Al Doped ZnO by Atomic Layer Deposition with Plasma Etch Back," 2013 Electronic Materials Conference Digest, paper V2, p. 72, June 2013.

M.-Y. Lee, E. Dorjpalam, S. Trolier-McKinstry, and **T. N. Jackson**, "Spin Spray ZnO Thin Films," 2013 Electronic Materials Conference Digest, paper V3, p. 72, June 2013.

K. Montgomery, Q. Nian, X. Zhao, H. U. Li, G. J. Cheng, **T. N. Jackson**, and J. M. Woodall, "Revisiting ZnO/InP Heterojunction Solar Cells," 2013 Electronic Materials Conference Digest, paper X10, p. 76, June 2013.

J. I. Ramirez, M. Wallace, Y. V. Li, S. Trolier-McKinstry, and **T. N. Jackson**, "Integration of ZnO Thin Film Transistors with PZT Capacitors," 2013 Electronic Materials Conference Digest, paper EE5, p. 88, June 2013.

H. A. Basantani, D. B. St. John, M. W. Horn, **T. N. Jackson**, and H.-B. Shin, "Vertically Integrated High Resistivity, Hight TCR a-Ge:H and VOx Thin-Films for Uncooled IR Microbolometers," 2013 Electronic Materials Conference Digest, paper EE2, p. 87, June 2013.

K. G. Sun, Y. V. Li, D. B. St. John, and **T. N. Jackson**, "pH-based Selective Etching of Al2O3 over ZnO," 2013 Electronic Materials Conference Digest, paper FF2, p. 89, June 2013.

H. H. R. Fok and **T. N. Jackson**, "Self-Aligned Patterning of SU-8 by a Non-Etch-Based Process," 2013 Electronic Materials Conference Digest, paper FF3, p. 89, June 2013.

H. U. Li, and **T. N. Jackson**, "Substrate Surface Energy Dependence of Parylene Chemical Vapor Deposition," 2013 Electronic Materials Conference Digest, paper FF4, p. 90, June 2013.

Y. Jin, H. A. Basantani, A. Ozcelik, **T. N. Jackson**, and M. W. Horn, "High Resistivity and High TCR Vanadium Oxide Thin Films for Infrared Imaging Prepared by Bias Target Ion Beam Deposition," Proceedings of SPIE, 8704, p 87043C, 2013.

H. A. Basantani, H.-B. Shin, **T. N. Jackson**, and M. W. Horn, "Vertically Integrated Pixel Microbolometer for IR Imaging Using High Resistivity VOx," Proceedings of SPIE, 8704, p 87041A, 2013.

**T. N. Jackson**, "PEALD ZnO TFTs for Large Area and Flexible Applications," 2013 Materials Research Society Fall Meeting, Symposium M, December 2013. Invited talk.

J. I. Ramirez, Y. V. Li, H. A. Basantani, and **T. N. Jackson**, "ZnO Thin Film Transistors for Extreme Environment Applications," 2013 International Semiconductor Research Symposium Technical Digest, paper WP2-04, December 2013.

K. G. Sun, Y. V. Li, J. I. Ramirez, and **T. N. Jackson**, "Double-Gate Tri-Layer PEALD ZnO TFTs," 2013 International Semiconductor Research Symposium Technical Digest, paper TP6-03, December 2013.

**M. Kavehrad**, "Optical wireless applications: A solution to ease the wireless airwaves spectrum

crunch," Invited paper - SPIE Photonics West, San Francisco, CA, February 2 - 7, 2013.

W. Zhang, **M. Kavehrad**, "Comparison of VLC-based indoor positioning techniques," SPIE

Photonics West, San Francisco, CA, February 2 - 7, 2013.

A. Ranjha and **M. Kavehrad**, "Precoding techniques for PAPR reduction in asymmetrically

clipped OFDM Based Optical Wireless Systems," SPIE Photonics West, San Francisco, CA,

February 2 - 7, 2013

**I. C. Khoo**, “Nonlinear Optics of Blue Phase Liquid Crystals,” Symposium on Liquid Crystals Photonics 2013, Chengdu, China April 20 - 25, 2013. Invited Plenary speaker

**I. C. Khoo**, “Liquid Crystals Nonlinear Photonics,” Invited speaker in Novel Optical Materials and Applications, Cetraro, Italy June 9-15, 2013

**I. C. Khoo**, “Nonlinear Optics with Blue Phase Liquid Crystals,” International Symposium on Modern Optics and Its Applications, Bandung, Indonesia June 24-27, 2013

**I. C. Khoo**, “Liquid Crystals Photonics,” Joint Colloquium - Electrical Engineering and Physics Departments, Distinguished Lecturer Series, University of Malaya, Kuala Lumpur, Malaysia June 21, 2013

Shuo Zhao, K. L. Hong and **I. C. Khoo**, “Ultrafast optical nonlinearities of liquid crystals for all-optical switching” SPIE Liquid Crystals Conference XVI1, San Diego, 8/2013

G. Pawlik, W. Walasik, K. Tarnowski, A. Mitus and **I. C. Khoo**, “Negative refraction for TM polarization in nanosphere dispersed liquid crystal (NDLC) metamaterial” SPIE Liquid Crystals Conference XVI1, San Diego, 8/2013

J. Ptasinski, S. W. Kim, L. Pang, **I. C. Khoo**, and Y. Fainman, “Active electrical and optical tuning of silicon photonic devices with liquid crystals,” SPIE Liquid Crystals Conference XVI1, San Diego, 8/2013

Y. Gu, R. Luo, Q. Gong, and **I. C. Khoo**, “Mode recombination and surface plasmons modes transformation in anisotropic mediums” SPIE Liquid Crystals Conference XVI1, San Diego, 8/2013.

**I. C. Khoo**, “Nonlinear Optics of Liquid Crystals Visible - THz - and Beyond” Progress In Electromagnetics Research Symposium PIERS 2013, Stockholm, Sweden, 12-15 August, 2013 Keynote Presentation

**I. C. Khoo**, C,-W. Chen, K. L. Hong, T.H. Lin, and Shuo Zhao, “Nonlinear Optics of Nematic and Blue Phase Liquid Crystals,” Invited paper in Optics of Liquid Crystals Conference, Hawaii, 9/29-10/4, 2013

**I. C. Khoo**, “Blue-Phase Liquid Crystals for Multifunctional All-Optical Photonics,” Invited Paper in 2nd International Workshop on Nano and Bio-Photonics (IWNBP2013), Biarritz, France Nov. 3-8, 2013

G. Pawlik, W. Walasik, K. Tarnowski, A. C. Mitus, **I. C. Khoo**, “k-vector angular correlations in negative refraction for TM polarization in nanosphere dispersed liquid crystal (NDLC) metamaterial,” Conference on Optics and Photonics for Counterterrorism, Crime Fighting and Defence IX; and Optical Materials and Biomaterials in Security and Defence Systems Technology X, Dresden, Germany September 23-25 (2013)

A.. Jasour, **C. Lagoa**, "Convex Relaxations of a Probabilistically Robust Control Design Problem," Proceeding of the 2013 IEEE Conference on Decision and Control, 2013.

E. Laftchiev, C. **Lagoa, Constantino**, S. Brennan, “Robust Map Design by Outlier Point Selection for Terrain-Based Vehicle Localization,” Proceeding of the 2013 IEEE Conference on Decision and Control, 2013

K. Bekiroglu, **C. Lagoa**, S. Murphy, Suzan A., S. Lanza, “A Robust MPC Approach to the Design of Treatments,” Proceeding of the 2013 IEEE Conference on Decision and Control, 2013

B. Yilmaz, **C. Lagoa** and M. Sznaier, “An Efficient Atomic Norm Minimization Approach to Identification of Low Order Models,” Proceeding of the 2013 IEEE Conference on Decision and Control, 2013

F. Xiong, Y. Cheng, O. Camps, M. Sznaier, **C. Lagoa**, “Hankel Based Maximum Margin Classifiers: A Connection between Machine Learning and Wiener Systems Identification,” Proceeding of the 2013 IEEE Conference on Decision and Control, 2013

Bekiroglu, K.; Sznaier, M.; **Lagoa, C.**; Shafai, B., "Vision based control of an autonomous blimp with actuator saturation using pulse-width modulation," Control Applications (CCA), 2013 IEEE International Conference on , vol., no., pp.1036,1041, 28-30 Aug. 2013

B.Yang, K. Shi, M. Zhou, D. Ma, V. Gopalan, S. Yin, S. Zheng, and **Z. Liu**, "Parallel axial imaging in scanning microscopy," SPIE Photonics and Optics, San Diego, CA, August 2013

C. Yang, K. Shi, M. Zhou, S. Zheng, S. Yin, **Z. Liu**, "Z-microscopy for parallel axial imaging with micro mirror array," SPIE Photonics West, San Francisco, Feb. 2013

N. Mehta, J. Chen, Z. Zhang, and **Z. Liu**, "CMOS: Compressive Multi-heterodyne Optical Spectroscopy," SPIE Photonics West, San Francisco, Feb. 2013

N. Mehta, J. Chen, Z. Zhang, and **Z. Liu**, "CMOS: Compressive Multi-heterodyne Optical Spectroscopy," SPIE Photonics and Optics, San Diego, CA, August 2013.

**Z. Liu**, C. Yang, N. Mehta, H. Li, D. Ma, C. Zhang, and Y. Xu "Nonlinear nanoprobe and nanomanipulator," Novel Optical Materials and Applications (11th Mediterranean Workshop and Topical Meeting), Cetraro, Italy, June 2013 Invited

P. S. Edwards, C. T. Janisch, B. Peng, L. Yang and **Z. Liu**, "Cavity Enhanced Raman Spectroscopy," SPIE Photonics West, Laser Resonators, Microresonators and Beam Control XV, LASE, San Francisco, CA, February 2013

P. S. Edwards, C. Janisch, B. Peng, L. Yang, and **Z. Liu**, "Raman spectroscopic sensing using whispering gallery microresonators," SPIE Photonics and Optics, San Diego, CA, August 2013

**Z. Liu**, "CARS holography," IEEE Photonics Conference, Seattle, WA, September 2013. Invited

Zhu, Q., **J. D. Mathews**, and R. Volz, “Radar interferometric imaging using Compressed Sensing for point targets,” CEDAR, Boulder CO, 22-24 June 2013.

Gao, B., and **J. D. Mathews**, “Phase and amplitude calibration of the Jicamarca radar using satellites,” CEDAR Workshop, Boulder CO, 22-24 June 2013.

**Mathews, J. D**., “From Appleton to Arecibo and Beyond,” Arecibo Observatory 50th Anniversary Scientific Symposium, Arecibo Obervatory, Puerto Rico, 27-30 October 2013. Invited

**J. D. Mathews**, B. Gao, **J. Urbina**, and F. Galindo, “High-altitude meteors and meteoroid fragmentation observed at Jicamarca,” National Radio Science Meeting, Boulder CO, 9-12 January 2013.

Q. Zhu, and **J. D. Mathews**, “Radar interferometric imaging using the maximum entropy method for the case of point targets,” National Radio Science Meeting, Boulder CO, 9-12 January 2013.

B. Gao, **J. D. Mathews**, and J. L. Chau, “Phase and pattern calibration of the Jicamarca radar using satellites,” National Radio Science Meeting, Boulder CO, 9-12 January 2013.

Faryad, M., L. Liu, **T. S. Mayer**, and A. Lakhtakia, "Optical and Electrical Modeling of an Amorphous Silicon Tandem Solar Cell with Nonhomogeneous Intrinsic Layers and a Periodically Corrugated Back Reflector," SPIE Conference on Thin Film Solar Technology V in San Diego, CA, August 2013.

**Mayer, T. S.**, "Adding New Capabilities to Silicon CMOS Integrated Circuits via Deterministic Programmed Assembly," Tech Connect 2013, National Harbor, MD, May 2013. Invited

Li, J., S. Levin, D. Deng, X. Zhong, M. Li, T. Morrow, D. Sun, R. E. Schaak, **S. Datta**, C. D. Keating, and **T. S. Mayer**, "Field-Assisted Directed Assembly of Nanowire and 2D Crystal Materials," ISANN, Kauai, HI, December 2013. Invited

**T. S. Mayer**, "Deterministic Programmed Assembly of Nanomaterials," CMOS Emerging Technologies, Whistler, BC, Canada, July 2013. Invited

He, **Kesidis, Miller**; Latent interest group discovery; GENI Conference, Brooklyn, NY; October 2013;

**Raj Mittra**, Ravi Kumar Arya, Chiara Pelletti, Tianyu Dong, “Efficient and accurate analysis of arbitrary metamaterials with three-dimensional crystal elements,” International Conference on Metamaterials(Meta), Sharjah, UAE, 2013.

**Raj Mittra**, Yuda Zhou, “Real-World Design of Thin Absorbers for RCS Reduction of Arbitrarily Shaped Radar Targets Over A Wide Band and for Arbitrary Incident Angles and Polarization Using the Concepts of Transformation Optics,” European Conference on Antennas and Propagation (EUCAP), Gothenburg, Sweden, 2013.

**R. Mittra**, C. Pelletti, R. K. Arya, T. Dong, G. Bianconi, “A General-Purpose Simulator for Metamaterials with Three-Dimensional Elements,” URSI International Symposium on Electromagnetic Theory(EMTS), Hiroshima, Japan, 2013. Invited

Xiang Gu, Chiara Pelletti, **Raj Mittra**, Yunhua Zhang, “Signal Processing Approach to Electromagnetic Sub-wavelength Imaging,” IEEE AP-S/USNC-URSI Symposium, Orlando, USA, 2013.

Yingsong Li, Wenxing Li, **Raj Mittra**, William Whittow, “Design of Compact Antenna Deigns for WLAN/WiMAX Bands and for Dual Band-notched UWB Applications,” Progress In Electromagnetics Research Symposium (PIERS), Stockholm, Sweden, 2013.

U. Srinivas, H. S. Mousavi, C. Jeon, **V. Monga**, A. Hattel, and B. Jayarao, “SHIRC: A Simultaneous sparsity model for Histopathological Image Representation and Classification,” in Proc. IEEE International Symposium on Biomedical Imaging, San Francisco, CA, April 7th -11th, 2013.

B. Kang, **V. Monga** and M. Rangaswamy, "On the practical merits of the rank constrained ML estimator", Proc. IEEE Radar Conference, Ottawa, Canada, Apr 29th -May 3rd, 2013.

Y. Suo, M. Dao, T. D. Tran, U. Srinivas, and **V. Monga**, “Hierarchical sparse modeling using spike and slab priors,” Proc. IEEE International Conference on Acoustics, Speech and Signal Processing, Vancouver, Canada, May 2013.

U. Srinivas, N. M. Nasrabadi, and **V. Monga**,”Graph-based multi sensor fusion for acoustic signal classification,” Proc. IEEE International Conference on Acoustics, Speech and Signal Processing, Vancouver, Canada, May 2013.

U. Srinivas, Y. Suo, M. Dao, **V. Monga**, and T. D. Tran, “Structured sparse priors for image classification,” Proc. IEEE International Conference on Image Processing, Melbourne, Australia, Sep 16th-18th, 2013.

B. Kang, **V. Monga**, and M. Rangaswamy, “EASTR: Efficient Approximation of Structured covariance under joint Toeplitz and Rank constraints,” Proc. IEEE Asilomar Conference on Signals, Systems and Computers, Pacific Grove, November 2013.

B. Kang, **V. Monga**, and M. Rangaswamy, "Constrained ML estimation of structured covariance matrices with applications in radar STAP," IEEE 5th International Workshop on Computational Advances in Multi-Sensor Adaptive Processing (CAMSAP), 2013, pp.101-104, 15-18 December 2013

K.A. Gallagher and **R.M. Narayanan**, "Human Detection and Ranging at Long Range and Through Light Foliage using a W-Band Noise Radar with an Embedded Tone," Proc. SPIE Conference on Radar Sensor Technology XVII, Baltimore, MD, Vol. 8714, pp. 871402-1-871402-12, April 2013, (Primary Presenter).

S. Smith and **R.M. Narayanan**, "Ranging and Target Detection Performance Through Lossy Media using an Ultrawideband S-Band Through-Wall Sensing Noise Radar," Proc. SPIE Conference on Radar Sensor Technology XVII, Baltimore, MD, Vol. 8714, pp. 871408-1-871408-12, April 2013, (Primary Presenter).

B.R. Phelan, M.A. Ressler, G.J. Mazzaro, K.D. Sherbondy, and **R.M. Narayanan**, "Design of Spectrally Versatile Forward-Looking Ground-Penetrating Radar for Detection of Concealed Targets," Proc. SPIE Conference on Radar Sensor Technology XVII, Baltimore, MD, Vol. 8714, pp. 87140B-1-87140B-10, April 2013, (Primary Presenter).

T.D. Bufler, **R.M. Narayanan**, T. Dogaru, and E.H. Lenzing, "Spectral Characteristics of Human and Indoor Clutter for Through the Wall Sensing," Proc. SPIE Conference on Radar Sensor Technology XVII, Baltimore, MD, Vol. 8714, pp. 87140M-1-87140M-11, April 2013, doi: 10.1117/12.2016649 (Primary Presenter).

 H.J. Shin, **R.M. Narayanan**, and M. Rangaswamy, "Tomographic Imaging with Ultra-wideband Noise Radar using Time-domain Data," Proc. SPIE Conference on Radar Sensor Technology XVII, Baltimore, MD, Vol. 8714, pp. 87140R-1-87140R-9, April 2013, (Primary Presenter).

M.C. Shastry, **R.M. Narayanan**, and M. Rangaswamy, "Characterizing Detection Thresholds Using Extreme Value Theory in Compressive Noise Radar Imaging," Proc. SPIE Conference on Compressive Sensing II, Baltimore, MD, Vol. 8717, pp. 87170B-1-87170B-9, April 2013, (Primary Presenter).

D.P. Fairchild and **R.M. Narayanan**, "Micro-Doppler Radar Classification of Human Motions under Various Training Scenarios," Proc. SPIE Conference on Active and Passive Signatures IV, Baltimore, MD, Vol. 8734, pp. 873407-1-873407-11, April 2013, (Primary Presenter).

**R.M. Narayanan** and N.S. McCoy, "Delayed and Summed Adaptive Noise Waveforms for Target Matched Radar Detection," Proc. 22nd International Conference on Noise and Fluctuations (ICNF 2013), Montpellier, France, 4 pages, June 2013, (Primary Presenter).

**R.M. Narayanan**, "Technical Considerations in Medical Radar," Proc. 8th International Conference on Body Area Networks: Workshop on Perspectives and Future Trends for Body Area Networks (PFT-BAN), Boston, MA, pp. 526-535, September-October 2013 (Primary Presenter).

**R.M. Narayanan**, "Radar Systems for Homeland Security Applications," Proc. International Radar Symposium India (IRSI-13), Bangalore, India, December 2013 (Invited Tutorial Presentation)

**R.M. Narayanan**, "Radar Systems for Homeland Security," Proc. International Radar Symposium India (IRSI-13), Bangalore, India, December 2013 (Invited Plenary Paper)

Celestin, S., W. Xu, and **V. P. Pasko**, “Spectra of X-ray and gamma-ray bursts produced by stepping lightning leaders,” Geophysical Research Abstracts, Vol. 15, EGU2013-13065, EGU General Assembly, Vienna, Austria, 7-12 April 2013.

Celestin, S. J., W. Xu, and **V. P. Pasko**, “Dependence of the Number of Counts in Terrestrial Gamma-ray Flashes on the Source-to-satellite Radial Distance,” Abstract AE23A-0402 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December 2013.

da Silva, C. L., and **V. P. Pasko**, “Model of streamer-to-leader transition in the Earth’s atmosphere,” CEDAR MLT Poster Session Booklet, p. 26, Abstract STRT-01, Boulder, Colorado, June 26, 2013.

da Silva, C. L., and **V. P. Pasko**, “On the Vertical Structuring of Gigantic Jets,” Abstract AE33A-0320 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December 2013.

Qin, J. Q., S. Celestin, and **V. P. Pasko**, “Minimum charge moment change in positive and negative cloud to ground lightning discharges producing sprites,” USNC-URSI National Radio Science Meeting, Boulder, CO, Abstract GHE1-5, January 9-12, 2013.

Qin, J. Q., S. Celestin, and **V. P. Pasko**, “Low frequency electromagnetic radiation from sprite streamers,” USNC-URSI National Radio Science Meeting, Boulder, CO, Abstract GHE1-6, January 9-12, 2013.

Qin, J. Q., S. Celestin, **V. P. Pasko**, S. A. Cummer, M. G. McHarg, and H. C. Stenbaek-Nielsen, “Mechanism of column and carrot sprites derived from optical and radio observations,” CEDAR MLT Poster Session Booklet, p. 29, Abstract STRT-06, Boulder, Colorado, June 26, 2013.

Qin, J., S. J. Celestin, **V. P. Pasko**, S. A. Cummer, M. G. McHarg, and H. C. Stenbaek-Nielsen, “Mechanism of Column and Carrot Sprites Derived from Optical and Radio Observations,” Abstract AE32A-06 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December 2013.

Qin, J. Q., S. Celestin, and **V. P. Pasko**, “Low Frequency Radio Signals from Sprite Streamers,” Abstract AE33A-0322 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December 2013.

Mallios, S. A., S. Celestin, and **V. P. Pasko**, “Production of very high potential in intra-cloud lightning in connection with terrestrial gamma ray flashes,” USNC-URSI National Radio Science Meeting, Boulder, CO, Abstract GHE1-3, January 9-12, 2013.

Mallios, S. A., and **V. P. Pasko**, “Time-dependent model of the global electric circuit,” CEDAR MLT Poster Session Booklet, p. 1, Abstract COUP-02, Boulder, Colorado, June 26, 2013.

Mallios, S. A., and **V. P. Pasko**, “Time-Dependent Model of the Global Electric Circuit,” Abstract AE23B-0422 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December 2013.

**Pasko, V. P**., “Earthquake lights: Time-dependent Earth surface - ionosphere coupling model,” USNC-URSI National Radio Science Meeting, Boulder, CO, Abstract GHE2-2, January 9-12, 2013. Presenter

**Pasko, V. P**., “Earthquake lights: Time-dependent Earth surface - ionosphere coupling model,” CEDAR MLT Poster Session Booklet, p. 28, Abstract STRT-05, Boulder, Colorado, June 26, 2013. Presenter

**Pasko, V. P**., “Electrostatic Interpretation of Electric Fields Observed at Close Range from Intra-Cloud Stepped Leader and Mechanisms of Terrestrial Gamma Ray Flashes,” Abstract AE21A-03 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December 2013. (Presenter)

Pachter, J., J. Q. Qin, and **V. P. Pasko**, “Investigation of long-delayed sprite inception mechanism and the pole of electron detachment,” CEDAR MLT Poster Session Booklet, p. 28, Abstract STRT-04, Boulder, Colorado, June 26, 2013.

Xu, W., S. Celestin, and **V. P. Pasko**, “Monte Carlo simulation of neutron generation by lightning leaders,” USNC-URSI National Radio Science Meeting, Boulder, CO, Abstract GHE2-8, January 9-12, 2013.

Xu, W., S. Celestin and **V. P. Pasko**, “Monte Carlo simulation of X-ray emissions produced by stepping lightning leaders,” CEDAR MLT Poster Session Booklet, p. 30, Abstract STRT-08, Boulder, Colorado, June 26, 2013.

Xu, W., S. J. Celestin, and **V. P. Pasko**, “Optical Emissions Associated with Terrestrial Gamma-ray Flashes,” Abstract AE21A-04 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 December 2013.

Mallios S. A., and **V. P. Pasko**, “Time-dependent modeling of global electric circuit processes,” FESD Team Meeting, Boulder, CO, February 28, 2013.

Mallios, S. A., W. Deierling, C. Kalb, D. Mach, and **V. P. Pasko**, “Role of different types of lightning, flash rates, and conductivity on Wilson currents above thunderstorms, based on measurements,” FESD Team Meeting, Boulder, CO, July 1, 2013.

Mallios, S. A., and **V. P. Pasko**, “Single dipole configurations for different kinds of storms,” FESD Team Meeting, Boulder, CO, July 1, 2013.

Pachter, J., S. A. Mallios, A. Baumgaertner, and **V. P. Pasko**, “Development of efficient reference conductivity model for GEC calculations,” FESD Team Meeting, Boulder, CO, July 1, 2013.

**Pasko, V. P.**, “Time-dependent Earth surface-ionosphere coupling model: Application to earthquake lights and global electric circuit,” FESD Team Meeting, Boulder, CO, February 28, 2013.

**Pasko, V. P**., “Static model of global electric circuit in cylindrical and Cartesian geometries: Discussion of source currents and boundary conditions,” FESD Team Meeting, Boulder, CO, February 28, 2013.

da Silva, C. L., and **V. P. Pasko**, “Vertical structuring of gigantic jets, Presented at Lightning Effects in the Middle and Upper Atmosphere Workshop” 2013 CEDAR Meeting, Boulder, Colorado, June 26, 2013.

Chao, J-H., A. Kshirsagar, and **J. Ruzyllo**, "Surface Processing for Area Selective Mist Deposition of Nanocrystalline Quantum Dot Films", Intern. Symposium on Semiconductor Cleaning Science and Technol. 13, ECS Meeting, Sn Francisco, CA, October 27-29, 2013.

**Ruzyllo, J.,** "Considerations of Ethical Implications in Engineering Curriculum". Intern. Conf. on Eng. Education", Cracow, Poland, June 10, 2013. Invited

**Srinivas Tadigadapa**, DARPA Glass Etching Project Review Presentation, Denver, CO, April, 2013

Ryan Supino, Grant Lodden, **Srinivas Tadigadapa**, DARPA PASCAL Project Review Presentation, Denver, CO, April, 2013

Ryan Supino, Grant Lodden, **Srinivas Tadigadapa**, DARPA PASCAL Project Review Presentation, New Orleans, LA, November, 2013

Hwall Min, Gokhan Hatipoglu, **Srinivas Tadigadapa**, “Designing Chemically Selective Microsensor Arrays using Ionic Liquid doped Ionomers,” IEEE Sensors Conference, Baltimore, MD, 2013.

David Gaddes, Son Vu Hoang Lai, **Srinivas Tadigadapa**, “An Automated Miniaturized Creatinine Sensing System,” IEEE Sensors Conference, Baltimore, MD, 2013.

Ventkata Sharat Parimi, **Srinivas Tadigadapa**, Richard A. Yetter, “A Parametric Study Of Reactive Wave Propagation In Nanoporous Silicon Energetic Composites,” Eastern States section of the Combustion Institute, Fall Meeting, Clemson University, SC, 2013.

Hwall Min, Gokhan Hatipoglu, **Srinivas Tadigadapa**, “Ionomer Functionalized Gravimetric Gas Sensing Applications,” Nanomechanical Sensing Workshop, Stanford University, CA, May 2013.

David E Gaddes III, Jessica L Westland, Frank L Dorman and **Srinivas Tadigadapa**, “Novel Format Chromatographic Columns For Improved Overall Analytical Performance,” 17th International Conference on Solid State Transducers, Barcelona, Spain, June 2013.

**Uchino, K.,** "Politico-Engineering", Global Penn State 2013 Conference, University Park, PA, September 27-28, 2013.

**Uchino, K.**, "Politico-Engineering", International Conference on Advanced Electromaterials (ICAE2013), Jeju Island, Korea, November 12 – 15, 2013.

**Uchino, K.,** "Piezoelectricity and Magnetostriction", Daegu Gyeongbuk Institute of Science and Technology (DGIST) Special Seminar, Daegu, Korea, November 11, 2013.

**Uchino, K.,** "Piezoelectric Actuator Renaissance", International Conference on Traditional and Advanced Ceramics (ICTA2013), Bangkok, Thailand, September 11-13, 2013.

**Uchino, K.,** "Piezoelectric Actuator Renaissance", IEEE UFFC/ISAF Symposium, Prague, Czech Republic, July 21-25, 2013.

**Uchino, K.,** "Politico-Engineering", International Symposium on Inorganic and Environmental Materials 2013 (ISIEM 2013), Rennes, France, October 27 – 31, 2013.

**Uchino, K.,** "Piezoelectric Actuator Renaissance", MRS-Japan Annual Meeting, Yokohama, Japan, December 9 -10, 2013.

**Uchino, K.,** "Politico-Engineering", International Conference on NanoElectronics and NanoDevices (ICNEND-13), Chennai, India, January 20, 2013.

**Uchino, K**., "Politico-Engineering", 5th Meeting of Promotion Center for Global Materials Research (PCGMR), National Cheng Kung University, Tainan, Taiwan, December 12-13, 2013.

**Uchino, K.,** "Politico-Engineering", Pennsylvania State University (PSU) & Sungkyunkwan University (SKKU) Research Collaboration Workshop, Seoul, Korea, June 19 – 22, 2013.

**Uchino, K.,** "Drive Techniques of Piezomotors", Pennsylvania State University (PSU) & Sungkyunkwan University (SKKU) Research Collaboration Workshop, Seoul, Korea, June 19 – 22, 2013.

**Uchino, K.** "Risk Management - Crisis Technology-", Keio University Grand Design Forum, Yokohama, Japan, November 23, 2013.

Gurdal, E. A., L. Zhang and **K. Uchino**, "Influence of Doping on Hardening in (Na0.5K0.5)NbO3-Based Lead-Free Piezoelectric Ceramics", 2013 U.S. NAVY Workshop on Acoustic Transduction Materials and Devices, State College, PA, May 7-9, 2013.

Gurdal, E. A., S. O. Ural, H. Y. Park, S. Nahm, T. Tou and **K. Uchino**, "Doping Effect on Hardening/Softening Mechanisms in (Na0.5K0.5)NbO3‐based Lead‐free Piezoelectric Ceramics", 66th ICAT/JTTAS Joint International Smart Actuator Symposium, State College, PA, October 1-2, 2013.

Shekhani, H., **K. Uchino**, "Thermal Conductivity in Piezoelectric Ceramics", ICAT 66th International Smart Actuator Symposium, State College, PA, October 1-2, 2013.

Shekhani, H., S. O. Ural, and **K. Uchino**, "Characterization of Heat Generation of Piezoelectric Materials In Resonance Conditions", 2013 International Workshop on Acoustic Transduction Materials and Devices, State College, PA, May 7-9, 2013.

T. Liu, E.A. Gurdal, H. Shekhani, and **K. Uchino**, "Stress Dependence of Losses in Piezoelectric Materials", 66th ICAT & JTTAS International Smart Actuator Symposium, State College, PA, Oct 1-2, 2013.

**K. Uchino**, "Piezoelectric Actuator Renaissance", 66th ICAT/JTTAS Joint International Smart Actuator Symposium, State College, PA, October 1-2, 2013.

**Uchino, K.** "Loss and Domain Dynamics in Ferroelectrics", 2013 International Workshop on Acoustic Transduction Materials and Devices, State College, PA, May 7-9, 2013.

**Mathews J. D.** , B. Gao, **J. Urbina,** and F. Galindo, “High-altitude Meteors and Meteoroid Fragmentation Observed at Jicamarca,” URSI 2013, Boulder, Colorado, January 9-12, 2013.

Bostan S. M., H. Torpi, and **J. V. Urbina**, “High Cross Polarized Ku-band OMT Design for SNG Vehicles,” URSI 2013, Boulder, Colorado, January 9-12, 2013.

**Urbina J.**, J. Fentzke, L. Dyrud, R. Seal, and A. Hackett, “Meteor Trail Observations Collected With The New Penn State Vhf Radar” URSI 2013, Boulder, Colorado, January 9-12, 2013.

Mills A. C., **J. V. Urbina**, G. Rajagopalan, S. A. Gonzalez, M. Sulzer, and **M. Wharton**, “A New UHF High Dynamic Range Receiver for the Arecibo Observatory,” URSI 2013, Boulder, Colorado, January 9-12, 2013.

Tuysuz B., **J. Urbina**, and F. D. Lind, “First Results from a Coherent-Scatter Atmospheric Passive Radar Imager (CAPRI) for Passive Radio Sensing of Equatorial Plasma Instabilities Near the Peruvian Andes,” URSI 2013, Boulder, Colorado, January 9-12, 2013.

Sorbello R. M., **J. Urbina**, and Z. Stephens, “First Steps Towards the Implementation of a Cognitive Radar to Study Plasma Instabilities Near the Peruvian Andes,” URSI 2013, Boulder, Colorado, January 9-12, 2013.

Galindo F., **J. Urbina**, L. Dyrud, and J. Fentzke, “Modeling the Effect of Turbulence on Specular Meteor Echoes,” URSI 2013, Boulder, Colorado, January 9-12, 2013.

Hackett A., **J. Urbina**, and **J. Mathews**, “Development of a Reconfigurable Ionosonde Receiver Using a Software-defined Radio Hardware Platform, Coupling, Energetics, and Dynamics of Atmospheric Regions,” Boulder, June 22-28, 2013.

Hackett A., **J. Urbina**, R. Seal, R. Sorbello, P. Reyes, E. Kudeki, amd S. Franke, “Development of an Advanced Digital Radar Network for Mid- latitude Ionospheric Studies, Coupling, Energetics, and Dynamics of Atmospheric Regions,” Boulder, June 22-28, 2013.

Sorbello R., K. Kuyeng, **J. Urbina**, and A. Hackett, “Initial Results of a Cognitive Radar System to Study Plasma Irregularities near the Peruvian Andes, Coupling, Energetics, and Dynamics of Atmospheric Regions,” Boulder, June 22-28, 2013.

Galindo F., **J. Urbina** , L. Dyrud , and J. Fentzke, “On the effect of turbulence on the evolution of underdense specular meteors, Coupling, Energetics, and Dynamics of Atmospheric Regions, Boulder, June 22-28, 2013.

E. Broker, J. Waynert, J. Li, N. W. Damiano, **D. H. Werner**, and P. L. Werner, "Modeling of Medium Frequency Propagation Experiments at the NIOSH Safety Research Coal Mine," Proceedings of the 2013 ACES Conference, Monterey, CA, USA, March 24-28, 2013

**D. H. Werner**, Z. H. Jiang, J. P. Turpin, C. P. Scarborough, M. D. Gregory, Q. Wu, and P. L. Werner, "Broadband Low-loss Metamaterial-enabled Antennas," the Seventh International Congress on Advanced Electromagnetic Materials in Microwaves and Optics, Bordeaux, France, September 16-19, 2013.

**D. H. Werner**, M. D. Gregory, P. J. Gorman, and P. L. Werner, "Design of Circularly Polarized Ultra-Wideband Aperiodic Antenna Arrays," Proceedings of the International Conference on Electromagnetics in Advanced Applications, Torino, Italy, Sept 9-13, 2013.

J. P. Turpin, D. Brocker, and **D. H. Werner**, "Optimization of Quasi-Conformal Transformation Optics Lenses with an Arbitrary GRIN-Capable Ray Tracer," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

J. A. Bossard, L. Lin, S. Yun, **D. H. Werner**, and **T. Mayer**, "Octave Bandwidth Absorbers for the Mid-IR Based on Electromagnetic Band-gap Surfaces," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

Z. Jiang, S. Yun, L. Lin, **D. H. Werner**, and **T. Mayer**, "A Dispersion Engineering Enabled Broadband Optical Metamaterial Filter," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

A. Panaretos, and **D. H. Werner**, "Analysis of a Plasmonic Core-Shell Particle Exhibiting High-Impedance and High-Admittance Characteristics," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

C. Scarborough, **D. H. Werner**, and D. E. Wolfe, "Miniaturized Tunable Metamaterial Antenna Design and Modeling in the Low UHF Band," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

J. P. Turpin, and **D. H. Werner**, "Semicircular Beam-Scanning Metamaterial Antenna with Magnetic Slot Feed," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, .July 7-13, 2013.

G. Oliveri, P. Rocca, M. Salucci, E. T. Bekele, **D. H. Werner**, and A. Massa, "Design and Synthesis of Innovative Metamaterial-Enhanced Arrays," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

J. Ashbach, X. Wang, and **D. H. Werner**, "The Finite Element Boundary Integral Method Accelerated Using a Graphics Processing Unit," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

M. D. Gregory, and **D. H. Werner**, "Multi-Band and Wideband Antenna Design Using Port Substitution and CMA-ES," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

Z. Jiang, and **D. H. Werner**, "Substrate-induced Bianisotropy Compensation in Optical Metamaterials," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

A. Panaretos, and **D. H. Werner**, "Ultra-thin Wideband Absorbers Comprised of Frequency Selective Surfaces with Concentric Square Loop Elements," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

J. Ashbach, J. A. Bossard, X. Wang, and **D. H. Werner**, "Metamaterial Absorber for the Near-IR with Curvilinear Geometry based on Beziér Surfaces," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

J. P. Turpin, P. Sieber, and **D. H. Werner**, "Absorbing FSS Ground Plane for Reduced-Radar Cross Section of Conformal Antennas," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

F. Namin, and **D. H. Werner**, "Higher-Dimensional Application of Rigorous Coupled-Wave Analysis to Quasicrystalline Gratings," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

D. Brocker, J. Waynert, J. Li, N. Damiano, P. L. Werner, and **D. H. Werner**, "Multi-Mode Propagation on a Medium Frequency Twin-Lead Transmission Line with Earth Return," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

J. A. Bossard, J. P. Turpin, and **D. H. Werner**, "Reconfigurable Angle Selective Emitters in the Near-IR Based on Phase Change Materials," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

J. A. Bossard, and **D. H. Werner**, "Metamaterial Emitters with Custom Angle and Polarization Control in the Near-IR," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

A. Panaretos, and **D. H. Werner**, "Analysis of a Dual Mode Nanodipole Loaded by a Plasmonic Core-Shell Particle," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

Z. Jiang, Q. Wu, and **D. H. Werner**, "A Low-Profile High-Gain SIW Slot Antenna Using Anisotropic Zero-Index Metamaterial Coating," Proceedings of the 2013 IEEE International Symposium on Antennas & Propagation and USNC/URSI National Radio Science Meeting, Orlando, FL, July 7-13, 2013.

J. P. Turpin, and **D. H. Werner**, "Beam Scanning Antenna Enabled by a Spatially Reconfigurable Near-Zero Index Metamaterial," The 7th European Conference on Antennas and Propagation (EuCAP), Gothenburg, Sweden, 8-12 April 2013.

I. Martinez, A. Panaretos, **D. H. Werner**, G. Oliveri, and A. Massa, "Ultra-thin Reconfigurable Electromagnetic Metasurface Absorbers," The 7th European Conference on Antennas and Propagation (EuCAP), Gothenburg, Sweden, 8-12 April 2013.

**Wheeler, T.F**., Brannon, M.L., **Schiano,** **J., Urbina**, **J.** "Enhancing the quality of senior design projects: The introduction of a coordinated sequence of design courses to prepare students for the capstone experience". ASEE Annual Conference and Proceedings, Atlanta GA. 2013

Mohamed Nafea and **Aylin Yener**, “Degrees of Freedom of the Single Antenna Gaussian Wiretap Channel with a Helper Irrespective of the Number of Antennas at the Eavesdropper,” Proceedings of the IEEE GlobalSIP Symposium on Cyber-Security and Privacy, GlobalSIP'13, Austin, TX, December 2013.

Basak Guler, **Aylin Yener** and Prithwish Basu, “A Study of Semantic Data Compression,” Proceedings of the IEEE GlobalSIP Symposium on Network Theory, GlobalSIP'13, Austin, TX, December 2013.

Burak Varan and **Aylin Yener**, “Two-Hop Networks with Energy Harvesting: The (Non-)Impact of Buffer Size,” Proceedings of the IEEE GlobalSIP Symposium on Energy Harvesting and Green Wireless Communications, GlobalSIP'13, Austin, TX, December 2013

Burak Varan and **Aylin Yener**, “The Energy Harvesting Two-Way Decode-and-Forward Relay Channel with Stochastic Data Arrivals,” Proceedings of the IEEE GlobalSIP Symposium on Energy Harvesting and Green Wireless Communications, GlobalSIP'13, Austin, TX, December 2013.

Burak Varan and **Aylin Yener**, “Multi-pair and Multi-way Communications Using Energy Harvesting Nodes,” Proceedings of the 47th Asilomar Conference on Signals, Systems and Computers, Asilomar'13, Pacific Grove, CA, November 2013.

Mohamed Nafea and **Aylin Yener**, “How Many Antennas Does a Cooperative Jammer Need for Achieving the Degrees of Freedom of Multiple Antenna Gaussian Channels in the Presence of an Eavesdropper?,” Proceedings of the 51st Annual Allerton Conference on Communication, Control, and Computing, Allerton'13, Monticello, IL, October 2013.

Kaya Tutuncuoglu and **Aylin Yener**, “Cooperative Energy Harvesting Communications with Relaying and Energy Sharing,” Proceedings of Information Theory Workshop, ITW'13, Seville, Spain, September 2013.

Kaya Tutuncuoglu, Omur Ozel, **Aylin Yener** and Sennur Ulukus, “Binary Energy Harvesting Channel with Finite Energy Storage,” Proceedings of the IEEE International Symposium on Information Theory, ISIT'13, Istanbul, Turkey, July 2013.

Ye Tian and **Aylin Yener**, “Degrees of Freedom for the MIMO Multi-way Relay Channel,” Proceedings of the IEEE International Symposium on Information Theory, ISIT'13, Istanbul, Turkey, July 2013.

Kaya Tutuncuoglu, Burak Varan and **Aylin Yener**, “Energy Harvesting Two-Way Half-Duplex Relay Channel with Decode-and-Forward Relaying: Optimum Power Policies,” Proceedings of the IEEE International Conference on Digital Signal Processing, DSP'13, Santorini, Greece, July 2013.

Ye Tian and **Aylin Yener**, “Degrees of Freedom Optimal Transmission for the Two-Cluster MIMO Multi-way Relay Channel,” Proceedings of the IEEE International Conference on Communications, ICC'13, Budapest, Hungary, June 2013.

Basak Guler and **Aylin Yener**, “Selective Interference Alignment for MIMO Femtocell Networks,” Proceedings of the IEEE International Conference on Communications, ICC'13, Budapest, Hungary, June 2013.

Igor Stanojev and **Aylin Yener**, “Relay Selection for Flexible Multihop Communication via Competitive Spectrum Leasing,” Proceedings of the IEEE International Conference on Communications, ICC'13, Budapest, Hungary, June 2013.

Kaya Tutuncuoglu, Burak Varan and **Aylin Yener**, “Optimum Transmission Policies for Energy Harvesting Two-way Relay Channels,” Proceedings of the IEEE ICC'13 Workshop on Green Broadband Access: Energy Efficient Wireless and Wired Network Solutions, Budapest, Hungary, June 2013.

Kaya Tutuncuoglu and **Aylin Yener**, “Multiple Access and Two-way Channels with Energy Harvesting and Bidirectional Energy Cooperation,” Proceedings of the 2013 Information Theory and Applications Workshop, ITA'13, San Diego, CA, February 2013.

Min Li, Osvaldo Simeone and **Aylin Yener**, “The State-Dependent Degraded Broadcast Diamond Channel,” Proceedings of the 14th annual Australian Communications Theory Workshop, AusCTW-13, Adelaide, Australia, January 2013.

**Q. M. Zhang** and X. Y. Li, “Recent Advances in Electrocaloric Materials and Devices,” ISIF, Dallas, TX, July, 2013.

**Q. M. Zhang**, “Electroactive Polymers and Nanocomposites With Giant Electromechanical Responses,” The 7th World Congress on BAMN, Jeju, S. Korea, August 2013.

**Q. M. Zhang** and Shan Wu, “Thin film polymer dielectrics of high energy density and low loss.” ACS meeting, Indianapolis, IN, September 2013.

**Q. M. Zhang**, “Dielectrics with Large Electrocaloric Effect And Related Cooling Devices,” European Conf. on Mater&Tech for Sustainable Growth, Bled, Slovenia, September 2013.

Yue Zhou, Noa Lachman, Mehdi Ghaffari, Haiping Xu, Brian L. Wardle, and **Q.M.Zhang**, "Nano-Scale Morphology Control of Graphene, Conducting Polymer, and Carbon Nanotube Electrodes for High Performance Energy Storage", 224th ECS meeting, San Francisco, CA, October 2013.

Yue Zhou, Mehdi Ghaffari, Brian L. Wardle, **Q. M. Zhang**, "Densified Aligned Carbon Nanotube Supercapacitors", Center for dielectric studies Spring 2013 meeting, State College, PA, September 2013.

Mehdi Ghaffari, R. Ruoff, and **Q. M. Zhang**, “Aligned Nano-Porous Graphene Ionic Actuators,”SPIE Smart Structures/NDE meeting, San Diego, CA, March 10-14, 2014.

Mehdi Ghaffari, M. Lin, Yue Zhou, R. Ruoff, and **Q. M. Zhang**, “Ultra-high Strain Ionic Actuators Based on Porous Graphene with Controlled Nano-morphology,” International Workshop on Acoustic Transduction Materials and Devices, State College, PA, May 7-9, 2013.

Mehdi Ghaffari, H. Xu, Yue Zhou, R. Ruoff, and **Q. M. Zhang**, “High Volumetric Performance Aligned Nano-Porous Graphene-based Electrochemical Capacitors,” The Electrochemical Society Meeting, San Francisco, CA, October 27-November 1, 2013.

S Wu, Q Burlingame, M Lin, **Q Zhang**, “Aromatic Polythiourea Dielectrics with High Energy Density, High Breakdown Strength, and Low Dielectric Loss,” APS meeting, March 2013.

Xiaoshi Qian, Xinyu Li, Haiming Gu, and **Q. M. Zhang**, Recent Advanced in electrocaloric materials and cooling devices, MRS meeting, San Francois, CA, March 2013.

1. **Patents
*Listed by inventor, title, issue date, and patent number***

**Mayer, Theresa S**.; Keating, Christine D.; Li, Mingwei; Morrow, Thomas J.; Kim, Jaekyun, “Bottom-Up Assembly of Structures on a Substrate,” issued January 29, 2013. #8,361,297

Singh, Jawar; Krishnan, Ramakrishnan; Mookerjea, Saurabh; **Datta, Suman**; Narayanan, Vijaykrishnan, “TFET Based 6T SRAM Cell,” issued February 5, 2013. #8,369,134

**Werner, Douglas H**.; Kwon, Do-Hoon, “Method and Apparatus for Reduced Coupling and Interference Between Antennas,” issued March 5, 2013. #8,390530

**Uchino, Kenji**; Zhuang, Yuan; Ural, Seyit Onurhan; Amin, Ahmed, “High Power Single Crystal Piezoelectric Transformer,” issued March 12, 2013. #8,395,301

1. **Research Projects Active in 2013**

***Listed by title, sponsoring agency and faculty member(s)***

“A new approach to electromagnetic scattering from ice crystal aggregates for improving quantitative radar measurements of clouds and precipitation”
National Science Foundation, Grant
**Aydin, Kultegin**, Principal Investigator

“Moving ASR Cloud Microphysical Retrievals beyond the Vertical Column”
U.S. Department of Energy, Grant
**Aydin, Kultegin**, Co-PI

“North Slope Site Scientist Team”
U.S. Department of Energy, Grant
**Aydin, Kultegin**, Co-PI

“MRI: Development of a Wirelessly-Connected Network of Seismometers and GPS Instruments for Polar and Geophyiscal Research”
National Science Foundation, Grant
**Bilen, Sven** **G**, Co-PI; **Urbina, Julio V**, Co-PI

“HF Network Simulation”
Harris RF Communications Division, Contract
**Bilen, Sven G**, Principal Investigator

“PSU Emergency Aerial Communications System”
Massachusetts Institute of Technology (Homeland Security), Purchase Order (Contract)
**Bilen, Sven G**, Principal Investigator

“Energy Harvesting: Energy Harvesting on Spacecraft Using Electrodynamic Tethers”
Air Force Office of Scientific Research, Grant
**Bilen, Sven G,** Principal Investigator

“STTR Phase I: Hybrid Chemical-Electric Propulsion (HCEP): Variable Isp Ionic Liquid Electric Thruster”
ElectroDynamic Applications, Inc., Subcontract
**Bilen, Sven G,** Co-PI

“Phase II: Communication-Based Unmanned Aerial System”
Massachusetts Institute of Technology, Purchase Order
**Bilen, Sven G,** Principal Investigator

“NASA Innovative Asteroid Capture, Retrieval, and Utilization Concepts”
Valador, Inc., Contract
**Bilen, Sven G,** Principal Investigator

“PennTAP 2.0 - Advanced Technical Assistance and Accelerating Innovation (D2PA)”
COP: Department of Community and Economic Development, Contract
**Bilen, Sven G**, Co-PI

“RF Engineering and Testing Support FY-12”
Naval Sea Systems Command, Contract
**Breakall, James K**, Research Associate

“Correlated Electron Switching Based Tunnel Transistors”
Office of Naval Research, Grant
**Datta, Suman**, Principal Investigator

“Center for low energy systems technology (LEAST)”
Notre Dame, University of, Subcontract
**Datta, Suman**, Principal Investigator; **Mayer, Theresa S**, Co-PI

“Basic Single-Event and Total-Ionizing Dose Mechanisms in Antimony (Sb)-based CMOS Transistors with High-K Dielectric”
Defense Threat Reduction Agency, Grant
**Datta, Suman**, Principal Investigator

“Multi-Gate III-V QWFET”
Semiconductor Research Corporation, Contract
**Datta, Suman**, Principal Investigator

“Post CMOS Circuits and Architecture”
Intel Corp., No Formal Agreement
**Datta, Suman**, Principal Investigator

“Ultrafast Spectroscopy in Heterojunction Tunnel Transistors”
National Institute of Standards and Technology, Grant
**Datta, Suman**, Principal Investigator

“III-V Nanowire and Tunnel FET Nanoelectronics”
Samsung Advanced Institute of Technology, Grant
**Datta, Suman**, Principal Investigator

“Collaborative Research: Visual Cortex on Silicon”
National Science Foundation, Grant
**Datta, Suman**, Faculty

“Research Instrumentation for Transient Characterization of Abrupt Metal Insulator Phase Transition in Correlated Materials”
Office of Naval Research, Grant
**Datta, Suman**, Principal Investigator

“Midwest Institute for Nanoelectronics Discovery Project 1.5 (MIND 1.5)”
Notre Dame, University of, Subcontract
**Datta, Suman**, Principal Investigator**; Mayer, Theresa S**, Co-PI

“Combining Biology with CMOS through Programmed Nanowire Assembly”
Massachusetts Institute of Technology, Subcontract
**Datta, Suman**, Principal Investigator; **Mayer, Theresa S**, Co-PI

“Heterojunction Tunnel Transistors for Ultra Low Power Logic Applications”
Intel Corp., Sponsored Research Agreement
**Datta, Suman,** Principal Investigator

“Next Generation Atomic Layer Deposition System For The Integration Of High-K Dielectrics With Novel Electronic Materials”
Office of Naval Research, Contract
**Datta, Suman,** Co-PI

“Development and Demonstration of Next Generation Electronic Warfare Components based on Graphene Technologies”
Office of Naval Research, Contract
**Datta, Suman,** Co-PI

“Collaborative: Mixed Anion and Cation Based Transistor Architecture for Ultra-Low Power Complementary Logic Applications”
National Science Foundation, Grant
**Datta, Suman,** Principal Investigator

“Scattering Solar Thermal Concetrators”
U.S. Department of Energy, Cooperative Agreement
**Giebink, Noel C,** Principal Investigator

“Organic photonics: Enabling complex index modulation for optical isolation and switching in next-generation plastic fiber networks”
Space and Naval Warfare Systems Center, San Diego, Grant
**Giebink, Noel C,** Principal Investigator

“Technician-Free Methods for Image-Guided Bronchoscopy”
Broncus Medical, Inc., Fixed Price Agreement
**Higgins, William E,** Principal Investigator

“Multimodal Image-Guided Intervention System for Lung-Cancer Diagnosis and Staging”
National Cancer Institute, Grant
**Higgins, William E,** Principal Investigator

“NSF Nanosystems Engineering Research Center (ERC) on Advanced Self-Powered Systems of Integrated Sensor Technologies (ASSIST)”
North Carolina State University, Subaward
**Jackson, Thomas N**, Principal Investigator; **Datta, Suman**, Co-PI; **Mayer,** **Theresa S,** Co-PI; **Werner, Douglas H,** Faculty

“Organic Thin Film Transistor Parameter Extraction for Organic Photovoltaics”
National Institute of Standards and Technology, Grant
**Jackson, Thomas N**, Principal Investigator

“Kinesin and +TIP-based microtubule steering”
National Institute of General Medical Sciences, Grant
**Jackson, Thomas** **N,** Co-PI

“Integrated Control Electronics for Adjustable X-ray Optics”
National Aeronautics and Space Administration, Grant
**Jackson, Thomas N**, Co-PI

“Radiation-Hard and Self-Healing Substrate-Agnostic Nanocrystalline ZnO Thin Film Electronics”
Air Force Office of Scientific Research, Grant
**Jackson, Thomas N**, Principal Investigator

“Growth, Characterization and Modeling of Monolithic Silicon Microbolometer Materials for Uncooled Infrared Detectors”
U.S. Army Research, Development and Engineering Command Acquisition Center, Cooperative Agreement
**Jackson, Thomas N**, Co-PI

“Flexible and Printed Electronics Program”
Dow Chemical Company, Sponsored Research Agreement
**Jackson, Thomas N**, Principal Investigator; **Giebink, Noel C,** Co-PI

“High performance Tunable Materials Program Phase II Cost Proposal (Task 09-9C3)”
North Carolina State University, Subcontract
**Jackson, Thomas N**, Principal Investigator

“REU: Electrical Engineering Research and Technology Transfer Experience for Undergraduates”
National Science Foundation, Grant
**Jenkins, William K,** Principal Investigator; **Bilen, Sven G**, Co-PI

“Very High-Speed, Infrared VCSEL-Array Light Wireless Links”
National Science Foundation, Grant
**Kavehrad, Mohsen**, Principal Investigator

“I/UCRC on Optical Wireless Applications”
National Science Foundation, Grant
**Kavehrad, Mohsen**, Principal Investigator; **Kane, Timothy J**, Co-PI; **Liu, Zhiwen,** Co-PI; **Yin, Shizhuo**, Co-PI
Membership:
Oberon Wireless Communications Solutions, Inc.,
Airbus S.A.S.,
Boeing Company
Airbus S.A.S., Membership
Lockheed Martin Corporation, Inc.,

“NeTS Collaborative Research: Supporting unstructured peer-to-peer social networking”
National Science Foundation, Grant
**Kesidis, George**, Principal Investigator

“NetSE Small: Unsupervised Flow-Based Clustering”
National Science Foundation, Grant
**Kesidis, George,** Principal Investigator; **Miller, David J**, Co-PI

“Nets:Small:Collaborative Research: Inter-provider dynamics in neutral and non-neutral networks”
National Science Foundation, Grant
**Kesidis, George**, Principal Investigator

“Collaborative: GENI: EAGER: GENI Experiments to Explore Adoption of New Security Services”
National Science Foundation, Grant
**Kesidis, George,** Principal Investigator

“TWC: Medium: Towards Securing Coupled Financial and Power Systems in the Next Generation Smart Grid”
National Science Foundation, Grant
**Kesidis, George,** Principal Investigator; **Miller, David J,** Co-PI

“Nonlinear Electro-Optical Liquid Crystalline Materials for High Speed Optical Switching and Signal Processing”
Air Force Office of Scientific Research, Grant
**Khoo, Iam-Choon**, Principal Investigator

“Robust Control of Uncertain Switched Systems”
National Science Foundation, Grant
**Lagoa, Constantino M**, Principal Investigator

“CPS: Synergy: Collaborative Research: Digital Control of Hybrid Systems via Simulation and Bisimulation”
National Science Foundation, Grant
**Lagoa, Constantino M**, Principal Investigator

“IIS EAGER: Recurring Pattern Discovery”
National Science Foundation, Grant
**Liu, Yanxi,** Principal Investigator

“IGERT: Big Data Social Science - An Integrative Education and Research Program in Social Data Analytics”
National Science Foundation, Grant
**Liu, Yanxi**, Faculty

“Sino-USA Summer School in Vision, Learning, Pattern Recognition, VLPR 2012”
National Science Foundation, Grant
**Liu, Yanxi**, Principal Investigator

“CREATIV: Symmetry Group-based Regularity Perception in Human and Computer Vision”
National Science Foundation, Grant
**Liu, Yanxi,** Principal Investigator

“Welding fume sensing for the construction safety”
Virginia Polytechnic Institute and State University, Subcontract
**Liu, Zhiwen**, Principal Investigator

“Optoelectronic nanohand”
National Science Foundation, Grant
**Liu, Zhiwen**, Principal Investigator

“GFresnel cellular-phone spectrometer”
Vodafone Foundation, Grant
**Liu, Zhiwen**, Principal Investigator

“Zinc Selenide Fiber Lasers”
Air Force Research Laboratory, Cooperative Agreement
**Liu, Zhiwen**, Co-PI

“Collaborative Research: Rayleigh and Raman scattering in an ultrahigh-Q microresonator - a new way to detect, identify, and measure nanoparticles”
National Science Foundation, Grant
**Liu, Zhiwen**, Principal Investigator

“Nanoprobes for nano-femto optics”
National Science Foundation, Grant
**Liu, Zhiwen**, Principal Investigator

“Micrometeoroid Mass Flux Influences on Space Weather and Middle Atmosphere Aeronomy Using the Six SNF Radars and Modeling”
National Science Foundation, Grant
**Mathews, John D**, Principal Investigator

“Collaborative Research: New Directions in Optical-Instrument-Driven Aeronomy at Arecibo Observatory”
National Science Foundation, Grant
**Mathews, John D**, Principal Investigator

“High-Resolution E/F Region Waves and Electrodynamics Studies Using the Arecibo Observatory Instrument Cluster and the Chain Radars”
National Science Foundation, Grant
**Mathews, John D**, Principal Investigator

“EAGER: Adapting the New Arecibo On-Dish HF Transmitter System to Radar Mode”
National Science Foundation, Grant
**Mathews, John D,** Principal Investigator and **Urbina, Julio V**, Co-PI

“Penn State GATE Center of Excellence: In-Vehicle, High-Power Energy Storage Technologies”
National Energy Technology Laboratory, Grant
**Mayer, Jeffrey S**, Co-PI

“DOE/PSU Graduate Student Fellowship Program for Hydropower Research”
U.S. Department of Energy, Grant
**Mayer, Jeffrey S,** Co-PI

“Germanium GRIN Lens”
Lockheed Martin Missiles and Fire Control Company, Fixed Price Agreement
**Mayer, Theresa S,** Principal Investigator

“NNIN: National Nanotechnology Infrastructure Network - Summer Internship Program”
Cornell University, Subcontract
**Mayer, Theresa S**, Principal Investigator

“NNIN: National Nanotechnology Infrastructure Network”
Cornell University, Subcontract
**Mayer, Theresa S,** Principal Investigator

“Electro-Optical (EO) Reconfigurable Meta-Filter”
Lockheed Martin Missiles and Fire Control Company, Fixed Price Agreement
**Mayer, Theresa S**, Principal Investigator

“Three-dimensional co-assembly of functional nano/microparticles for reconfigurable multicomponent structures”
Pittsburgh Foundation, Grant
**Mayer, Theresa S**, Co-PI

“Reconfigurable Phase Change Material (PCM) Meta-mask”
Lockheed Martin Missiles and Fire Control Company, Fixed Price Agreement
**Mayer, Theresa S**, Principal Investigator

“Electro-Optical (EO) Reconfigurable Meta-Filter”
Lockheed Martin Missiles and Fire Control Company, Fixed Price Agreement
**Mayer, Theresa S**, Principal Investigator

“Deterministic Assembly of Nano/Microstructures”
Northrop Grumman Corporation, Unrestricted Grant
**Mayer, Theresa S**, Principal Investigator

“Collaborative Research: GOALI-FRG: Engineered crystallization behavior of Phase Change Materials to enable advanced optical functionalities”
National Science Foundation, Grant
**Mayer, Theresa S,** Principal Investigator

“Nanoscale Contacts”
U.S. Army Research, Development and Engineering Command Acquisition Center, Grant
**Mayer, Theresa S**, Co-PI

“Innovative Design and Manufacturing of Gradient-Index-Based Transformation Optics Components”
Air Force Research Laboratory, Contract
**Mayer, Theresa S,** Principal Investigator and **Werner, Douglas H,** Co-PI

“SOLAR Collaborative: Multiplasmonic light harvesting for thin film solar cells”
National Science Foundation, Grant
**Mayer, Theresa S**, Co-PI

“High Aspect Ratio Semiconductor Heterojunction Solar Cells” (CONTINUATION)
U.S. Department of Energy, Grant
**Mayer, Theresa S**, Co-PI

“ARRA: MRI-R2: Acquisition of a Versatile Electron Beam Nanolithography Instrument for Patterning on Planar and Curved Surfaces”
National Science Foundation, Grant
**Mayer, Theresa S,** Principal Investigator

“STTR: Saliency Annotation of Image and Video Data Phase II”
Toyon Research Corporation, Subcontract
**Miller, David J,** Principal Investigator and Kesidis, George, Co-PI

“Directionally-Tailored Infrared Emission and Transmission”
Office of Naval Research, Grant
**Mittra, Raj,** Principal Investigator

“Metamaterial Antennas for Communication and High Power Applications”
Office of Naval Research, Grant
**Mittra, Raj,** Principal Investigator

“Adaptive Sparse Representations For Image Understanding and Classification”
Office of Naval Research, Grant
**Monga, Vishal**, Principal Investigator

“Robust, Adaptive Radar Detection and Estimation”
Air Force Office of Scientific Research, Grant
**Monga, Vishal,** Principal Investigator

“Intelligent Video Anomaly Detection for Transportation Applications”
Xerox Corp., Sponsored Research Agreement
**Monga, Vishal,** Principal Investigator

“Robust Estimation for Phenomenology Based Adaptive Radar”
Dynetics, Inc., Purchase Order
**Monga, Vishal**, Principal Investigator

“Noise Tomography and Adaptive illumination in Noise Radar”
Air Force Office of Scientific Research, Grant
**Narayanan, Ram M,** Principal Investigator

“Ultrawideband Radar System Development for Landmine and IED Detection”
Delaware State University, Subaward
**Narayanan, Ram M,** Principal Investigator

“DURIP: Instrumentation For Controlled Ultrawideband Radar Cross Section Measurements Of Landmines And Improvised Explosive Devices (IEDS)”
U.S. Army Research, Development and Engineering Command Acquisition Center, Grant
**Narayanan, Ram M,** Principal Investigator

“Physical Origins of Coupling to the Upper Atmosphere from Lightning (PhOCAL)”
Duke University, Subcontract
**Pasko, Victor P**, Principal Investigator

“FESD Type-1: Electrical Connections and Consequences within the Earth System”
Colorado, University of, Subaward
**Pasko, Victor P,** Principal Investigator

“Development of Efficient Models of Streamer to Leader Transition in the Earth's Atmosphere”
National Science Foundation, Grant
**Pasko, Victor P**, Principal Investigator

“Development of Efficient Three-Dimensional Models of Lightning Discharges”
National Science Foundation, Grant
**Pasko, Victor P**, Principal Investigator

“Simulations and Theory of Streamer Discharges in Transient Luminous Events”
National Science Foundation, Grant
**Pasko, Victor P,** Principal Investigator

“CEDAR: Modeling Studies of Infrasonic Waves from Thunderstorms and Aurora”
National Science Foundation, Grant
**Pasko, Victor P**, Principal Investigator

“Energetic Radiation From Lightning Leaders: Effects and Origins”
National Science Foundation, Grant
**Pasko, Victor P,** Principal Investigator

“MRI: Development of an NMR Console for the 36 T Series Hybrid”
Florida State University, Subaward
**Schiano, Jeffrey L**, Principal Investigator

“Detection and characterization of CBRN agents using Quadrupole Resonance”
U.S. Army Construction Engineering Research Laboratory, Cooperative Agreement
**Schiano, Jeffrey L**, Principal Investigator

“Further Reduction of Temporal Magnetic Field Variations in Resistive and Hybrid Magnets Using Digital Feedback Control”
Florida State University, Subcontract
**Schiano, Jeffrey L,** Principal Investigator

“Process Development of High Speed Etching of Glass and Quartz Substrates”
Honeywell Aerospace, Purchase Order
**Tadigadapa, Srinivas A**, Principal Investigator

“Reactive Ion Etching (RIE) with NF3 for hole Drilling in Glass”
Corning, Incorporated, Sponsored Research Agreement
**Tadigadapa, Srinivas A,** Principal Investigator

“Chip Scale Magnetic Sensor Arrays Based On Magnetoviscous Effect Of Ferrofluids”
National Science Foundation, Grant
**Tadigadapa, Srinivas A,** Principal Investigator

“Ultra-high Speed Anisotropic Reactive Ion Etching (RIE) of Quartz and Borosilicate Glass”
U.S. Department of the Army, Grant
**Tadigadapa, Srinivas A**, Principal Investigator

“ARRA: Quartz Resonator Based Calorimetric Sensor for Biochemical Sensing and Clinical Diagnostic Applications”
National Science Foundation, Grant
**Tadigadapa, Srinivas A**, Principal Investigator

“International Center for Actuators and Transducers (ICAT) Consortium”
Toyota Central R&D Labs., Inc., Membership (Financial Assistance)
**Uchino, Kenji**, Principal Investigator

“Intergovernmental Personnel Act Assignment with ONRG in Tokyo, Japan”
Office of Naval Research, Grant
**Uchino, Kenji**, Principal Investigator

“Engineering Pathways: An Undergraduate Scholars Program”
National Science Foundation, Grant
**Urbina, Julio V,** Co-PI

“Collaborative Research: A New 50 MHz Radar for Meteor and Aeronomical Science”
National Science Foundation, Grant
**Urbina, Julio V**, Principal Investigator

“CAREER: A Cognitive VHF Radar System Approach to Study Ionospheric Irregularities”
National Science Foundation, Grant
**Urbina, Julio V**, Principal Investigator

“Equatorial Vortex Experiment (EVEX): A Study of the Ionospheric Plasma Circulation and Sunset Layer from Kwajalein”
University of Illinois at Urbana-Champaign, Subaward
**Urbina, Julio V**, Principal Investigator

“Collaborative Research: A New 50 MHz Radar for Meteor and Aeronomical Science”
National Science Foundation, Grant
**Urbina, Julio V**, Principal Investigator

“HPM Antenna Modeling for Improved Effectiveness 2”
Naval Sea Systems Command, Contract
**Werner, Douglas H**, Principal Investigator

“HPM Antenna Modeling for Improved Effectiveness”
Naval Sea Systems Command, Contract
**Werner, Douglas H**, Principal Investigator

“FY13 BA2 Compact HPM Antenna Metamaterial Study”
Naval Sea Systems Command, Contract
**Werner, Douglas H**, Co-PI

“RF Beam Steering”
Lockheed Martin Missiles and Fire Control Company, Fixed Price Agreement
**Werner, Douglas H**, Principal Investigator and **Mayer, Theresa** **S**, Co-PI

“Multipath, Multi-frequency, and Small Form Factor Communications Antenna”
Antenna Research Associates, Inc., Purchase Order
**Werner, Douglas H**, Principal Investigator

“Electromagnetic Modeling of the Near-Field Radiation Parameters of Selected Radiator Designs”
Naval Sea Systems Command, Contract
**Werner, Douglas H**, Principal Investigator

“EBG Metamaterials”
Lockheed Martin Corporation, Inc., Sponsored Research Agreement
**Werner, Douglas H**, Principal Investigator

“Compact HPM Antenna Metamaterial Study”
Naval Sea Systems Command, Contract
**Werner, Douglas H,** Principal Investigator

“Full-wave Modeling of Medium Frequency Propagation in Coal Mines”
NIOSH-Pittsburgh Research Center, Contract
**Werner, Douglas H**, Principal Investigator

“Structural Acoustic and Metamaterial Modeling and Measurements”
Office of Naval Research, Contract
**Werner, Douglas H**, Co-PI

“Aerospace Corporation University Affiliate Program”
Aerospace Corporation, Grant
**Wheeler, Timothy F,** Principal Investigator

“The Network Science (NS) Collaborative Technology Alliance (CTA)”
Raytheon BBN Technologies, Cooperative Agreement
**Yener, Aylin**, Co-PI

“CIF:Small:Collaborative:Realizing the Vision of Information-Theoretic Security for Wireless Communications”
National Science Foundation, Grant
**Yener, Aylin**, Principal Investigator

“TWC SBE: Medium: Collaborative: Incentive Compatible Wireless Security”
National Science Foundation, Grant
**Yener, Aylin**, Principal Investigator

“NeTS: Medium: Collaborative Research: Rechargeable Networks”
National Science Foundation, Grant
**Yener, Aylin**, Principal Investigator

“CIF: Medium: Collaborative Research: Interactive Security”
National Science Foundation, Grant
**Yener, Aylin**, Principal Investigator

“Unconventional Ultrafast Optical Switch”
U.S. Army Research Laboratory, Cooperative Agreement
**Yin, Shizhuo**, Principal Investigator

“Electroactive Polymers with Tailored Nanostructure Morphologies”
Korea Institute of Science and Technology, Fixed Price Agreement
**Zhang, Qiming**, Principal Investigator

“Unconventional High Density Vertically Aligned Conducting Polymer/Carbon Nanotube Composites for Ultrahigh Energy Density and Power Density Energy Storage Devices”
Air Force Office of Scientific Research, Grant
**Zhang, Qiming**, Principal Investigator

“Electrocaloric Polymer Films”
United Technologies Research Center, Fixed Price Agreement
**Zhang, Qiming**, Principal Investigator

“Ferroelectric Polymers with Ultrahigh Energy Density, Low Loss, and Broad Operation Temperature For Navy Pulse Power Capacitors”
Office of Naval Research, Grant
**Zhang, Qiming**, Principal Investigator

“Giant Electrocaloric Effect in Ferroelectric Polymers with Taylored Polar-Nanostructures”
U.S. Department of Energy, Grant
**Zhang, Qiming**, Principal Investigator

“Magnetic Sensors for MRI Systems”
Cincinnati Children's Hospital Medical Center, Fixed Price Agreement
**Zhang, Qiming**, Principal Investigator

“Understanding the Scientific Basis of Electrocaloric Effect In Defects Modified Ferroelectric Polymers”
Army Research Office, Grant
**Zhang, Qiming**, Principal Investigator

“Novel Polymer Dielectrics of High Dielectric Constant, Low Loss, and High Breakdown Fields”
Asea Brown Boveri Ltd. (ABB), Contract
**Zhang, Qiming**, Principal Investigator

“Instrument for characterization of Mechanical and Dielectric Properties of Polymer Dielectrics Under Different Application Environments”
Office of Naval Research, Grant
**Zhang, Qiming**, Principal Investigator

“Low-Cost Robust Refreshable Full-Page Braille Display with Advanced Electroactive”
Strategic Polymer Sciences^, SBIR Sub
**Zhang, Qiming**, Principal Investigator

“Ionic Liquids in Electroactive Devices (ILEAD) MURI”
Virginia Polytechnic Institute and State University, Subcontract
**Zhang, Qiming**, Co-PI

“Ionic Electroactive Polymer Actuators with Tailored NanoStructure Morphology”
National Science Foundation, Grant
**Zhang, Qiming**, Principal Investigator

## IV. Awards

## Penn State Engineering Alumni Society Awards*Outstanding Research Award* Ram Narayanan

## Faculty Promotions*Associate Professor* Julio Urbina

## *Distinguished Professor* Theresa Mayer

## College of Engineering Awards*Outstanding Engineering Alumni Award* Tom Roell

## Penn State Electrical Engineering Society Awards

## *Early Career Recognition Alumni Award*

## Arnab Roy, InterDigital

1. **Department Activities**
2. **Research Experience for Undergraduates**

The Research Experience for Undergraduates (REU) is a National Science Foundation (NSF) funded program which supports active research participation by undergraduate students who come to Penn State from other universities. 2013 marks the eleventh year for the program at Penn State.

The 2013 participates are listed along with their, university, research topic, and faculty mentor.

Niklas Anthony
Penn State University
We’re Lucky to Have the Moon
**John Mathews**

Ryan Collins
Bucknell University
Comparisons of Advanced AdapTive Signal Processing Methods for Removing Maternal Interference Noise from Fetal Electro-Cardiograms
**Ken Jenkins and David Salvia**

Thenmozhi Elayaperumal
University of West Florida
Development of a User In Terface Based Program To Track Impedance Characteristic Of A Micromachined Quartz Resonator
**Srinivas Tadigadapa**

Amy Hein
West Virginia Wesleyan College
Characterization of Quadrupole Resonance Transitions in Cyanuric Acid
**Jeff Schiano**

Bill Kim
Johns Hopkins University
Automated Control of a G-Fresnel Spectrometer
**Zhiwen Liu**

Zachary Morgan
University of Mississippi
Absolute Power Calibration of the Penn State Radar System For Meteor Studies
**Julio Urbina**

Jeremy Pachter
Columbia University
Development of an Efficient Reference Conductivity Model For Global Electric Circuit Model Calculations
**Victor Pasko**

Gregory Roberts
University of California, Berkeley
System-Level Design of Active Inflatable Falling Sphere for Use with Upcoming Sub-Orbital Flight Opportunities
**Sven Bilén**

Cynthia Rojas
New Mexico State University
Design of a Magnetic Torquer System for Cubesats
**Sven Bilén**

Mason Sutorius
Clarkson University
Scattering Element Design for Solar Thermal Concentrators **Chris Giebink**

Sophia Williams
Harvey Mudd College
Etch Rate and Geometry for Etched Si(001) Substrates for Subsequent GaN Film Growth
**Joan Redwing**

Benjamin Young
Virginia Commonwealth University
Development of a Software-Defined Radar Receiver for Ionospheric Studies
**Julio Urbina**

1. **Industrial and Professional Advisory Council (IPAC)**IPAC is a select group of Penn State alumni from industry, government agencies, and academia who advise the department on academic issues and on current trends and future directions in engineering. The group met in March on the Penn State campus and had discussions with faculty and students. A report was prepared outlining their recommendations for the department.

IPAC members are listed with their companies.

John Clark, Northrop Grumman

Thomas Foley, Altran – North America

Stephanie de Garay, Rockwell Automation

John Golombeck, Northrop Grumman

Forrest Hunsberger, MIT Lincoln Laboratory

Leslie Melaragno, Rockwell Automation

Thomas Roell, Parsons Infrastructure & Technology Group

Scott Thompson, Oberon Inc.

Tammy Kubasko Urbanski, Fairchild Semiconductor

William Wannisky, Fitzpatrick, Cella, Harper, and Scinto

1. **Arthur H. Waynick Memorial Lecture**

The 2013 speaker for the Arthur H. Waynick Memorial Lecture was Bill Murtagh.

Bill Murtagh is the Program Coordinator for the National Oceanic and Atmospheric Administration (NOAA), Space Weather Prediction Center (SWPC) in Boulder, Colorado. He is NOAA’s space weather lead in coordinating preparedness and response efforts with industry, national and international agencies, emergency managers, and government officials around the world.

Bill is a member of the White House Working Group on geomagnetic disturbances, guiding national policy in response to space weather storms. He regularly briefs the White House and members of Congress and their staff on vulnerabilities of critical infrastructure. Bill recently provided expert testimony at the British Parliament on global impacts of space weather. He represents the United States in consultation with the European Union and specialized agencies of the United Nations.

He is a regular guest speaker at universities, government agencies, and national and international conferences. Bill has provided numerous interviews to major media outlets and is featured in several documentaries on space weather.

Before joining NOAA, Bill was a meteorologist and space weather forecaster in the U.S. Air Force. He coordinated and provided meteorological support for national security interests around the world. Bill transferred to the SWPC in 1997 as a space weather forecaster and liaison between NOAA and the U.S. Air Force. He joined NOAA in 2003 after retiring from the Air Force with 23 years of military service.

1. **Mentoring Program**

2013 was the third full year of the department mentoring program with a group of 185 mentor/student pairs.

1. **Sabbatical***Spring 2013*

 Constantino Lagoa
 Iam-Choon Khoo

*Fall 2013*

Yanxi Liu

1. **Intergovernmental Personnel Act**Kenji Uchino
2. **Retirements**Anna Kennedy, Graduate Admissions Administrative Assistant
Mona Shaw, Department Head Administrative Support Assistant
Marsha Church, Senior IT Systems Administrator
3. **New Hires**

Ahmad Mirzaei, Associate Professor
Minghui Zhu, Assistant Professor

Adam Hackenberg, IT Systems Administrator

1. **Penn State Electrical Engineering Society**Officers
 President: Dale Hoffman
 Vice President: Jim Blazer
 Secretary/Treasurer: Eric Kline
2. **Early Career Recognition Alumni Award**

Ben Campbell, Assistant Professor at Robert Morris University

1. **Outstanding Engineering Alumni Award**

Richard Williams, Shell WindEnergy, President