REPORT DOCUMENTATION PAGE

Form Approved OMB NO. 0704-0188

1. REPORT DATE (DD-MM-YYYY)	2. REPORT TYPE	3. DATES COVERED (From - To)
20-12-2017	Final Report	30-Sep-2012 - 29-Sep-2017

4. TITLE AND SUBTITLE
Final Report: USNC/URSI NRSM Travel Fellowship Grants

5a. CONTRACT NUMBER
W911NF-12-1-0400

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER
611102

6. AUTHORS

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER

7. PERFORMING ORGANIZATION NAMES AND ADDRESSES
National Academy of Sciences
500 5th Street NW

Washington, DC 20001 -0001

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS (ES)
U.S. Army Research Office
P.O. Box 12211
Research Triangle Park, NC 27709-2211

10. SPONSOR/MONITOR'S ACRONYM(S)
ARO

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
62490-EL-CF.41

12. DISTRIBUTION AVAILIBILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES
The views, opinions and/or findings contained in this report are those of the author(s) and should not contrued as an official Department of the Army position, policy or decision, unless so designated by other documentation.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	15. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
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RPPR Final Report
as of 25-May-2018

Agency Code:

Proposal Number: 62490ELCF **Agreement Number: W911NF-12-1-0400**
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DUNS Number: 041964057 EIN: 530196932
Report Date: 29-Dec-2015 Date Received: 20-Dec-2017
Final Report for Period Beginning 30-Sep-2012 and Ending 29-Sep-2017
Title: USNC/URSI NRSM Travel Fellowship Grants
Begin Performance Period: 30-Sep-2012 **End Performance Period:** 29-Sep-2017
Report Term: 0-Other
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Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: **STEM Participants:** 88

Major Goals: The purpose of this grant is to provide travel support to allow graduate students to participate in the National Radio Science Meeting (NRSM). This open scientific meeting, held annually the first week of January in Boulder, CO, is organized by the U.S. National Committee (USNC) of the International Union of Radio Science (URSI), and co-sponsored by the IEEE Antennas and Propagation Society. URSI is an international scientific organization and a member of the International Council for Science (ICSU). The USNC-URSI is appointed by the National Academies of Sciences, and represents U.S. radio scientists in URSI.

The structure of the USNC-URSI parallels the international URSI structure. Both are organized around ten Commissions:

A - Electromagnetic Metrology
B - Fields and Waves, Electromagnetic Theory and Applications
C - Radio Communication Systems and Signal Processing
D - Electronics and Photonics
E - Electromagnetic Environment and Interference
F - Wave Propagation and Remote Sensing
G - Ionospheric Radio and Propagation
H - Waves in Plasmas
J - Radio Astronomy
K -Electromagnetics in Biology and Medicine

The NSRM is organized around these broad topics, and Commissions work both together and individually to organize sessions. Plenary sessions are always organized jointly by at least two Commissions.

The USNC-URSI makes a special effort to encourage graduate student participation in the NSRM. One of the most effective ways is to provide travel support for the students to attend the meeting and present their research results. Every student at a U.S. university who is the primary and presenting author of an accepted abstract is eligible to receive a fellowship to help defray meeting expenses. For the past few years, approximately 120 students per year have been able to take advantage of this support, with an average of 13 per year supported through this award.

By engaging the young scientists in the NSRM, the USNC-URSI is able to
- introduce their research to a broader audience,
- expose them to related fields in radio science and to new research ,

- broaden and expand their professional networks,
- introduce them both to USNC-URSI and the union itself, including the role and structure of the URSI Commissions, and
- begin exposing the students to the national and international leadership pipeline.

Accomplishments: From 2013-2017, 88 students were supported at NSRMs through this award. Most received $600; those residing in Colorado received $300. For the NARS meeting, which combined the U.S. NRSM and the Canadian national meeting in 2015, students were provided $800 each.

The students not only presented their research at the National Radio Science Meeting, but they were also able to meet leaders in the field and expand their professional networks, and they were strongly encouraged to learn about the work of the USNC-URSI and its Commissions.

In addition, the USNC-URSI sponsors a student paper prize competition. All papers submitted by graduate students are reviewed by a panel of reviewers representing the ten commissions. Finalists present their papers at a special plenary session of the meeting. Prizes awarded to the top three competitors. A special lunch is held following the student paper competition session for all student travel fellowship recipients and student paper competition finalists.

Mentoring is an important part of the USNC/URSI travel fellowship programs. The NSRM is regarded by students as a supportive environment in which to present their research and learn about new developments in the field.

Training Opportunities: This award is solely to support travel of graduate students to present research at the meetings organized by the USNC-URSI, specifically the National Radio Science Meeting. In 2015, the U.S. and Canadian national committees combine their meetings, so the NSRM is held at the North American Radio Science meeting. In addition to presenting their research, the students participate in a student paper competition, receive mentoring, learn about URSI and the USNC-URSI, and broaden their professional networks.

Results Dissemination: Abstracts are provided at the NSRM. In addition, each presenter is given the option to include his or her abstract on IEEE's Xplore.

Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI
Participant: Katherine Bailey
Person Months Worked: 1.00 **Funding Support:**
Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

Participant Type: Co-Investigator
Participant: Ana Ferreras
Person Months Worked: 1.00 **Funding Support:**
Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

RPPR Final Report
as of 25-May-2018

Participant Type: Other Professional
Participant: Pamela Gamble
Person Months Worked: 1.00 **Funding Support:**
Project Contribution:
International Collaboration:
International Travel:
National Academy Member: N
Other Collaborators:

CONFERENCE PAPERS:

Publication Type: Conference Paper or Presentation **Publication Status:** 4-Under Review
Conference Name: National Radio Science Meeting
Date Received: 09-Sep-2016 Conference Date: 06-Jan-2016 Date Published: 09-Sep-2016
Conference Location: Boulder, CO
Paper Title: All abstracts for the 14 awardees
Authors: 14 graduate students
Acknowledged Federal Support: **Y**

Final Report
Army Proposal #62490-EL-CF
Agreement Number W911NF-12-1-0400
Travel Grants for USNC-URSI Radio Science Meetings
December 14, 2017

Promoting the involvement of students in the national and international radio science pipeline has been a priority of the U.S. National Committee for over a decade. The purpose of this grant was to provide travel support to allow graduate students to participate in meetings organized by the U.S. National Committee of the International Union of Radio Science (USNC-URSI). The USNC-URSI is appointed by the National Academies of Sciences, and represents U.S. radio scientists in URSI.

Travel grants were provided for National Radio Science Meeting (NRSM) in 2013, 2014, 2016 and 2017, and to the North American Radio Science (NARS) meeting in 2015. The NSRM is usually held in Boulder, CO during the first week of January. Most NRSM travel awardees receive $600; those from Colorado receive $300. Every 5-8 years, the U.S. and Canadian National Committees hold the jointly-NARS meeting. NARS combines both the Canadian national meeting and the U.S. NSRM. The most recent NARS meeting was held July 19-25, 2015 in Vancouver, Canada. Because of the higher travel costs, each travel awardee that year received $800. Both the NSRM and NARS are open science meetings and are co-sponsored by the IEEE Antennas and Propagation Society.

The structure of the USNC-URSI parallels that of the International Union of Radio science (URSI). Both are organized around ten Commissions, and meeting plenary and breakout sessons are organized by the Commissions.

A - Electromagnetic Metrology
B - Fields and Waves, Electromagnetic Theory and Applications
C - Radio Communication Systems and Signal Processing
D - Electronics and Photonics
E - Electromagnetic Environment and Interference
F - Wave Propagation and Remote Sensing
G - Ionospheric Radio and Propagation
H - Waves in Plasmas
J - Radio Astronomy
K -Electromagnetics in Biology and Medicine

Students were selected across this spectrum. In order to receive a travel fellowship, students had to be the first author and presenter of a paper, and enrolled full-time in a graduate degree program at a U.S. university. The recipients were all expected to present their research, participate in sessions, and attend special events where students and young scientists were recognized. A special lunch for student travel awardees, student paper competition finalists,

U.S. commission chairs, and USNC-URSI officers was held immediately following the meeting's plenary session. This lunch provided an additional opportunity for students to meet each other and to speak with more senior researchers in the field.

Following the NSRM and NARS meeting, the Board on International Scientific Unions (BISO) at the National Academies surveyed travel award recipients to obtain feedback on the program and data on participation. Each travel grant recepient was asked to rate the the meetings on a scale of 1 (poor) to 7 (excellent) in terms of the following categories: diversity of topics covered, relevance to recepient's research, new analytical techniques or concepts learned, organization and quality of sessions and lectures, attendance by younger scientists, gender diversity, and ethnic diversity. The majority of survey responders consistently gave every category except gender diversity a rating of 7.

The travel fellowship program helps build future academic and research infrastructure. Through their participation in these events, U.S. students are exposed to leaders in radio science, have opportunities to present and discuss their work, and can interact with their peers from multiple research institutions. These interactions are important elements of the education process as they help to maintain interest among U.S. students for pursuing scientific careers and foster engagement in the radio science community.

The following chart represents the number of students participating in various years of this grant.

Year	# Students Supported
2017	28
2016	14
2015	10
2014	13
2013	13
	88

The following are the graduate students who received travel fellowships and the papers they presented:

2017

Amir Azemati

COHERENT BISTATIC SCATTERING MODEL FOR VEGETATED LAND COVER IN SUPPORT OF SOIL MOISTURE RETRIEVAL

Amir Azemati*, Mahta Moghaddam

Ming Hsieh Department of Electrical Engineering, University of Southern California, Los Angeles, CA

Drew Bresnahan

INVESTIGATION OF CREEPING WAVE PROPAGATIONS AROUND THE HUMAN HEAD AND NECK AT ISM FREQUENCY BANDS

Drew G. Bresnahan*, Yang Li
Electrical and Computer Engineering, Baylor University, Waco, TX

Jordan Budhu

SYNTHESIZING THIN DIELECTRIC LENSES FOR CONICAL SCANNING BEAMS: A HYBRID NUMERICAL ALGORITHM

Jordan F. Budhu*, Yahya Rahmat-Samii
University of California Los Angeles, Los Angeles, CA

George Che

A RAPID FILTER BANK DESIGN AND MEASUREMENT SCHEME FOR SUPERSPEC

George Che*[1], Philip Mauskopf[1], Georgios Trichopoulos[2], Steven Hailey-Dunsheath[3], Charles M. Bradford[3,4], Jason Glenn[5], Corwin Shiu[6], Erik Shirokoff[7], Jordan Wheeler[5]
[1] *Earth & Space Exploration, Arizona State University, Tempe, AZ*
[2] *Electrical, Computer and Energy Engineering, Arizona State University, Tempe, AZ*
[3]*Astronomy, California Institute of Technology, Pasadena, CA*
[4]*Astronomy & Space Sciences, NASA Jet Propulsion Laboratory, Pasadena, CA*
[5]*Astrophysical & Planetary Sciences, University of Colorado Boulder, Boulder, CO*
[6]*Physics, Princeton University, Princeton, NJ*
[7]*Astronomy & Astrophysics, University of Chicago, Chicago, IL*

Shu Chen

COMPUTATIONAL ELECTROMAGNETICS WITH DISCRETE EXTERIOR CALCULUS

Shu Chen*[1], Weng C. Chew[2]
[1]*Physics, University of Illinois Urbana-Champaign, Champaign, IL*
[2]*Electrical and Computer Engineering, University of Illinois Urbana-Champaign, Champaign, IL*

Adam Christman

OBSERVATIONS OF INTERNAL MARINE ATMOSPHERIC BOUNDARY LAYER DEVELOPMENT DURING THE CASPER EAST CAMPAIGN

Adam J. Christman*[1], H. J. S. Fernando[1], Raghavendra Krishnamurthy[1], David Grober[2], Chris Hocut[3], Ed Creegan[3], Qing Wang[4]
[1]*University of Notre Dame, Notre Dame, IN*
[2]*Motion Picture Marine-Perfect Horizon Stabilization, Marina del Rey, CA*
[3]*U.S. Army Research Laboratory, White Sands, NM*
[4]*Naval Postgraduate School, Monterey, CA*

EVAPORATION DUCT HEIGHT ESTIMATION FROM UWB LOWER ATMOSPHERIC PROPAGATION (LATPROP) MEASUREMENT SYSTEM

Luyao Xu*[1], Caglar Yardim[1], Swagato Mukherjee[1], Robert J. Burkholder[1], Jon Pozderac[1], Adam Christman[2], Harindra Fernando[2], Qing Wang[3], Edward Creegan[4]
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EVAPORATION DUCT HEIGHT COMPARISONS FROM X-BAND EM PROPAGATION MEASUREMENTS OF THE CASPER CAMPAIGN AND NAVSLAM PREDICTIONS
Qi Wang*[1], Robert J. Burkholder[1], Luyao Xu[1], Jon Pozderac[1], Swagato Mukherjee[1], Caglar Yardim[1], Adam Christman[2], Harindra J. Fernando[2], Qing Wang[3], Edward Creegan[4]
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Brock Delong
LOW COST MULTI-LAYERED ARRAY DESIGN FOR MM-WAVE COMMUNICATIONS
Varittha Sanphuang, Brock J. DeLong*, Markus Novak, Elias A. Alwan, John L. Volakis
Electrical and Computer Engineering, The Ohio State University, Columbus, OH

Junming Diao
EXPERIMENTAL DEMONSTRATION OF A SUPERDIRECTIVE HORN ANTENNA DESIGNED BY POYNTING STREAMLINE METHOD
Junming Diao*, Karl F. Warnick
Electrical and Computer Engineering, Brigham Young University, Provo, UT

COMPROMISE BETWEEN PEAK SIDELOBE LEVEL AND ELEMENT NUMBER AND DENSITY FOR ELECTRICALLY SCANNED ROTATIONAL APERIODIC SUBARRAYS
Junming Diao*, Jakob W. Kunzler, Karl F. Warnick
Electrical and Computer Engineering, Brigham Young University, Provo, UT

Negar Golestani
MAGNETIC INDUCTION COMMUNICATIONS FOR WIRELESS BODY AREA NETWORK
Negar Golestani*, Mahta Moghaddam
Ming Hsieh Department of Electrical Engineering, University of Southern California, Los Angeles, CA

Me Hajizadegan
ULTRASENSITIVE PARITY-TIME SYMMETRIC WIRELESS MICROSENSORS
Mehdi Hajizadegan*, Pai-Yen Chen
Wayne State University, Detroit, MI

Md Asifu Islam
EFFICIENT MICROWAVE BIOMEDICAL IMAGING THROUGH SPARSE RECONSTRUCTION OF FREQUENCY INDEPENDENT PARAMETERS
Md Asiful Islam*, Asimina Kiourti, John L. Volakis
Electrical and Computer Engineering, Electroscience Laboratory, The Ohio State University, Columbus, OH

Daniel Kiddle
CHARACTERISTIC MODE ANALYSIS OF CONDUCTIVE NANOWIRES AND MICROWIRES
Daniel S. Kiddle*[1], Ethan J. Wilcox[1], Ahmed M. Hassan[1], Edward J. Garboczi[2]

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[2]*Applied Chemicals and Materials Division, National Institute of Standards and Technology, Boulder, CO*

Sanja Manic

SCATTERING CALCULATIONS FOR ASYMMETRIC RAIN DROPS UNDERGOING MIXED MODE OSCILLATIONS
Sanja Manic*, Merhala Thurai, V. N. Bringi, Branislav Notaros
Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

Omid Manoochehri

HIGH GAIN OMNIDIRECTIONAL ARRAY ANTENNA WITH LOW SIDE LOBE LEVELS IN THE ELEVATION PLANE
Omid Manoochehri*[1], Amin Darvazehban[2], Farhad Farzami[1], Danilo Erricolo[1]
[1]*Electrical and Computer Engineering, University of Illinois Chicago, Chicago, IL*
[2]*Electrical and Computer Engineering, Amirkabir University of Technology, Tehran, IRAN*

HIGH GAIN MINIATURIZED MULTI-BEAM LUNEBURG LENS ANTENNA FOR SATELLITE COMMUNICATIONS
Omid Manoochehri*[1], Amin Darvazehban[2], Farhad Farzami[1], Danilo Erricolo[1]
[1]*Electrical and Computer Engineering, University of Illinois Chicago, Chicago, IL*
[2]*Electrical and Computer Engineering, Amirkabir University of Technology, Tehran, IRAN*

Ashanthi Maxworth

NON-CAUSAL FILTERING APPLIED TO NUMERICAL WHISTLER MODE RAYTRACING
Ashanthi S. Maxworth*, Titsa Papantoni, Mark Golkowski
Electrical Engineering, University of Colorado Denver, Denver, CO

WARM PLASMA RAYTRACING OF WHISTLER MODE WAVES IN THE EARTH'S MAGNETOSPHERE
Ashanthi S. Maxworth*, Mark Golkowski
Electrical Engineering, University of Colorado Denver, Denver, CO

Dong-Yeop Na

DIAGNOSING SPURIOUS CHERENKOV RADIATION FROM NUMERICAL DISPERSION ON UNSTRUCTURED GRIDS
Dong-Yeop Na*[1], Fernando L. Teixeira[1], Yuri A. Omelchenko[2]
[1] *Electrical and Computer Engineering, The Ohio State University, Columbus, OH*
[2]*Trinum Research Inc., San Diego CA*

SIMULATION OF ELECTRON BERNSTEIN WAVES BY CHARGE-CONSERVING EMPIC ON IRREGULAR MESHES
Dong-Yeop Na*[1], Fernando L. Teixeira[1], Yuri A. Omelchenko[2]
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Mohamed Othman

THEORY OF EXCEPTIONAL POINTS OF DEGENERACY IN COUPLED WAVEGUIDES WITH BALANCED GAIN AND LOSS
Mohamed Othman*, Filippo Capolino
Electrical Engineering and Computer Science, University of California Irvine, Irvine, CA

HIGH POWER TEST OF X-BAND ACCELERATOR CAVITY POWERED BY SOLID STATE RF SOURCE
Mohamed Othman*[1,2], Emilio A. Nanni[2], Valery Dolgashev[2], Sami Tantawi[2], Jeff Neilson[2]
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[2]*SLAC National Accelerator Laboratory, Menlo Park, CA*

MULTIMODAL WAVEGUIDES WITH EXCEPTIONAL POINTS OF DEGENERACY OF VARIOUS ORDERS
Mohamed Othman[1], Mehdi Veysi[1], Farshad Yazdi[1], Mohamed Nada[1], Dmitry Oshmarin[1], Alexander Figotin[2], Filippo Capolino*[1]
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Yuxiang Peng

MULTI-CONSTELLATION GNSS TEC MEASUREMENTS
YuXiang Peng*[1,2], Xavier E. Gomez[1], Wayne A. Scales[1,2]
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Jonathan Pozderac

EVAPORATION DUCT HEIGHT ESTIMATION FROM UWB LOWER ATMOSPHERIC PROPAGATION (LATPROP) MEASUREMENT SYSTEM
Luyao Xu*[1], Caglar Yardim[1], Swagato Mukherjee[1], Robert J. Burkholder[1], Jon Pozderac[1], Adam Christman[2], Harindra Fernando[2], Qing Wang[3], Edward Creegan[4]
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NUMERICAL MODELING OF SHIP MOTION AND SEA SURFACE ROUGHNESS EFFECTS ON X-BAND EM PROPAGATION MEASUREMENTS OF THE CASPER CAMPAIGNS
Qi Wang*, Robert Burkholder, Caglar Yardim, Jon Pozderac
Electrical and Computer Engineering, The Ohio State University, Columbus, OH

Maryam Sakhdari
PARITY-TIME-RECIPROCAL SYMMETRY IN RADIO-FREQUENCY ELECTRONICS
Maryam Sakhdari*, Pai-Yen Chen
Electrical and Computer Engineering, Wayne State University, Detroit, MI

James Schroeder
ELECTRON SLOSHING ASSOCIATED WITH INERTIAL ALFVEN WAVES
J. W. R. Schroeder*[1], F. Skiff[1], G. G. Howes[1], C. A. Kletzing[1], T. A. Carter[2], S. Vincena[2], S. Dorfman[2]
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Dim Siafarikas
MILLIMETER-WAVE TRANSMIT/RECEIVE SYSTEM FOR SECURE HIGH DATA RATE COMMUNICATIONS
Dimitrios Siafarikas*, Elias A. Alwan, John L. Volakis
Electrical and Computer Engineering, The Ohio State University, Columbus, OH

Aaron Smull
PARALLEL COMPUTATION IN HIERARCHICALLY SEMISEPERABLE METHODS FOR SURFACE INTEGRAL EQUATIONS
Aaron P. Smull*, Ana B. Manic, Branislav M. Notaros
Electrical and Computer Engineering, Colorado State University, Fort Collins, CO

Austin Sousa
THREE-DIMENSIONAL FORWARD MODELING OF LIGHTNING-INDUCED ELECTRON PRECIPITATION FROM THE RADIATION BELTS
Austin P. Sousa*[1], Robert A. Marshall[2]
[1]*Electrical Engineering, Stanford University, Stanford, CA*
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Nghia Tran
ANALYSIS OF MICRO-DOPPLER SIGNATURE OF HUMANOID ROBOT MOTIONS FOR HEALTH MONITORING
Nghia H. Tran*, Ankit Bhargava, Ozlem Kilic
Electrical Engineering and Computer Science, The Catholic University of America, Washington, DC

Satheesh Bojja Venkatakrishnan
WIDEBAND RF SELF-INTERFERENCE CANCELLATION FILTER FOR SIMULTANEOUS TRANSMIT/RECEIVE SYSTEMS
Satheesh Bojja Venkatakrishnan*, Elias A. Alwan, John Volakis
The Ohio State University, Columbus, OH

WIDEBAND AND MULTI-BEAM ANGLE OF ARRIVAL ESTIMATION USING ON-SITE CODING
Satheesh Bojja Venkatakrishnan*, Elias A. Alwan, John Volakis

Electrical and Computer Engineering, The Ohio State University, Columbus, OH

UNINTENTIONAL RF ENERGY TRANSFER DURING ENDOSCOPY
Satheesh Bojja Venkatakrishnan*[1], Edward L. Jones[2], Asimina Kiourti[1]
[1]*Electrical and Computer Engineering, The Ohio State University, Columbus, OH*
[2]*Surgery, University of Colorado, Denver, CO*

Mark Wagner
ESTIMATING REFRACTIVITY FROM PROPAGATION LOSS IN TURBULENT MEDIA
Mark A. Wagner*[1], Peter Gerstoft[1], Ted Rogers[2]
[1]*Electrical and Computer Engineering, University of California San Diego, La Jolla, CA*
[2]*SPAWAR, Point Loma, CA*

Weijia Zhan
ON THE SPECTRAL FEATURES OF EQUATORIAL SPREAD F ECHOES OBSERVED BY MELISSA
Weijia Zhan*[1], Fabiano S. Rodrigues[1], Eurico R. de Paula[2]
[1]*The University of Texas at Dallas, Richardson, TX*
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2016

Anas J. Abumunshar

- **18-40GHz Phased Array Antenna using Printed Circuit Board Fabrication and Surface-mount MEMS Phase Shifters**
  Anas J. Abumunshar*, Niru K. Nahar, Daniel J. Hyman, and Kubilay Sertel
  ElectroScience Laboratory, The Ohio State University, Columbus, OH

Ruzbeh Akbar

- Evaluation of the SMAP L1 Radar Backscatter Data and Effects of Terrain Topography on Soil Moister Estimation
  Ruzbeh Akbar*, Mahta Moghaddam
  Ming Hsieh Department of Electrical Engineering, University of Southern California, Los Angeles, CA

Faisal A. Alquaied

- **A Nonlinear Counts to Antenna Temperature Algorithm for a Total Power Radiometer with External Calibration and Noise Diode Injection**
  F. Alquaied and W. L. Jones
  Department of Electrical and Computer Engineering, University of Central Florida, Orlando, FL

Xin An

- **Excitation of Discrete and Broadband Whistler Waves in a Laboratory Plasma**
  X. An*, B. Van Compernolle, J. Bortnik, R. M. Thorne, P. Pribyl, and W. Gekelman
  Department of Atmospheric and Oceanic Sciences, University of California, Los Angeles, CA

Kyle Archer

- **Commissioning and Testing of SERENDIP VI Instrumentation**
  Kyle Archer*, Andrew Siemion, Dan Werthimer , Matt Lebofsky, Jeff Cobb, Zuhra Abdurashidova, and Jack Hickish
  Berkeley SETI Research Center, Berkeley, CA

Richard A. Black

- **Phased-Array 64-Element 20-MHz Receiver For Data Capture and Real-Time Beamforming**
  Richard A. Black, Jay M. Brady, Brian D. Jeffs, Junming Diao, and Karl F. Warnick
  Department of Electrical and Computer Engineering, Brigham Young University, Provo, UT

James M. Byrne

- **Space Radiation Environmental Analysis of Cubesat Avionics Components**
  James M. Byrne
  AeroAstro Department, Massachusetts Institute of Technology, Cambridge, MA

Jihun Choi

- **HF/VHF Antenna Characterization from Very-near-field Measurements over Arbitrary Closed Surfaces**
  Jihun Choi and Kamal Sarabandi
  Radiation Laboratory, Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, MI

Arjun Gupta

- **A Deployable Vivaldi-fed Conical Horn Antenna for CubeSats**
  Arjun Gupta*, J. Costantine, Y. Tawk, Christos G. Christodoulou, S. Pellegrino, and M. Sakovsky
  Configurable Space Microsystems, Innovations and Applications Center (COSMIAC), Universiy of New Mexico, Albuquerque, NM

Mina Labib

- **Coexistence between Radar and LTE-U Systems: Survey on the 5 GHz Band**
  Mina Labib*, Jeffrey H. Reed, Anothony F. Martone, and Amir I. Zaghloul
  Wireless@VT, Bradley Department of Electrical and Computer Engineering, Virginia Tech, Blacksburg, VA

Vignesh Manohar

- **Characterization of Ka-band Mesh Surfaces for CubeSat Reflector Antennas: From Simple Wire Grid Model to Complex Knits**
  Vignesh Manohar and Yahya Rahmat-Samii
  Department of Electrical Engineering, University of California, Los Angeles, CA

Dong-Yeop Na

- **Charge-conserving Relativistic PIC Algorithm on Unstructured Grids**
  Dong-Yeop Na*, Haksu Moon, Fernando L. Teixeira, and Yuri A. Omelchenko
  ElectroScience Laboratory, The Ohio State University, Columbus, OH

Lingnan Song

- **Analysis of Milimeter-size Implanted Loop Antennas for Brain-machine Interface Systems**
  Lingnan Song and Yahya Rahmat-Samii
  Department of Electrical Engineering, University of California, Los Angeles, CA

Gebreab K. Zewdie

- **Results of Coherent Backscatter Radar Imaging Using Capon's Method and Measurements Made by the Sao Luis Radar Interferometer**
  Gebreab K. Zewdie* and Fabiano S. Rodrigues
  The University of Texas in Dallas, Dallas, TX

2015

Behr Babakhani

A Beam Steering Linear Antenna Array with Novel Simultaneous Frequency Agility and Polarization Reconfigurablity
Behrouz Babakhani, Satish Sharma

Xiuzhang Cai

A Compact Broadband Horizontally Polarized Omnidirectional Antenna Using Folded Dipoles
Xiuzhang Cai, Kamal Sarabandi

Adaptively Matched Dual Band GPS Antenna for Plasma Environments
Xiuzhang Cai, Ali Uyrus, Abdulkadir C. Yücel, Amir Mortazawi, Eric Michielssen

Guanbo Chen

FDTD Based Numerical Green's Function for S-parameter Measurement in Inverse Scattering Problems
Guanbo Chen, John Stang, Mahta Moghaddam

Robert Hulsey

Adjustable Zone Microwave Ablation
Robert Hulsey, Mustafa Asili, Erdem Topsakal

Gregory Lee

Simulation and Characterization of Wearable, Flexible, Conductive Fabric based Antenna System
Gregory Lee, Abas Sabouni

Electronic Steerable Phased Array Antenna Design for Wireless Charging Application
Gregory Lee, David Carey, Abas Sabouni

Min Liang

Principal Component Analysis (PCA) based compressive sensing millimeter wave imaging system
Min Liang, Ying Li, Mark Neifeld, Hao Xin

3D Printable Multilayer Phased Array Design
Xiaoju Yu, Min Liang, Corey Shemelya, Ryan Wicker, Eric MacDonaldand, Hao Xin

Antenna Radiation Pattern Control through 3D Printed Inhomogeneous Dielectrics
Junqiang Wu, Xiaoju Yu, Min Liang, Hao Xin

Design of additive manufactured Luneburg Lens working at W-band
Min Liang, Hao Xin

Fabrication of a Realistic Breast Phantom Based on 3D Printing Technology for Thermoacoustic Imaging Application in Breast Cancer Detection
Xiong Wang, Min Liang, Russell Witte, Hao Xin

Hung Luyen

Non-coaxial-based balanced antenna for microwave ablation
Hung Luyen, Susan C. Hagness, Nader Behdad

Ana Manic

Numerical Computation of Near-Singular and Near-Hypersingular Integrals in Higher Order Method of Moments Using Curved Quadrilateral Patches
Ana Manic, Branislav M. Notaros

Efficient EM Scattering Analysis Based on MoM, HSS Direct Solver, and RRQR Decomposition
Ana Manic, François-Henry Rouet, Xiaoye Sherry Li, Branislav M. Notaros

Measurement and Characterization of Winter Precipitation at MASCRAD Snow Field Site
Branislav M. Notaros, V. N. Bringi, Cameron Kleinkort, Gwo-Jong Huang, Elene Chobanyan, Merhala Thurai, Olivera Notaros, Ana Manic, Patrick Kennedy, Milan Ilic, Andrew Newman, John Hubbert, Timothy Lim, William Brown

Visual Hull Method Based Shape Reconstruction of Snowflakes from MASC Photographs
Cameron Kleinkort, Gwo-Jong Huang, Elene Chobanyan, Ana Manic, Milan Ilic, Ali Pezeshki, V. N. Bringi, Branislav M. Notaros

Anton Menshov

An H-Matrix Accelerated Direct Solver for Fast Analysis of Scattering from Structures in Layered Media
Anton Menshov, Kai Yang, Vladimir I. Okhmatovski, Ali E. Yilmaz

Method of Moment Solution of Surface-Volume-Surface Electric Field Integral Equation for 2D TM and TE Scattering on a Penetrable Cylinders of Arbitrary Cross-Section
Farhad Sheikh Hosseini Lori, Anton Menshov, Vladimir I. Okhmatovski

Thomas Mozdzen

Evaluation of Terrestrial Sites for Global EOR Signal Detection via the RMS Error Metric of a Sky-Beam Convolution Polynomial Fit.
Thomas Mozdzen, Judd Bowman, Alan Rogers, Raul Monsalve

Characterization of the EDGES Receiver and its Capability for Constraining the EoR
Raul Monsalve, Judd Bowman, Alan Rogers, Thomas Mozdzen

2014

Elias A. Alwan

- **BC1-5 ANALYTICAL AND EXPERIMENTAL EVALUATION OF A NOVEL WIDEBAND TRANSCEIVER WITH ON-SITE CODING**
  Elias A. Alwan*, Waleed Khalil, John L. Volakis
  Dept. of Electrical and Computer Engineering, ElectroScience Laboratory, The Ohio State University, Columbus, OH

Cosan Caglayan

- **A2-6 NON-CONTACT PROBES FOR ON-WAFER CHARACTERIZATION OF THZ DEVICES AND INTEGRATED CIRCUITS**
  Cosan Caglayan*, Georgios C. Trichopoulos, Kubilay Sertel
  Dept. of Electrical and Computer Engineering, ElectroScience Laboratory, The Ohio State University, Columbus, OH

Andrew Compston

- **EGH2-1 WHISTLER OBSERVATIONS ON DEMETER COMPARED WITH FULL ELECTROMAGNETIC WAVE METHOD SIMULATIONS**
  Andrew Compston*(1), Morris Cohen (2), Nikolai Lehtinen (1), Umran Inan (1,3), Ivan Linscott (1), Ryan Said (4), Michel Parrot (5)
  (1) Dept. of Electrical Engineering, Stanford University, Stanford, CA
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  (3) Koc University, Istanbul, Turkey
  (4) Vaisala, Inc., Boulder, CO
  (5) LPC2E, CNRS, Orleans, France

Alexander Fletcher

- **HG1-7 RF EMISSION FROM HYPERVELOCITY IMPACT PLASMA**
  Sigrid Close*, Alexander Fletcher, Theresa Johnson, Ivan Linscott, Ashish Goel, Nicolas Lee
  Dept. of Aeronautics and Astronautics, Stanford University, Stanford, CA
- **HG1-8 SIMULATING HYPERVELOCITY IMPACT PLASMAS AND THEIR EFFECTS ON SPACECRAFT**

Alexander Fletcher*, Sigrid Close
Dept. of Aeronautics and Astronautics, Stanford University, Stanford, CA

Ahmad Gheethan

- **A1-2 MM-WAVE BEAM SCANNING FOCAL PLANE ARRAYS USING MICROFLUIDIC RECONFIGURATION TECHNIQUES**
  Ahmad Gheethan*, Abhishek Dey, Gokhan Mumcu
  Dept. of Electrical Engineering, University of South Florida, Tampa, FL

Saeid Houshmandyar

- **H2-6 WAVES IN WAVE-PRODUCED PLASMAS: DUCTED KINETIC ALFVÉN WAVES IN HELICON SOURCES**
  Saeid Houshmandyar*(1), Earl E. Scime (2)
  (1) Dept. of Physics, Gonzaga University, Spokane, WA
  (2) Dept. of Physics, West Virginia University, Morgantown, WV

Faezeh Tork Ladani

- **B9-1 EFFECTS OF DIPOLAR SCATTERER ORIENTATION BESIDE A PLASMONIC NANOSPHERE IN EXCITATION RATE ENHANCEMENT**
  Faezeh Tork Ladani*, Filippo Capolino
  Dept. of Electrical Engineering and Computer Science, University of California, Irvine, Irvine, CA

Lindsay E. McTague

- **EGH2-7 A RADIO-INFORMED SEARCH FOR WEAK TERRESTRIAL GAMMA-RAY FLASHES WITH FERMI GBM**
  Lindsay E. McTague*(1), Steven A. Cummer (1), Michael S. Briggs (2), Valerie Connaughton (2), Shaolin Xiong (2), Gerald J. Fishman (3)
  (1) Dept. of Electrical and Computer Engineering, Duke University, Durham, NC
  (2) CSPAR, University of Alabama in Huntsville, Huntsville, AL
  (3) Jacobs Engineering Group Inc., Huntsville, AL

Shyam C. Nambiar

- **CEB1-2 A SIMPLE WIRELESS POWER TRANSFER SCHEME FOR IMPLANTED DEVICES**
  Shyam C. Nambiar*, Majid Manteghi
  Dept. of Electrical and Computer Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA

Reza Rezaiesarlak

- **A2-1 TIME-FREQUENCY ANALYSIS OF THE SCATTERED SIGNAL FROM CHIPLESS RFID TAGS**
  Reza Rezaiesarlak*, Majid Manteghi
  Dept. of Electrical and Computer Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA
- **CEB2-8 A NEW DETECTION TECHNIQUE FOR IDENTIFYING CHIPLESS RFID TAGS**
  Reza Rezaiesarlak*, Majid Manteghi
  Dept. of Electrical and Computer Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA

Padmashri Suresh

- **FB1-9 MEASUREMENT OF LOWER THERMOSPHERE USING THE OPTICAL PROFILING OF THE ATMOSPHERIC LIMB (OPAL) CUBESAT EXPERIMENT**
  Padmashri Suresh*, Charles M. Swenson
  Dept. of Electrical and Computer Engineering, Utah State University, Logan, UT
- **GH2-5 A NOVEL METHOD TO ANALYZE IONOSPHERIC MEASUREMENTS MADE BY A NON-UNIFORMLY CONTAMINATED LANGMUIR PROBE ON-BOARD A SOUNDING ROCKET**
  Padmashri Suresh*, Charles M. Swenson
  Dept. of Electrical and Computer Engineering, Utah State University, Logan, UT

Taha Shahvirdi Dizaj Yekan

- **FB1-7 EXPERIMENTAL STUDY ON THE EFFECT BETWEEN COMMERCIAL SPACE SOLAR CELLS AND THE ANTENNAS INTEGRATED ON THEIR COVER GLASS**
  Taha Shahvirdi Dizaj Yekan*, Reyhan Baktur
  Dept. of Electrical and Computer Engineering, Utah State University, Logan, UT

Xirui Zhang

- **BK1-1 A HIGH-THROUGHPUT OPTICAL BIOSENSOR PLATFORM FOR IN VITRO MONITORING DNA CONFORMATION AND DNA-PROTEIN INTERACTION**
  Xirui Zhang*(1), George G. Daaboul (1), Philipp S. Spuhler (1), David S. Freedman (2), Abdulkadir Yurt (3), Sunmin Ahn (1), Selim Unlu (1,2)
  (1) Dept. of Biomedical Engineering, Boston University, Boston, MA
  (2) Dept. of Electrical and Computer Engineering, Boston University, Boston, MA
  (3) Div. of Materials Science and Engineering, Boston University, Boston, MA

2013

Mustafa Aksoy

- **EFJ1-3 PERFORMANCE CHARACTERIZATION OF THE SMAP RFI MITIGATION ALGORITHM USING DIRECT-SAMPLED SMAPVEX 2012 DATA**
  Sidharth Misra*(1), Joel Johnson (2), Mustafa Aksoy (2), Jeffrey Piepmeier (3), Damon Bradley (3), Hsin Li (3), James Mederios (3), Ian O'Dwyer (1)
  (1) Jet Propulsion Laboratory, Pasadena, CA
  (2) Ohio State University, Columbus, OH
  (3) Goddard Space Flight Center, Greenbelt, MD
- **EFJ1-4 RFI CHARACTERIZATION FOR SMAP USING L-BAND DIRECT SAMPLED DATA OBTAINED DURING THE SMAPVEX12 AIRBORNE CAMPAIGN**
  Mustafa Aksoy*(1), Joel T. Johnson (1), Sidharth Misra (2), Ian O'Dwyer (2)
  (1) The Ohio State University, Columbus, OH
  (2) Jet Propulsion Laboratory, Pasadena, CA

Salvatore Campione

- **B1-4 INCREASED LOCAL DENSITY OF STATES AND ELECTROMAGNETIC WELL EFFECT BY USING VERY THIN HYPERBOLIC METAMATERIAL**
  Caner Guclu*, Salvatore Campione, and Filippo Capolino

Department of Electrical Engineering and Computer Science, University of California, Irvine, CA

- **B1-6 CONDITIONS FOR ELECTRIC FIELD ENHANCEMENT IN $\mathbb{E}$-NEAR-ZERO SLABS UNDER TM POLARIZED OBLIQUE INCIDENCE**
  Salvatore Campione* (1), Domenico de Ceglia(2), Maria A. Vincenti(2), Michael Scalora(3) and Filippo Capolino(1)
  (1) Department of Electrical Engineering and Computer Science, University of California, Irvine, CA
  (2) Aegis Technologies Inc., Huntsville, AL
  (3) US Army Charles M. Bowden Research Center, RDECOM, Redstone Arsenal, Huntsville, AL
- **B7-4 STUDYING DIPOLE MOMENT MODIFICATION IN A SINGLE FLUORESCENT DYE BESIDE METALLIC NANO-PARTICLE BASED ON THE GREENS FUNCTION THEORY**
  Faezeh Tork Ladani*, Caner Guclu, Salvatore Campione, Filippo Capolino
  Electrical Engineering and Computer Science, University of California Irvine, Irvine, CA

Ebrahim Forati

- **B7-3 THE INTERACTION OF ELECTROMAGNETIC WAVES AND THREE-DIMENSIONAL NONISOTROPIC (UNIAXIAL) WIRE MEDIUM METAMATERIALS BASED ON A TRANSPORT MODEL**
  Ebrahim Forati*, George W. Hanson
  Electrical Engineering, University of Wisconsin Milwaukee, Milwaukee

Joshua Kovitz

- **B3-8 A COMPARATIVE STUDY BETWEEN CMA EVOLUTION STRATEGIES AND PARTICLE SWARM OPTIMIZATION FOR ANTENNA APPLICATIONS**
  Joshua M. Kovitz*, Yahya Rahmat-Samii
  Electrical Engineering Department, University of California Los Angeles, Los Angeles, CA
- **BC1-3 A NOVEL MEMS RECONFIGURABLE WIDEBAND E-SHAPED PATCH ELEMENT FOR ADVANCED COGNITIVE RADIO BASE STATIONS**
  Joshua M. Kovitz*, Yahya Rahmat-Samii
  Electrical Engineering Department, University of California Los Angeles, Los Angeles, CA

Faezeh Tork Ladani

- **B7-4 STUDYING DIPOLE MOMENT MODIFICATION IN A SINGLE FLUORESCENT DYE BESIDE METALLIC NANO-PARTICLE BASED ON THE GREENS FUNCTION THEORY**
  Faezeh Tork Ladani*, Caner Guclu, Salvatore Campione, Filippo Capolino
  Electrical Engineering and Computer Science, University of California Irvine, Irvine, CA

Nicolas Lee

- **GH1-6 THEORY AND EXPERIMENTS CHARACTERIZING HYPERVELOCITY IMPACT PLASMAS: TOWARD WEATHERPROOF SPACECRAFT SYSTEMS**
  Nicolas Lee*, Sigrid Close
  Aeronautics and Astronautics, Stanford University, Stanford, CA
- **GH1-7 TRANSIENT PLASMA ANALYZER FOR HYPERVELOCITY IMPACT EXPERIMENTS**
  David Lauben*, Sigrid Close, Ashish Goel, Nicholas Lee, Paul Tarantino
  Stanford University, Stanford, CA

Alireza Mahmoudian

- **HG1-8 RECENT OBSERVATIONS AND MODELING OF NARROWBAND STIMULATED ELECTROMAGNETIC EMISSIONS SEES AT HAARP**
  Wayne A. Scales*(1), Maitrayee R. Bordikar (1), Alireza Samimi (1), Alireza Mahmoudian (1), Hayiang Fu (1), Paul A. Bernhardt (2), Stanley J. Briczinski (2), Michael J. McCarrick (3)
  (1) Bradley Department of Electrical and Computer Engineering, Virginia Tech, Blacksburg, VA
  (2) Plasma Physics Division, Naval Research Laboratory, Washington D.C.
  (3) Marsh Creek, LLC, Gakona, AK
- **HG1 -9 ELECTROMAGNETIC SIGNATURES OF ELECTRON ACCELERATION BY HIGH POWER RADIO WAVES IN THE IONOSPHERE**
  Paul A. Bernhardt*(1), Stanley J. Briczinski (1), Wayne A. Scales (2), Haiyang Haiyang Fu (2), Alireza Mahmoudian (2), Alireza Samami (2)
  (1) Plasma Physics Division, Naval Research Laboratory, Washington, DC
  (2) Electrical Engineering Department, Virginia Tech University, Blacksburg, VA
- **HG2-2 ION GYRO-HARMONIC STRUCTURING IN THE STIMULATED RADIATION SPECTRUM DURING THIRD ELECTRON GYRO-HARMONIC HEATING**
  Alireza Mahmoudian* (1), Wayne Scales (1), Stan Briczinski (2), Paul Bernhardt (2)
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Jianqi Qin

- **GHE1-5 MINIMUM CHARGE MOMENT CHANGE IN POSITIVE AND NEGATIVE CLOUD TO GROUND LIGHTNING DISCHARGES PRODUCING SPRITES**
  Jianqi Qin*, Sebastien Celestin, Victor P. Pasko
  The Pennsylvania State University, University Park, PA
- **GHE1-6 LOW FREQUENCY ELECTROMAGNETIC RADIATION FROM SPRITE STREAMERS**
  Jianqi Qin*, Sebastien Celestin, Victor P. Pasko
  Electrical Engineering, The Pennsylvania State University, University Park, PA

Weiwei Sun

- **C1-5 HIGH SPEED COMPUTATION FOR NEW DIGITAL VHF AND UHF PASSIVE RADAR RECEIVER**
  Weiwei Sun*, John D. Sahr
  University of Washington, Seattle, WA

Georgios Trichopoulos

- **CD1-2 TERAHERTZ COMPUTED TOMOGRAPHY USING A LARGE-FORMAT, REAL-TIME FOCAL PLANE ARRAY SENSOR**
  Georgios Trichopoulos*, Kubilay Sertel
  ECE, The Ohio State University, ElectroScience Laboratory, Columbus, OH
- **CD1-10 DEVICE CHARACTERIZATION WITH NON-CONTACT PROBES IN THE THZ BAND**
  Cosan Caglayan*, Georgios C. Trichopoulos, Kubilay Sertel
  Electroscience Laboratory, The Ohio State University, Columbus OH

Ryan Volz

- **G2-2 CLUSTERING AND CONFIDENCE INTERVALS FOR RADAR TARGET IDENTIFICATION AND ESTIMATION**

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Wenlong Yang

- **A3-3 AUTO-BALANCED DETECTOR FOR FIBER LASER BASED STIMULATED RAMAN SCATTERING (SRS) MICROSCOPY**
  Wenlong Yang* (1), Christian Freudiger (1), Gary Holtom (1), Khanh Kieu (2), Xiaoliang S. Xie (1)
  (1) Chemistry and Chemical Biology, Harvard University, Cambridge, MA
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Woon-Gi Yeo

- **BJ1-10 KA-BAND PHASED ARRAY ANTENNA WITH INTEGRATED MEMS PHASE SHIFTERS**
  Woon-Gi Yeo*, Niru K. Nahar, Kubilay Sertel
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