

Technical Program

DEFENSE & SECURITY

S Y M P O S I U M

An **SPIE** Event

17–21 April 2006

Gaylord Palms Resort and Convention Center

Orlando (Kissimmee), Florida USA




The International Society
for Optical Engineering



**IF YOU HAVE VISIONS OF OPTICAL
SYSTEMS OR FOCAL PLANES
DANCING IN YOUR HEAD**




LET'S TALK.



At Ball, we're looking into space. Deep space. Our projects enable us to look from space as well. And one of the keys to how well we'll be able to see is our optical and focal plane engineers. They work on a variety of projects from civil programs such as Deep Impact, the Hubble Instrument upgrades and Kepler to operational space programs like the NPOESS ozone mapping. They may even be asked to contribute their expertise to one of our many defense programs. At Ball, our scientists have the freedom and flexibility to follow their interests. And Ball offers something else, a great place to live and raise a family. We're located in Boulder, Colorado at the base of the Rocky Mountains just 30 minutes from Denver.

So if you eat, sleep, and dream optical engineering or focal plane technology, direct your focus to the current Colorado-based opportunities listed below.




We will be conducting interviews during the SPIE Defense and Security Symposium at the:

Orlando World Center Marriott
8701 World Center Drive
Orlando, FL

10:00 am - 4:00 pm
Tuesday, April 18th and Wednesday, April 19th

Recruiter Phone: 303-618-6191

(Look for our posters at the hotel or
call the number above for the suite location)



Engineering Manager Senior/Chief Engineer, Focal Plane, Optics (133820) will lead a team in the development of focal plane subsystem requirements, trade studies, and end-to-end system modeling. Will manage the development of custom CCD, CMOS, CID, and IR camera systems for high reliability applications.

Engineer Principal, Detector Test (136620) will lead the development and execution of test and characterization methods and equipment for custom CCD, CID, and IR camera systems for high reliability applications.

Engineering Manager II, Focal Plane Systems (133016) will lead a team in the development of focal plane subsystem requirements, trade studies, and end-to-end system modeling. Will lead cross functional teams (optical, electrical, mechanical, and thermal engineers) to develop and optimize detector system performance.

Project Engineer Senior, IPT Lead Manager, Focal Plane (133018) will lead in the successful execution of the architecture, design, manufacture, test, and delivery of Focal Plane Subsystems. Will lead a team in the management of cost and schedule for the successful definition, development, and delivery of focal plane subsystems.

Principal Engineer, Detector Packaging (136632) will help to define the system architecture and provide conceptual guidance in the design, fabrication, and test of low noise focal plane detectors used in both high-speed video and scientific space-based applications.

Technical Lead, Focal Plane Electronics (135690) will be responsible for the technical integrity of all work products produced within the DTC electronics product area. Will bring detector system architecture, focal plane electronics experience, subcontract management knowledge and understanding to the total program lifecycle.

Project Engineer Senior, Optics (108866) will manage space-based and terrestrial electro optical systems from concept development through operational implementation including planning and control of cost and schedule.

Staff Consultant/Chief Engineer, Focal Plane (133017) will provide technical leadership and support to Instrument Remote Sensing and/or Spacecraft Bus programs. Will bring experience in electro-optic subsystems and sensors (UV, visible, and/or IR), spacecraft payload interfacing, spacecraft telecommunication systems, command and data handling systems, or spacecraft power systems.

For a complete listing of all our jobs, including some in Albuquerque, NM and Dayton, OH, and to submit your resume, please go to www.ballaerospace.com/careers.html. You may call 303-618-6191 for more information. Ball Aerospace is proud to be an equal opportunity employer committed to a diverse workforce.



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Dr. John C. Carrano
Luminex Corp.
*Defense and Security
Symposium Chair*



Dr. Larry B. Stotts
DARPA
*Defense and Security
Symposium Cochair*

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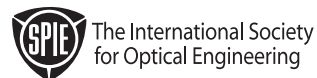
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This program is based on commitments received up to the time of publication and is subject to change without notice.

SPIE would like to express its deepest appreciation to the program chairs, conference chairs, cochairs, program committees, and session chairs who have so generously given of their time and advice to make this symposium possible. The symposium, like our other conferences and activities, would not be possible without the dedicated contribution of our participants and members.

Sponsored by:



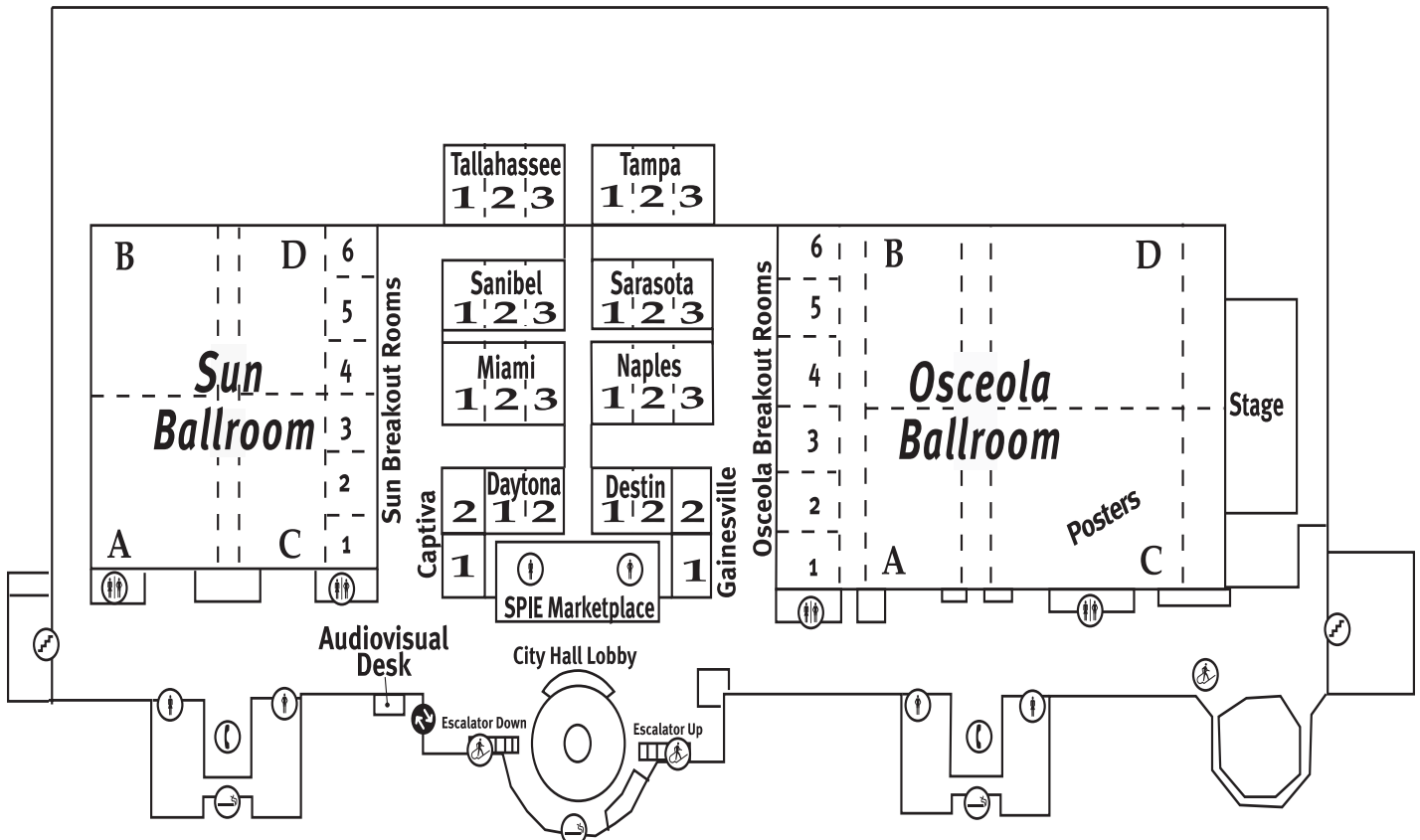
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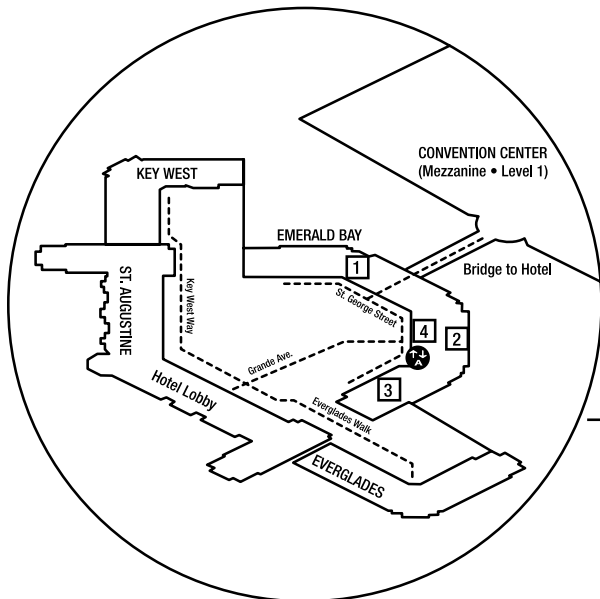
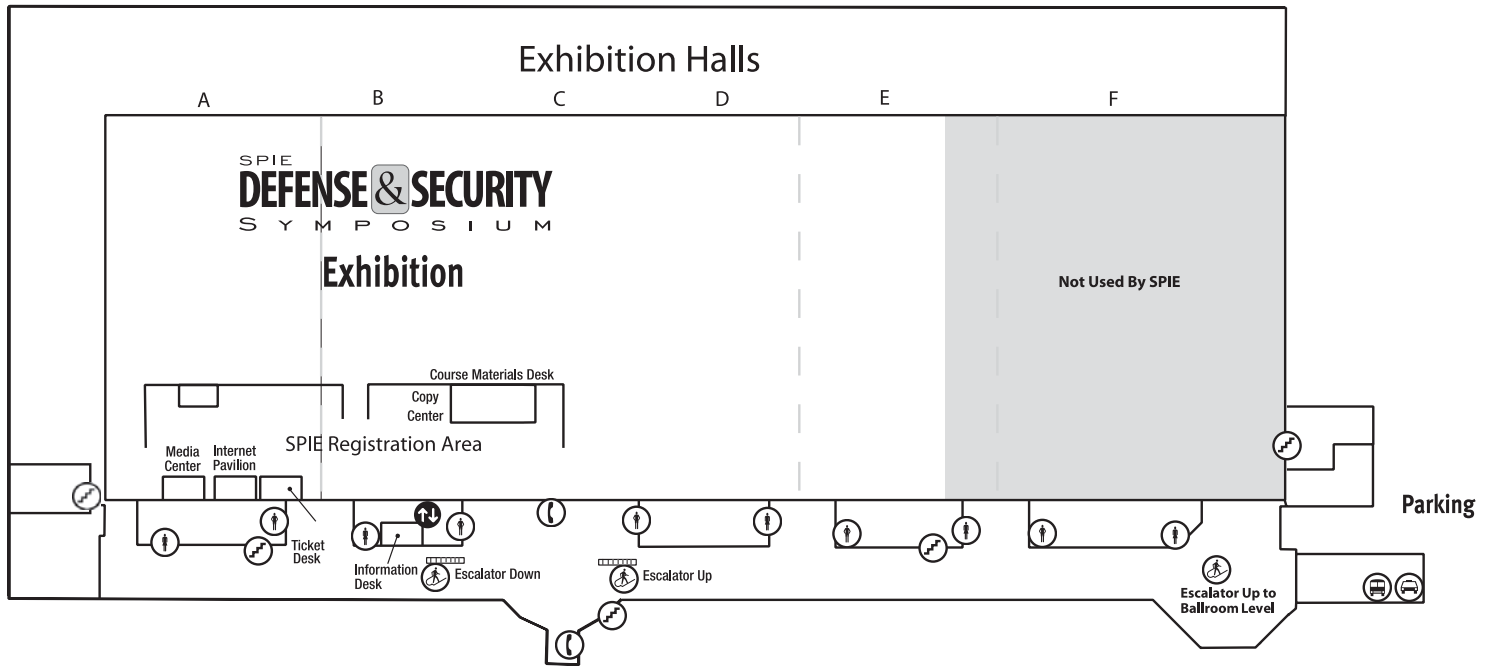


BALLROOM LEVEL (Level 2)



Gaylord Palms Resort & Convention Center

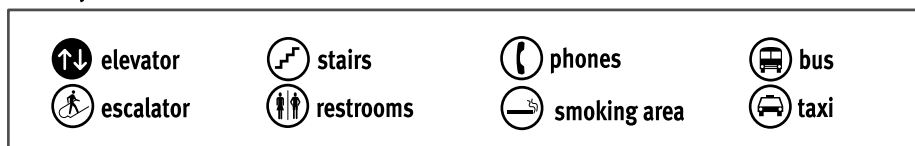
EXHIBITION LEVEL (Lower Level)



Additional Meeting Rooms In Hotel:

- | | |
|--|---|
| 1 HEMINGWAY AND SANCHEZ BOARDROOMS:
Level 4 via Emerald Bay Elevators | 3 102-108 ST. GEORGE STREET MEETING ROOMS:
On St. George St. |
| 2 EMERALD ROOMS 1-8
Pool Level, down 1 level from Atrium | 4 ORANGE BLOSSOM ROOM:
Atrium level |

Key:

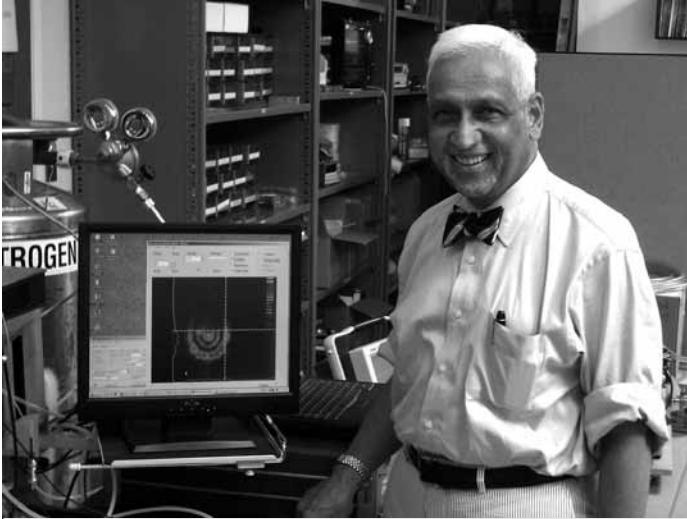


Special Events

Monday 17 April	Tuesday 18 April	Wednesday 19 April	Thursday 20 April	Friday 21 April
<p><i>Plenary Presentation for Signal Image and Neural Net Processing Program Track:</i> Quantum computing using linear optics and hybrid approaches, 8:55 to 10:00 am, p. 10</p>	<p><i>Plenary Presentation for Space Technologies and Operations Program Track:</i> Should we enhance the observing systems or improve coordination among the operating agencies, 8:05 to 8:35 am, p. 11</p>	<p><i>Plenary Presentation for Tactical Sensors and Imagers Program Track:</i> Millimeter wave myths and reality, 8:40 to 9:20 am, p. 11</p>	<p><i>Industry Perspective:</i> The Future of Hyperspectral Imaging, 8:30 to 10:30 am, p. 15</p>	<p><i>Student Event: Optimizing Your Resume</i>, 1:30 to 4:00 pm, p. 13</p>
<p><i>Special Presentation</i> 6206-05: From infrared imaging to Space, 9:30 to 10:00 am, p. 6</p>	<p><i>Special 2-Day Event!</i> SPIEWorks Career Fair 10:00 am to 5:00 pm 10:00 am to 5:00 pm <i>See page 18 for further details.</i></p>		<p><i>Technical Group Meeting:</i> Polarization, 11:40 am to 1:30 pm, p. 9</p>	
<p><i>Student Event: Lunch with the Experts - A Networking Event</i>, 12:30 to 1:30 pm, p. 12</p>	<p><i>Special Session: The Use of Civil Remote Sensing in Improving Hurricane Forecasting and Assisting Emergency Responders</i>, 11:10 am to 12:10 pm, p. 0</p>	<p><i>Industry Perspectives:</i> DARPA/MTO Photonics Overview, 9:00 to 9:40 am, p. 14-15 The Future of Terahertz Imaging, 9:40 to 10:20 am</p>	<p><i>Student Event: The Craft of Scientific Writing: A Workshop on Technical Writing</i>, 1:30 to 5:30 pm, p. 13</p>	
<p><i>Plenary Presentation for Communications Program Track:</i> Optimal polarized waveform design for low-grazing-angle targets in compound-Gaussian clutter, 1:20 to 2:20 pm, p. 10</p>	<p>SPIE Women in Optics Lunch, Noon to 1:00 pm, p. 7</p>	<p>The Future of Fiber Lasers, 2:00 to 3:15 pm The Future of Infrared Imaging, 3:30 to 4:45 pm</p>	<p><i>UGS User Panel Discussion</i>, 2:30 to 4:30 pm, p. 8</p>	
<p>Thermosense Vendor Presentations and Reception, 5:30 to 8:00 pm, p. 41</p>	<p>Joint Panel Discussion (6249 & 6220), 4:00 to 5:00 pm, p. 7</p>	<p>DARPA Grand Challenge, 6:00 to 6:45 pm, p. 8</p>	<p><i>Technical Group Meeting:</i> Global Homeland Security, 5:15 to 6:30 pm, p. 9</p>	
<p>Invited Panel Discussion: Issues in Resource Management with Applications to Real-World Problems, 7:00 to 9:30 pm, p. 6</p>	<p>Infrared Image Gallery Award, 5:50 to 6:30 pm, p. 7</p>	<p>Banquet and Award Presentation, 7:00 to 9:30 pm, p. 5</p>	<p>Defense and Security Displays Workshop, 8:00 to 10:00 pm, p. 8</p>	
<p><i>Evening Speaker: "and where do we go from here?"</i> 6:30 to 7:30 pm, p. 12</p>	<p><i>Technical Group Meeting:</i> Port and Harbor Security Subcommittee Meeting, 5:30 to 6:30 pm, p. 9</p>			
	<p><i>Technical Group Meeting:</i> Thermosense, 7:30 to 9:00 pm, p. 9</p>			
	<p><i>Technical Group Meeting:</i> Automatic Target Recognition, 7:45 to 9:00 pm, p. 9</p>			
	<p><i>Demonstrations and Open Discussion:</i> Signal and Data Processing, 8:00 to 10:00 pm, p. 7</p>			
	<p>Poster Sessions, 6:00 to 7:30 pm, p. 7</p>			
	Exhibition, p. 16-17			
	10:00 am to 5:00 pm	10:00 am to 5:00 pm	10:00 am to 2:00 pm	

Banquet and Award Presentation

Wednesday 19 April · 7:00 to 9:30 pm · Osceola Ballroom D



\$80 per person

Ticket purchase deadline is
1:00 pm on Monday 17 April
at the SPIE Cashier

Please join your colleagues to present the DSS Honoree of the Year Award to Dr. Kumar Patel.

All attendees are invited to the banquet on Wednesday evening. Dinner will start at 7:00 pm, followed by a presentation highlighting the works of Dr. Kumar Patel. Tickets for the banquet and presentation are \$80 per person and are sold separately from the conference registration. Ensure your place and purchase your tickets. The ticket purchase deadline is 1:00 pm on Monday 17 April at the SPIE Cashier. Space is limited.

Dr. Kumar Patel

Department of Physics and Astronomy, Univ. of California/Los Angeles and Pranalytica, Inc.

Presentation on: Confessions of a Laser Jock

Dr. Patel has over 40 years of experience in the field of lasers and holds 39 patents. His creation of the Carbon Dioxide Laser has covered the sphere of uses in every area of the sciences.

He began his career at Bell Labs. In early 1980s he was appointed Executive Director of AT&T Bell Labs Physics Research and subsequently Executive Director of Materials Science and Engineering, where he was well known as a dynamic advocate of others' work along with opening new areas of innovation. In 1993 the University of California at Los Angeles recruited Dr. Patel to be its Vice Chancellor for Research. In 2000, he returned to his academic position in the Department of Physics & Astronomy and founded Pranalytica, Inc.

Among his numerous awards and honors, Dr. Patel is the 1996 National Medal of Science recipient.

Defense and Security Executive Committee

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Dieter Clement, FGAN-FOM (Germany)

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F. Patrick Doty, Sandia National Labs.

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Harry L. Guthmuller, Naval Surface Warfare Ctr.

Russell S. Harmon, U.S. Army Research Office

Michael J. Hayduk, Air Force Research Lab.

Daniel Henry, Recon/Optical, Inc.

Jeffery R. Heberley, U.S. Army RDECOM/TARDEC

Darrel G. Hopper, Air Force Research Lab.

John H. Holloway, Naval Surface Warfare Ctr. Panama City

Gerald C. Holst, JCD Publishing

Richard T. Howard, NASA Marshall Space Flight Ctr.

R. Jennifer Hwu, Innosys, Inc.

Sabah A. Jassim, Univ. of Buckingham (United Kingdom)

Bahram Javidi, Univ. of Connecticut

James O. Jensen, U.S. Army Edgewood Chemical Biological Ctr.

Ivan Kadar, Interlink Systems Sciences, Inc.

Gary W. Kamerman, FastMetrix, Inc.

T. S. Kelso, Ctr. for Space Standards and Innovation

James E. Kimbrell, L-3

Communications/Brashear

Kathryn M. Knettel, United Space Alliance

Valentin Korman, Madison Research Corp.

James L. Kurtz, Univ. of Florida

Carlton E. Land, Joint Non-Lethal Weapons Directorate

Daniel Lehrfeld, Photonic Products Group, Inc.

Paul E. Lewis, National Geospatial-Intelligence Agency

Guifang Li, College of Optics and Photonics/Univ. of Central Florida

Peter L. Marasco, Air Force Research Lab.

Michael K. Masten, Texas Instruments Inc.

Jonathan J. Miles, James Madison Univ.

Pejmun Motaghehi, The Boeing Co.

Robert Lee Murrer, Millennium Engineering and Integration Co.

Fazio Nash, Air Force Research Lab.

Mark A. Neifeld, The Univ. of Arizona

Paul R. Norton, U.S. Army Night Vision & Electronics Sensors Directorate

Erkki Oja, Helsinki Univ. of Technology (Finland)

Sharath Pankanti, IBM Thomas J. Watson Research Ctr.

G. Raymond Peacock, Temperatures.com, Inc.

Andrew R. Pirich, Air Force Research Lab.

Kevin L. Priddy, Air Force Research Lab.

Zia-ur Rahman, College of William & Mary

Raghuveer M. Rao, Rochester Institute of Technology

Clarence E. Rash, U.S. Army Aeromedical Research Lab.

Colin E. Reese, U.S. Army Night Vision & Electronic Sensors Directorate

Stephen E. Reichenbach, Univ. of Nebraska/Lincoln

Robert Richards, Optech, Inc. (Canada)

Mark J. Rosker, DARPA

Firooz A. Sadjadi, Lockheed Martin Corp.

Theodore T. Saito, Lawrence Livermore National Lab.

Kevin Schum, Air Force Research Lab.

Sylvia S. Shen, The Aerospace Corp.

Charles M. Shoemaker, Army Research Lab.

Glenn T. Shwaery, Univ. of New Hampshire

Alex F. Sisti, Air Force Research Lab.

Mark J. T. Smith, Purdue Univ.

Larry A. Stockum, The Boeing Co.

Larry B. Stotts, DARPA

Raja Suresh, General Dynamics Advanced Information Systems

Harold H. Szu, The George Washington Univ. and Office of Naval Research

Edward W. Taylor, International Photonics Consultants, Inc.

Peter Tchoryk, Michigan Aerospace Corp.

William E. Thompson, Air Force Research Lab.

Robert N. Trebits, Georgia Institute of Technology

Dawn A. Trevisani, Air Force Research Lab.

Monte D. Turner, DARPA

Jacques G. Verly, Univ. de Liège (Belgium)

George Vourvopoulos, Science Applications International Corp.

Wendell R. Watkins, Independent Consultant

David A. Wikner, Army Research Lab.

Gary L. Wood, Army Research Lab.

Dwight L. Woolard, Army Research Lab.

Stephan H. Wyatt, QuickSet International Inc.

Cynthia Y. Young, Univ. of Central Florida

Edmund G. Zelnio, Air Force Research Lab.

John C. Zolper, DARPA

Michael D. Zoltowski, Purdue Univ.

Monday
17 April

Special Presentation · 6206-05

From infrared imaging to Space

Monday 17 April · 9:30 to 10:00 am · Sun Ballroom A



Gregory H. Olsen, Sensors Unlimited, Goodrich Corp.

Gregory H. Olsen, Ph.D. is chairman of the Board of Directors and co-founder of Sensors Unlimited Inc., a developer and manufacturer of optoelectronic devices for fiber optic communications systems, photonic and near infrared imaging devices.

Olsen co-founded Sensors Unlimited in 1991. Under his direction, the company has been profitable since its inception and grown into a world-class fiber optic component design, fabrication and supply operation without any outside investment. In 2000, Finisar Corp. acquired Sensors Unlimited for \$600 million. Then in 2002, Olsen orchestrated a management buyback of the company. In October 2005, Sensors Unlimited was sold again, and became a part of Goodrich Corporation's Optical and Space Systems Division.

In 1984, prior to his work at Sensors Unlimited, Olsen founded EPITAXX Inc., a high-technology company that manufactured fiber optic detectors and emitters. EPITAXX was acquired twice, once in 1990 by Nippon Sheet Glass for \$12 million and again in 1999 by JDS Uniphase for \$400 million.

In October 2005 he became the third private fare-paying space traveler, blasting off on a Russian Soyuz rocket and docking with the International Space Station. He spent eight days there, living with Russian cosmonauts and U.S. astronauts and helping to carry out experiments. He hopes to use his experience as a means of kindling interest in space, science and technology among young people by visiting schools and giving talks about his trip.

Olsen earned a master's degree in Physics at Fairleigh Dickinson Univ., and his PhD in Materials Science at the Univ. of Virginia.

See conference 6206 for further details.

Student Lunch with the Experts - A Networking Event

Monday 17 April · 12:30 to 1:30 pm

Combine fun, food and networking at this engaging, free event open to all students. Hosted by SPIE Student Services, this event will feature experts willing to share their accumulated wisdom on career paths within the optics and photonics industry. Please come early, as space is limited.

Vendor Presentations and Reception

Monday 17 April · 5:30 to 8:00 pm · Sun Breakout 5-6

Chairs: **G. Raymond Peacock**, Temperatures.com, Inc.; **Andrés E. Rozlosnik**, SI Termografía Infrarroja (Argentina)

A new feature at Thermosense XXVIII, brief presentations from hardware and software vendors on what is new this year in their product lines that impact thermal imaging applications and practices.

See conference 6205 for further details.

Invited Panel Discussion

Issues in Resource Management with Applications to Real-World Problems

Monday 17 April · 7:00 to 9:30 pm · Osceola Breakout 3-4

Chairs: **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Ronald P. Mahler**, Lockheed Martin Corp.

Moderators: **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Thiagalingam Kirubarajan**, McMaster Univ. (Canada)

See conference 6235 for further details.

Tuesday
18 April



Special 2-Day Event!

SPIEWorks Career Fair

Tuesday 18 April 10:00 am to 5:00 pm
 Wednesday 19 April 10:00 am to 5:00 pm
 See page 18 for further details.

Special Session

The Use of Civil Remote Sensing in Improving Hurricane Forecasting and Assisting Emergency Responders

Tuesday 18 April · 11:10 am to 12:10 pm · Osceola Breakout 5-6

Chair: **Paul E. Lewis**, National Geospatial-Intelligence Agency

Presentations:

The use of remotely sensed data and innovative modeling to improve hurricane prediction, R. M. Atlas, NOAA Atlantic Oceanographic and Meteorological Lab.

U.S. Environmental Protection Agency civil airborne rapid needs assessment efforts in the aftermath of Hurricanes Katrina and Rita, M. J. Thomas, U.S. Environmental Protection Agency Region VII

See conference 6233 for further details.

SPIE Women in Optics Lunch

Tuesday 18 April · Noon to 1:00 pm

Join us for an opportunity to network with other optics professionals, generate new contacts, and expand your resources and referrals. This SPIE hosted luncheon at Defense and Security is the perfect way to meet and develop relationships with others in your field. Register for this lunch at the SPIE Cashier onsite; location information will be provided upon sign-up.

Joint Panel Discussion on Responsive Space

Tuesday 18 April · 4:00 to 5:00 pm · Sun Ballroom C

Moderators: **Raja Suresh**, General Dynamics Advanced Information Systems and **Peter Tchoryk**, Michigan Aerospace Corp.

Panelists: **Joseph R. Guerci**, DARPA; **David A. Whelan**, The Boeing Co.; **Ronald Graves**, General Dynamics C4 Systems; **Jeffrey Puschell**, Raytheon Space and Airborne Systems

See conference 6249 and 6220 for further details.

Infrared Image Gallery Award

Tuesday 18 April · 5:50 to 6:30 pm · Sun Breakout 5-6

Chair: **Ralph Dinwiddie**, Oak Ridge National Lab.

See conference 6205 for further details.

Demonstrations and Open Discussion

Signal and Data Processing

Tuesday 18 April · 8:00 to 10:00 pm · Sarasota 1-2

See conference 6236 for further details.

Poster Sessions

Tuesday 18 April · 6:00 to 7:30 pm · Osceola Ballroom C

Conference attendees are invited to attend the poster sessions on Tuesday and Thursday evenings. Each evening will represent a different set of conferences. Come view the posters, ask questions, and enjoy the refreshments. Authors of poster papers will be present to answer questions concerning their papers. Attendees are requested to wear their conference registration badges to the poster sessions.

Special Events

Wednesday
19 April



Special 2-Day Event! SPIEWorks Career Fair

Tuesday 18 April 10:00 am to 5:00 pm
Wednesday 19 April 10:00 am to 5:00 pm
See page 18 for further details.

DARPA Grand Challenge Wednesday 19 April · 6:00 to 6:45 pm · Osceola Ballroom A

Speaker: **Larry Stotts**, Deputy Director,
DARPA Advanced Technology Office



The Defense Advanced Research Projects Agency (DARPA) Grand Challenge was a unique program to harness American ingenuity to accelerate autonomous ground vehicle technology that could be used to someday save lives on the battlefield.

The Grand Challenge was simple: DARPA would award a \$2 million prize to any one that could develop an autonomous ground vehicle that could travel approximately 140 miles across tough Mojave Desert roads in under ten hours. The program began in 2003, and Stanford won the \$2 million prize on Oct 8, 2005 when their vehicle ‘Stanley’ completed the course in 6 hours and 53 minutes. There were 4 other finishers in the 2005 race, proving the concept that prize competitions can accelerate technology development.

Larry Stotts will provide an insider’s view of the Grand Challenge program—its goals, processes, results, and most importantly, the stories of the innovators who took part in the great race.

Banquet and Award Presentation Wednesday 19 April · 7:00 to 9:30 pm · Osceola Ballroom D

Please join your colleagues to present the DSS Honoree of the Year Award to Dr. Kumar Patel.

Dr. Kumar Patel
Department of Physics and Astronomy, Univ. of California/
Los Angeles and Pranalytica, Inc.

All attendees are invited to the banquet on Wednesday evening. Dinner will start at 7:00 pm, followed by a presentation highlighting the works of Dr. Kumar Patel. Tickets for the banquet and presentation are \$80 per person and are sold separately from the conference registration. Ensure your place, the ticket purchase deadline is 1:00 pm on Monday 17 April at the SPIE Cashier. See page 3 for further details.

Thursday
20 April

UGS User Panel Discussion Thursday 20 April · 2:30 to 4:30 pm · Sun Ballroom B

Moderator: **Edward M. Carapezza**, DARPA and Cochair of DoD/DoJ Joint Program Committee Steering Group
See conference 6231 for further details.

Defense and Security Displays Workshop Thursday 20 April · 8:00 to 10:00 pm · Naples I

Theme: **Display Technology and Issues**

Facilitator: **Jim Byrd**, U.S. Air Force Aeronautical Systems Ctr.

Agenda

- 8:00 pm: **Welcome and solicitation of topics.**
- 8:05 pm: **Demonstrations** (announcements of setups in back of ballroom)
 - Flexible Plasma Display (Ms. Carol Wedding)
 - Metrolaser 3D Display
 - Display Symbology Language (Mike Gilger)
- 8:10 pm: **Initial discussion topics include:**
 - Structure of Displays Track at SPIE Orlando and Other SPIE Venues
 - Need for Standardized Interfaces
 - Emerging Defense and Security Display Requirements
 - Revolutionary Display Advances: Ultraresolution, True3D, Rollable Active Screens, etc.
 - Industry/Academia View of New Technologies DoD & DHS Should Be Considering (but are not)
- 9:00 pm: **Impromptu topics and demonstrations**
- 10:00 pm: **Adjourn**

Displays workshops are free to all registered attendees at SPIE Defense and Security Symposium.

See conference 6225A for further details.

Poster Sessions Thursday 20 April · 6:00 to 7:30 pm · Osceola Ballroom C

Conference attendees are invited to attend the poster sessions on Tuesday and Thursday evenings. Each evening will represent a different set of conferences. Come view the posters, ask questions, and enjoy the refreshments. Authors of poster papers will be present to answer questions concerning their papers. Attendees are requested to wear their conference registration badges to the poster sessions.

Members and nonmembers alike are welcome to attend these informative meetings that provide excellent opportunities for networking with colleagues.

Port and Harbor Security Subcommittee Meeting

*Part of the Global Homeland Security Technical Group
Tuesday 18 April · 5:30 to 6:30 pm · Tallahassee 1*

Chair: Michael J. DeWeert, BAE Systems

This meeting will mark the three-year anniversary of the Port and Harbor Subcommittee of the Global Homeland Security Technical Group. Since this meeting occurs in the middle of the PHS conference, we will discuss which topics seem to be gaining the most attention, and promote the sessions still to come. This year's conference is organized by applications (container security, diver interdiction, etc.) instead of by technologies, in order to encourage cross-disciplinary collaborations. We will seek feedback on the effectiveness of the application-centric approach. We will also discuss the future direction of the PHS technical group — conferences, workshops, and what audiences we want to seek out. How can we scientists and engineers work effectively with the defenders and decision-makers to develop and deploy of protective systems? We look forward to seeing you in Orlando, and to working on this important initiative.

Thermosense Technical Group

Tuesday 18 April · 7:30 to 9:00 pm · Sun Breakout 5-6

Chair: Ralph Dinwiddie, Oak Ridge National Lab.

The Thermal Sensing for Diagnostics and Control (Thermosense) Technical Group of SPIE provides a forum for information exchange on relevant matters among technical group members, committees involved in thermosense technology, and SPIE. This is the most direct method of providing feedback to SPIE on the conduct and content for future Thermosense conferences as well as on other thermosense activity. This year the group will host a Thermographic Image contest and reception with prizes awarded to the top entries.

Contact Ralph Dinwiddie at:

dinwiddierb@ornl.gov or by phone at 423-574-7599; fax 423-574-3920

All members and nonmembers interested in participating in this event, or those wishing to join in the coordination process for future conferences and related activities are encouraged to attend.

Automatic Target Recognition Technical Group

Tuesday 18 April · 7:45 to 9:00 pm · Tampa 1

Chair: Firooz A. Sadjadi, Lockheed Martin Corp.

The main purpose of the Automatic Target Recognition (ATR) Technical Group is to bring together those members of academia, industry, and government institutions from around the world who are interested in research, development, and applications of ATR and its related technologies in an unrestricted setting.

Although the theme of ATR permeates SPIE meetings across the board, there is no unique forum for the exchange of ideas on a continuing basis. The ATR Technical Group will facilitate interaction between individuals and groups interested in these diverse sensors, platforms, and applications.

The Charter of the Group shall range from algorithms and processing, to the networking and communication between ATR platforms, to the design and development of infrastructures for supporting ATR.

Polarization Technical Group

Thursday 20 April · 11:40 am to 1:30 pm · Tampa 2

*Chairs: Arthur Lompado, Polaris Sensor Technologies, Inc.;;
Derek Sabatke, Ball Aerospace & Technologies Corp.*

This Technical Group is focused on research, development, engineering, and applications in fields of optics where polarization and its measurement are key issues.

Box lunches will be available for purchase in the room.

Global Homeland Security Technical Group

Thursday 20 April · 5:15 to 6:30 pm · Sun Ballroom D

Chair: Theodore T. Saito, Lawrence Livermore National Lab.

Join us! SPIE's Global Homeland Security Technical Group Meeting at DSS is key for planning the upcoming year as we pursue our mission "to stimulate and focus the optics and photonics community's contribution to enhance safety, improve the sense of well being, and to counter terrorist threats." We will have feedback from the activities at SPIE's Photonics West meeting (Jan 2006) including the special focus on Drinking Water Safety (chaired by Dan Kroll) and the meeting with a Water District. An update will also be given on our Port and Harbor Security subcommittee, chaired by Michael DeWeert. We will solicit input for future GHSTG conferences and activities. You need not be a technical group member to attend, and are invited to participate. Visit <http://spie.org/homelandsecurity> to learn more.

Track Plenary Presentations

Plenary Presentation for Signal Image and Neural Net Processing Track

Monday 17 April · 8:55 to 10:00 am · Osceola Ballroom D

8:55 am

Welcome and Introduction

Dr. Andrew R. Pirich

9:00 to 10:00 am

Quantum computing using linear optics and hybrid approaches



Professor James Franson,
Johns Hopkins Univ.

Although logic operations are inherently nonlinear, Knill, Laflamme, and Milburn have shown that quantum logic operations can be performed using linear optical elements, additional photons (ancilla), and feed-forward control based on measurements made on the ancilla. We have used techniques of that kind to demonstrate a controlled-NOT quantum logic gate, small-scale circuits, and quantum error correction. Although there has been considerable progress in linear optics quantum computing by a number of groups, the logic operations are probabilistic in the sense that they sometimes fail. A scalable approach to quantum computing must deal with these failure events in some way. One possible approach is to use cluster states, as has been demonstrated recently by the Zeilinger group. Hybrid approaches that combine ion traps or cavity QED with linear optics techniques may also be promising, since the probabilistic nature of the logic operations can be avoided using “repeat-until-success” techniques as suggested by Lim et al. We are considering an all optical solution to the problem in which the quantum Zeno effect is used to suppress the failure events altogether. In the Zeno effect, frequent measurements to determine whether or not an event has occurred can be used to prevent the event from ever occurring. We plan to implement Zeno logic gates by using strong two-photon absorption to inhibit the failure modes of our controlled-NOT logic gates. The status of experiments in these areas will be reviewed.

Dr. James Franson is a member of the Principal Professional Staff at the Johns Hopkins University Applied Physics Laboratory and Research Professor in the Johns Hopkins Department of Electrical and Computer Engineering. He has a B.S. from Purdue U. and a Ph. D from Caltech.

Plenary Presentation for Communications Track

Optimal polarized waveform design for low-grazing-angle targets in compound-Gaussian clutter

Monday 17 April · 1:20 to 2:20 pm · Sun Ballroom C



Professor Arye Nehorai,
Washington Univ. in St. Louis

Targets at low elevation angles over the sea surface, such as sea-skimming missiles, are known to be difficult to detect due to the strong coherent multipath interference and non-Gaussian sea clutter. We develop optimal design methods of polarimetric radar signals to improve the sensing performance of such targets. The polarized waveforms are optimally selected based on the target and clutter parameters. We use a weighted sum of the Cramer-Rao bounds on the parameters of interest as the optimization cost function. We compare the performances of different sensor systems, including arrays of 6D and 2D vector sensors and 1D uniformly polarized sensors. Simulation examples illustrate the performance of the proposed methods for target detection and estimation.

This work has been done in collaboration with Martin Hurtado and Jian Wang.

Arye Nehorai received the B.Sc. and M.Sc. degrees in electrical engineering from the Technion, Israel, and the Ph.D. degree in electrical engineering from Stanford University, California. From 1985 to 1995 he was a faculty member with the Department of Electrical Engineering at Yale University. In 1995 he joined as Full Professor the Department of Electrical Engineering and Computer Science at The University of Illinois at Chicago (UIC). From 2000 to 2001 he was Chair of the department's Electrical and Computer Engineering (ECE) Division, which then became a new department. In 2001 he was named University Scholar of the University of Illinois. In 2006 he assumed the Chairman position of the Department of Electrical and Systems Engineering at Washington University in St. Louis, where he is also the inaugural holder of the Eugene and Martha Lohman Professorship of Electrical Engineering.

Dr. Nehorai was Editor-in-Chief of the IEEE Transactions on Signal Processing during the years 2000 to 2002. In the years 2003 to 2005 he was Vice President (Publications) of the IEEE Signal Processing Society, Chair of the Publications Board, member of the Board of Governors, and member of the Executive Committee of this Society. He is the founding editor of the special columns on Leadership Reflections in the IEEE Signal Processing Magazine.

He was co-recipient of the IEEE SPS 1989 Senior Award for Best Paper with P. Stoica, as well as co-author of the 2003 Young Author Best Paper Award and of the 2004 Magazine Paper Award with A. Dogandzic. He was elected Distinguished Lecturer of the IEEE SPS for the term 2004 to 2005. He is the Principal Investigator of the new multidisciplinary university research initiative (MURI) project entitled Adaptive Waveform Diversity for Full Spectral Dominance. He has been a Fellow of the IEEE since 1994 and of the Royal Statistical Society since 1996.

Plenary Presentation for Space Technologies and Operations Track

Should we enhance the observing systems or improve coordination among the operating agencies: what is needed the most for security: a philosophical discussion

Tuesday 18 April · 8:05 to 8:35 am · Osceola Ballroom D

Shahid Habib, Assistant Director, Earth Science Directorate, NASA Goddard Space Flight Ctr.

Dr. Shahid Habib is responsible for the strategic planning activities include short, mid and long range plans addressing science needs, technology readiness, risks, manpower, budget and Inter-Agency partnering and international collaborations. He is part of the Earth Sciences Directorate management team dealing with such issues and advising and representing the Directorate members on critical matters. In this capacity he requires an extensive understanding and coordination with a wider science and engineering community in order to prioritize present and future science needs deriving major remote sensing space flight missions. These missions serve a critical role in studying earth's integrated climate system by providing global measurements from various vantage points from space to clarify uncertainties such as carbon cycle budget, global hydrology cycle, land-imaging and biomass changes, solid earth hazards and ocean and atmospheric variability.

He is responsible for managing the Independent Research and Development program to focus the investments in the enabling technologies (such as lasers, UV, microwave and infrared radiometry, formation flying and on-board processing, and sensor webs) to meet the science goals. He also oversees the critical workforce issues and budget for the future missions under definition and development.

Dr. Habib has received a number of awards and commodations including the Yuri Gagarin Medal of Honor by the Russian Government. Dr. Habib holds a bachelor degree in Electrical Engineering from Northern Arizona University, master's degree also in electrical engineering from Arizona State University, and Doctorate of Science degree in systems and non linear controls from the George Washington University. His area of specialization was Continuous Time Neural Network Controller for Non Linear Systems. He is a registered professional engineer. He is a member of Tau Beta Pi, Eta Kappa Nu honor societies. He also is a member of IEEE and AIAA.

Plenary Presentation for Tactical Sensors and Imagers Track

Millimeter wave myths and reality

Wednesday 19 April · 8:40 to 9:20 am · Osceola Ballroom D



H. Bruce Wallace, MMW Concepts

Mr. H. Bruce Wallace is an internationally recognized expert on millimeter-wave (MMW) and sub-MMW technology. He received the BA degree in physics from the Johns Hopkins University in 1971 and the MSEE degree from the University of Delaware in 1984.

Following his bachelor's degree he entered the US Army as a Lieutenant in the Ordnance Corps. In 1974, after serving in the US Army, he joined the Ballistics

Research Laboratory where he investigated the application of millimeter-wave techniques to weapon systems. Key among these studies were MMW sensor systems which combined radar and radiometry into a single sensor which became the primary sensor for the SADARM artillery delivered system, which was used effectively in the most recent Iraq war. For his work he received the US Army Research and Development Award in 1981. He subsequently led his research team to establish the Army's High Resolution Radar Imaging facility at the Aberdeen Proving Grounds, MD, which provides state-of-the-art imaging of ground platforms.

From 1996 to 2004 he was the Chief of the RF & Electronics Division where he was responsible for the research that led to development of the Army's Multifunction Radio Frequency System (MFRF) which has become a key electronic component in the Future Combat Systems (FCS). He was also responsible for the numerous programs investigating passive MMW Imaging, Ultra-Wideband Radar, and Frequency Control technology. During that period he was involved in NATO sensor panels including chairing the NATO TG-24 Panel on Multifunctional RF Technologies.

He is a Fellow of the IEEE Geosciences and Remote Sensing Society.

Student Events

Lunch with the Experts - A Networking Event

Monday 17 April · 12:30 to 1:30 pm

Combine fun, food and networking at this engaging, free event open to all students. Hosted by SPIE Student Services, this event will feature experts willing to share their accumulated wisdom on career paths within the optics and photonics industry. Please come early, as space is limited.

Among the experts in attendance will be:

Belur V. Dasarathy, Ph.D. FIEEE, is an independent consultant to Defense, Aerospace, and Other Civilian/Commercial Clients in the design of Autonomous/Semi-Autonomous Decision Systems in multi-source, multi-sensor information environments. He is the founding and current Editor-in-Chief of the First International Journal on Information Fusion. He also teaches short courses at SPIE and other organizational events as well as at client locations. He has 3 books and nearly 200 other open-literature publications. He is the organizing chair of the annual SPIE conferences on Information Fusion and Data Mining.

Dr. Grant Gerhart is currently is a Senior Research Scientist (ST) within the Tank-automotive Research Development and Engineering Center (TARDEC) in Warren, MI. He is an author on more than 200 journal articles and conference proceedings and holds 7 patents. His primary research focus at present relates to small unmanned ground vehicle technology. Dr. Gerhart received the U.S. Army Greatest Inventions Award in 2005 for the ODIS robot deployment to Iraq and Afghanistan. He is a member of the IEEE, AIP, APS, JOSA and SPIE professional societies and a fellow of SPIE.

Peter Tchoryk is the Chief Executive Officer (CEO) of Michigan Aerospace Corporation and is responsible for leading the day-to-day operations of the company. He has nearly 20 years experience in developing and leading the development of advanced technology, including optical and electro-optical systems for satellite, aircraft (fixed and rotary wing), and ship-based platforms, sensors for military and commercial applications, as well as software systems development. Some of the areas that he has cultivated while at Michigan Aerospace include optical air data systems for stealth aircraft and weapon systems and autonomous rendezvous and docking systems for on-orbit satellite servicing and situational awareness. Mr. Tchoryk received his Masters in Electrical Engineering from the University of Michigan in 1994 and his Bachelors from GMI in 1986 and is currently working on a Masters in Economics.

Evening Speaker

“...and where do we go from here?”



Dr. Robert Rosner,
Argonne National Labs
Monday 17 April · 6:30 to 7:30pm
Sun Ballroom C

Look to the future with Dr. Robert Rosner, Director of Argonne National Labs. Dr. Rosner will discuss opportunities for student professional development through the national labs and examine growth fields in optics.

Robert Rosner, an internationally recognized astrophysicist, recently assumed the leadership of Argonne National Laboratory. Prior to his position as Director of Argonne, he served as Chief Scientist at the institution since 2002. He was chairman of astronomy and astrophysics at the University of Chicago from 1991 to 1997, and since 1998 has been the university's William E. Wrather Distinguished Service Professor. He was the Rothschild Visiting Professor at the Newton Institute for Mathematical Sciences at Cambridge University in 2004. He was elected to the American Academy of Arts and Sciences in 2001, and is a Fellow of the American Physical Society. He holds a Ph.D. in physics from Harvard University (1976) and bachelors in physics from Brandeis University (1969).

The Craft of Scientific Presentations: A Workshop on Technical Presentations

This course provides attendees with an overview of what distinguishes the best scientific presentations. The course introduces a new design for presentation slides that is both more memorable and persuasive from what is typically shown at conferences.

LEARNING OUTCOMES

This course will enable you to:

- account for the audience, purpose, and occasion in a presentation,
- logically structure the introduction, middle, and ending of a scientific presentation,
- create a memorable and persuasive set of presentation slides, and
- deliver a presentation with more confidence.

INTENDED AUDIENCE

This material is intended for anyone who needs to present scientific research. Those who either have not yet presented or have made several presentations will find this course valuable.

INSTRUCTOR

Michael Alley teaches writing and speaking to engineering and science students at Virginia Tech. Alley has taught this workshop at Sandia National Labs, Los Alamos National Laboratory, and United Technologies.

COURSE PRICE INCLUDES the text *The Craft of Scientific Presentations* by the instructor. This workshop is **free** to SPIE Student Members. **You must register to attend.**

Course level: Introductory

WS667 CEU .35 \$55 / \$110 USD

Thursday 8:30 am to 12:30 pm

**Students Save
50% on courses**

The Craft of Scientific Writing: A Workshop on Technical Writing

This course provides an overview on writing a scientific paper. The course focuses on the structure, language, and illustration of scientific papers.

LEARNING OUTCOMES

This course will enable you to:

- account for the audience, purpose, and occasion in a scientific paper,
- logically structure the introduction, middle, and ending of a scientific paper,
- understand how to make your language clear, energetic, and fluid, and
- avoid the most common mechanical errors in scientific writing.

INTENDED AUDIENCE

This material is intended for anyone who needs to write about scientific research. Those who either have not yet written a paper or have written several papers will find this course valuable.

INSTRUCTOR

Michael Alley teaches writing and speaking to engineering and science students at Virginia Tech. Alley has taught this workshop at Sandia, Lawrence Livermore, and Los Alamos National Laboratory.

COURSE PRICE INCLUDES the text *The Craft of Scientific Writing* by the instructor. This workshop is **free** to SPIE Student Members. **You must register to attend.**

Course level: Introductory

WS668 CEU .35 \$55 / \$110 USD

Thursday 1:30 to 5:30 pm

Optimizing Your Resume

Today's job market pits you against hundreds, if not thousands, of candidates who have approximately the same credentials as you do. How do you stand out in the crowd? This workshop, which concentrates on students and recent graduates, will review a number of strategies, tips, and tools that you can use to increase the impact of your resume and cover letter. We'll examine ways to translate your educational experience into a format that is attractive to potential employers, and how to create tailored versions of your job search materials for multiple targets. The process of creating your resume will be discussed, with a focus on both layout/formatting and writing style. We'll also look at cover letters, lists of references, and other materials used in your job search.

LEARNING OUTCOMES

This course will enable you to:

- translate your educational and work experience into a focused and effective resume
- avoid common mistakes and misconceptions
- understand how HR and hiring managers typically review resumes
- tailor your resume and cover letter for multiple job targets
- use an effective layout and format to ensure maximum impact
- write a cover letter that helps you stand out from the crowd

INTENDED AUDIENCE

This student-only course is focused toward students and recent graduates who want to improve the quality and effectiveness of their job search materials.

INSTRUCTOR

John Cain is a former professional resume writer, and has written more than 500 resumes and cover letters for multiple industries and professions, focusing primarily on technical fields. He currently develops technical education programs for SPIE.

NOTE: This workshop is **only** open to students. There is no cost for the workshop, **but you must register to attend**; student ID will be required.

Course level: Introductory

**WS777 CEU .35 FREE to students;
student ID is required to attend**

Friday 1:30 to 4:00 pm

Register for Courses
at the SPIE Cashier.

Industry Perspectives

Technology Review and Forecasts in the Defense Industrial Base

In this new series of sessions, R&D leaders from DoD, DARPA, civilian agencies, and the commercial sector share their views on the future of technology, while spotlighting outstanding applications that support defense and security.

Industry panelists will stimulate your thinking in a discussion format that will enrich your perspective, help you identify new opportunities to collaborate, and solve critical problems using COTS technology spanning optics, photonics, and imaging.

These sessions are FREE for all attendees, including technical conference attendees, exhibitors and exhibition-hall visitors.

Wednesday Morning • April 19

9:00 to 9:40 am • Orange Blossom Ballroom

DARPA/MTO Photonics Overview

John Zolper, Director, Defense Advanced Research Projects Agency (DARPA), Microsystems Technology Office (MTO)

DARPA/MTO has played a central role in developing photonics technology for the DoD. Photonics continue to be a key enabler for future DoD systems. In this presentation, you'll hear about the key themes and future capabilities spanning photonic integration, imaging and sensing, RF photonics, communications, and nanotech. This is one overview no one in business should miss.

Wednesday Morning • April 19

9:40 to 10:20 am • Orange Blossom Ballroom

The Future of Terahertz Imaging

Panel session with leaders from R&D and industry will discuss emerging technology, applications, and vision of what's next for terahertz imaging.

Panelists will include executives from Picometrix, QinetiQ and TeraView

Terahertz imaging has grown in importance as new and sophisticated devices come to market, enabling applications for detection and imaging of concealed weapons, explosives, or toxic substances. This regime between microwaves and the infrared (i.e., ~ 0.3 – 3.0 THz), offers many advantages for sensing and characterizing chemical and biological systems. This session brings together a panel of industry experts to discuss the most promising applications (including security screening and remote sensing of biological warfare agents), future technologies, and deployment issues relevant for assessing the future of Terahertz imaging.



Wednesday Afternoon · April 19

2:00 to 3:15 pm · Orange Blossom Ballroom

The Future of Fiber Lasers

Panel session with leaders from R&D and industry will discuss emerging technology, applications, and vision of what's next for fiber lasers.

Panelists will include executives from **Aculight, OZ Optics, IPG Photonics, Nufern, and JDSU.**

Fiber lasers are increasing in popularity especially where high beam quality, cooling, efficiency, small size, light weight and maintenance-free longevity are essential. Today, performance rates are increasing to the point that applications ranging from industrial lasers (marking, cutting, welding, etc.) to laser weapons are in sight. The compact size, reliability, flexible path, reduced power consumption, and distances delivered via fiber allow easier placement and integration than ever before. Attend this session to hear from industry executives about their different architectures, case studies, technology roadmaps, and vision of the future.

Wednesday Afternoon · April 19

3:30 to 4:45 pm · Orange Blossom Ballroom

The Future of Infrared Imaging

Panel session with leaders from R&D and industry will discuss emerging technology, applications, and vision of what's next for infrared imaging.

Panelists will include executives from **iRobot, Raytheon, L-3 Cincinnati Electronics, Sensors Unlimited and BAE Systems.**

High resolution night vision and thermal imagery are critical aspects of battlefield awareness and information superiority. Whether for night-vision systems on the ground or space-based surveillance, new technologies continue to improve the ability to detect, identify and track items of interest. In this session, you will hear from the R&D leaders and product suppliers devoted to increasing the quality of imagery – while reducing weight and power— in solutions for homeland defense and military applications.



Thursday Morning · April 20

9:00 am to 11:30 am · Osceola Ballroom D

The Future of Hyperspectral Imaging: an Industry Perspective

Special session with leaders from R&D and industry will discuss emerging technology, applications, and vision of what's next for hyperspectral imaging.



Session Chair: **David Bannon**, COO, Headwall Photonics

Hyperspectral imaging, which involves detection and spectral analysis using hundreds of narrow, contiguous spectral channels, has been deployed by the DoD as a critical enabling technology to enhance battlespace awareness and homeland security. The acquisition of spectral information within a spatial framework is important for many applications ranging from UAV surveillance and target classification to land-mine detection to chemical/biological threat assessment. Hyperspectral sensors have also proven an extremely valuable for environmental monitoring and remote sensing for earth sciences applications. Now, technology developments and innovation have enabled the deployment of hyperspectral sensors to new application areas.

In this comprehensive session – industry leaders and program managers who have deployed hyperspectral sensors – you will hear and discuss what is being achieved today with COTS products. Developments include the reduction in size and cost of hyperspectral sensors for both the visible and infrared, along with more efficient processing techniques for hyperspectral data. The result is a greater understanding of the hyperspectral technology landscape, the opportunities, and the deployment options that must be considered. Don't miss this session!

I. Hyperspectral Technology Perspective: Where We've Been and Where We're Going

Keynote: Alex Goetz, Professor, Geological Sciences Director, Center for the Study of Earth from Space University of Colorado/Boulder; Chairman, Analytical Spectral Devices Inc.

II. An Industry Perspective: Hyperspectral Applications - How and Where it's Used

15 minute presentations each

Speakers:

- Agilent Technologies**
- Florida Environmental Research Institute**
- Naval Research Labs**
- US Dept of Agriculture**

III. Hyperspectral Imaging Technology: Hardware and Software Solutions

30 minute panel discussion

Participants:

- Headwall Photonics**
- Research Systems Inc.**
- Sensors Unlimited**
- XenICs**

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Tuesday 18 April 2006 10:00 am to 5:00 pm

Wednesday 19 April 2006 10:00 am to 5:00 pm

Thursday 20 April 2006 10:00 am to 2:00 pm

Make time to see the largest collection of IR imaging equipment, as well as the detectors, sensors, and cameras, and technologies that support homeland defense. Come connect with the right people, discover where the industry is going.

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ABB Analytical & Advanced Solutions
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Acreo AB
Active Silicon
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Acutronic USA, Inc.
Adimec
Advanced Imaging Magazine
Advanced Laser Systems Technology, Inc. (L-3 ALST)
Aerotech, Inc.
AFRL Sensor Directorate
AFRL Technology Horizons
Agilent Technologies
AGM Container Controls, Inc.
AIM Infrarot-Module GmbH
Air Force Research Lab.
Alpes Lasers
Alpine Research Optics Corp.
Ametek HCC Industries
Ampex Data Systems Corp.
Analog Modules, Inc.
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Barr Associates Inc.
Bodkin Design & Engineering, LLC
Boston Electronics Corp.
Boulder Imaging Inc.
Boulder Nonlinear Systems, Inc.
Brandywine Optics
Brysen Optical Corp
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CMC Electronics Inc.
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Coastal Optical Systems, Inc.
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Colibrys SA
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The Cooke Corp.
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Core by Indigo
Corning Inc.
Correlated Solutions, Inc.
Critical Imaging LLC
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Crytur USA
CVI Laser LLC
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Digital Infrared Imaging, Inc.
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Goodrich Corp.
GPD Optoelectronics Corp.
Great River Technology
GSI Group
H.N. Burns Engineering Corp.
Hamamatsu Corp.
Headwall Photonics
Heim Data Systems, Inc.
Hellma International, Inc.
Heraeus Quartz America
HiEnergy Technologies, Inc.
High Plains Optics
High Tech Photonics
Hitachi Kokusai
HOLOEYE Systems, Inc.
Ideal Aerosmith, Inc.
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ISG Thermal Systems USA Inc.
Isorad Ltd.
ISP Optics Corp.
Isuzu Glass Inc.
ITF Optical Technologies Inc.
ITT Industries
ITT Industries, AES Div.
Janos Technology, Inc.
JDSU
JENOPTIK Laser, Optik, Systeme GmbH - Business Unit Sensor Systems
JENOPTIK Laser, Optik, Systeme GmbH - Business Unit Optics
JMAR Technologies, Inc.

JT Ingram Sales & Marketing
 Judson Technologies, LLC
 K&Y Diamond Ltd.
 Kigre, Inc.
 Kollman, Inc.
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 Lake Shore Cryotronics, Inc.
 Lambda Research Corp.
 Lambda Research Optics, Inc.
 LAS-CAD GmbH
 LASER COMPONENTS IG, Inc.
 Laser Focus World
 Laser Optics
 Laser Research Optics
 Lasertel, Inc.
 Liebmann Optical Co.
 Lightel Technologies, Inc.
 LightPath Technologies, Inc.
 Lincoln Laser Co.
 Lumenera Corp.
 Lumics
 Lumitron
 LxSiX Photonics Inc.
 M3 Measurement Solutions Inc.
 The MathWorks Inc.
 Matrix, Inc.
 Max Levy Autograph, Inc.
 McPherson Inc.
 McQ
 MegaWatt Lasers, Inc.
 Meller Optics, Inc.
 Melles Griot
 MEMS Optical Inc.
 Met One Instruments, Inc.
 Metavac
 Micro Laser Systems, Inc.
 MicroDISC, Inc.
 MicroE Systems
 MIDAC Corp.
 Military & Aerospace Electronics
 Mindrum Precision, Inc.
 Missile Defense Agency SBIR
 Moore Nanotechnology Systems LLC
 Moulded Optics GmbH
 MPA Crystal Corp.
 MRC a PPGI company
 Multitel
 Naked Optics Corp.
 Nanjing Saifei Electro-Optics Co., Ltd.
 National Aperture, Inc.
 National Reconnaissance Office
 NDIA – National Defense Industrial
 Association
 NEC Corp.
 Neptec Design Group
 New England Photoconductor Corp.
 New Scale Technologies, Inc.
 Newcon Optik
 Newport Corp.
 Nippon Avionics Co., Ltd.
 nLight Corp.
 Northrop Grumman Corp.
 Northrop Grumman, Cutting Edge
 Optronics
 Nova Engineering, Inc.
 Nova Sensors
 Nozomi Photonics
 Nuferr
 Ocean Optics, Inc.
 Octec Ltd.
 OFIL/Eklund Innovations Inc.
 Olympus Industrial America
 ONTAR Corp.
 Onyx Optics Inc.
 Opgal Optronics Industries Ltd.
 Ophir Optics, Inc.
 Opnext, Inc.
 Optech, Inc.
 Optical Surface Technologies, LLC
 OPTICS 1, Inc.
 Optics Technology, Inc.
 Optikos Corp.
 Optimax Systems, Inc.
 OptiPro Systems

Opto Diode Corp.
 OptoSigma Corp.
 Optron Laboratories, Inc.
 Orion RD & P Center
 OSI Optoelectronics, Inc.
 OZ Optics Ltd.
 Pacific Advanced Technology
 Panavision Federal Systems
 Phoenix Diamond Turning
 Photo Sciences, Inc.
 Photon Engineering, LLC
 Photon Gear, Inc.
 Photonic Cleaning Technologies
 Photonic Products Ltd.
 Photonic Sense GmbH
 Photonics Industries International,
 Inc.
 Photonics Industry Association of
 New York (PIANY)
 Photonics Spectra - Laurin Publishing
 Photonics.com/Photonics Directory
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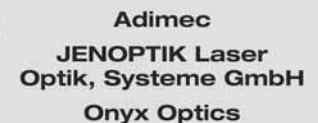
Tuesday Afternoon Dessert



Wednesday Afternoon Dessert



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Optical and Optomechanical Engineering				
SC156 Basic Optics for Engineers (<i>Ducharme</i>) 8:30 am to 5:30 pm, \$495 / \$580	SC178 Introduction to Radiometry and Photometry (<i>McCluney</i>) 8:30 am to 12:30 pm, \$395 / \$435	SC725 Optical & Laser Scanning Technology: Devices, Systems & Applications (<i>Marshall</i>) 8:30 am to 5:30 pm, \$630 / \$715	SC781 Optomechanical Analysis (<i>Hatheway</i>) 8:30 am to 5:30 pm, \$460 / \$555	
SC010 Introduction to Optical Alignment Techniques (<i>Ruda</i>) 8:30 am to 5:30 pm, \$885 / \$1035		SC447 Principles for Mounting Optical Components (<i>Yoder, Jr.</i>) 8:30 am to 5:30 pm, \$955 / \$1105		
		SC220 Optical Alignment Mechanisms (<i>Guyer</i>) 1:30 to 5:30 pm, \$285 / \$325	NEW SC785 Aerospace Miniaturization Using Multifunctional MEMS (<i>Bruhn</i>) 1:30 to 5:30 pm, \$290 / \$330	
Law Enforcement and Homeland Security				
SC584 Night Vision Tools for Homeland Security (<i>Kaplan</i>) 1:30 to 5:30 pm, \$315 / \$365	SC719 Chemical & Biological Detection: Overview of Point and Standoff Sensing Technologies (<i>Gardner</i>) 1:30 to 5:30 pm, \$285 / \$325	NEW SC766 Information Processing for Video Surveillance (<i>Ebrahimi, Dufaux</i>) 8:30 am to 5:30 pm, \$460 / \$545	SC633 Algorithms for Biometric Recognition (<i>Vijaya Kumar</i>) 1:30 to 5:30 pm, \$390 / \$430	
SC586 When Sonar Isn't Enough: Marine Optics for Port Security (<i>DeWeert, Gilbert</i>) 8:30 am to 12:30 pm, \$285 / \$325				
Sensor Networks				
SC640 Introduction to Sensor Networks (<i>Rao</i>) 8:30 am to 5:30 pm, \$460 / \$545				SC728 Network Centric Target Tracking and Classification (<i>Drummond</i>) 8:30 am to 5:30 pm, \$460 / \$545
Signal and Image Processing				
SC066 Fundamentals of Electronic Image Processing (<i>Weeks</i>) 8:30 am to 5:30 pm, \$520 / \$605	SC714 From FFTs to Wavelets for Image & Signal Processing (<i>Smith, Burrus</i>) 8:30 am to 12:30 pm, \$285 / \$325	SC197 Fundamentals of Digital Signal/Image Processing (<i>Dianat</i>) 8:30 am to 5:30 pm, \$460 / \$545	SC536 Image Based Motion Analysis (<i>Sanders-Reed</i>) 8:30 am to 12:30 pm, \$285 / \$325	SC162 SAR Signal Processing (<i>Soumekh</i>) 8:30 am to 5:30 pm, \$540 / \$625
	SC715 Real World Solutions by Blind Sources Separations & ICA (<i>Szu, Makino</i>) 1:30 to 5:30 pm, \$395 / \$435	SC189 Image Recognition Using Statistical Filtering Techniques, Wavelets and Neural Networks (<i>Javidli</i>) 8:30 am to 5:30 pm, \$515 / \$600		
		NEW SC766 Information Processing for Video Surveillance (<i>Ebrahimi, Dufaux</i>) 8:30 am to 5:30 pm, \$460 / \$545		
			Registration is required. See SPIE Cashier to Register.	

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Multisource, Multisensor Information Fusion and Knowledge				
	<p>SC149 Multi-Sensor, Multi-Source Information Fusion: Architectures, Algorithms, and Applications (<i>Dasarathy</i>) 8:30 am to 5:30 pm, \$460 / \$545</p>			<p>SC174 Multispectral Image Processing (<i>Schowengerdt</i>) 8:30 am to 5:30 pm, \$550 / \$635</p>
Target Acquisition and Recognition				
<p>SC545 Infrared Characterization of Sources and Backgrounds (<i>Jacobs</i>) 8:30 am to 5:30 pm, \$470 / \$555</p>			<p>SC158 Fundamentals of Automatic Target Recognition (<i>Nasr</i>) 8:30 am to 5:30 pm, \$460 / \$545</p>	<p>SC728 Network Centric Target Tracking and Classification (<i>Drummond</i>) 8:30 am to 5:30 pm, \$460 / \$545</p>
<p>SC181 Predicting Target Acquisition Performance of Electro-Optical Imagers (<i>Vollmerhausen</i>) 8:30 am to 5:30 pm, \$460 / \$545</p>				
Modeling and Simulation				
	<p>SC783 How to Validate Your Models and Simulations (<i>Law</i>) 1:30 to 5:30 pm, \$365 / \$405</p>			
Displays				
		<p>SC159 Head-Mounted Displays: Design and Applications, Including Night Vision (<i>Melzer, Browne</i>) 8:30 am to 5:30 pm, \$500 / \$545</p>		
GPS Technology				
	<p>SC549 Incorporating GPS Technology into Commercial and Military Applications (<i>Uijt de Haag</i>) 8:30 am to 12:30 pm, \$285 / \$325</p>			

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SC167 Introduction to Laser Radar (<i>Kammerman</i>) 8:30 am to 12:30 pm, \$285 / \$325	SC168 Advanced Coherent Laser Radars Design and Applications (<i>Kammerman, Molebny</i>) 8:30 am to 5:30 pm, \$460 / \$545	NEW SC784 Fiber Lasers for Defense Applications: Fibers, Components and System Design Considerations (<i>Samson, Torruellas</i>) 8:30 am to 5:30 pm, \$460 / \$545	NEW SC789 Introduction to Optical and Infrared Sensor Systems (<i>Shaw</i>) 1:30 to 5:30 pm, \$285 / \$325	SC717 3D Visualization Techniques for Laser Radar (<i>Roth</i>) 8:30 am to 12:30 pm, \$285 / \$325
SC160 Precision Stabilization and Laser Pointing Systems (<i>Stockum, Masten</i>) 8:30 am to 5:30 pm, \$460 / \$545	SC178 Introduction to Radiometry and Photometry (<i>McCluney</i>) 8:30 am to 12:30 pm, \$395 / \$435	SC188 Laser Beam Propagation for Applications in Laser Communications, Laser Radar, and Active Imaging (<i>Phillips, Andrews</i>) 8:30 am to 5:30 pm, \$520 / \$605		
	SC338 Limitations to Imaging and Laser Propagation in the Atmosphere (<i>Farmer</i>) 8:30 am to 5:30 pm, \$550 / \$635	SC725 Optical & Laser Scanning Technology: Devices, Systems & Applications (<i>Marshall</i>) 8:30 am to 5:30 pm, \$630 / \$715		
	SC649 Optical Phased Array Design & Implementation (<i>McManamon</i>) 1:30 to 5:30 pm, \$285 / \$325			

Tactical Sensors and Imagers

SC713 Engineering Approach to Imaging System Design (<i>Holst</i>) 8:30 am to 5:30 pm, \$510 / \$595	SC178 Introduction to Radiometry and Photometry (<i>McCluney</i>) 8:30 am to 12:30 pm, \$395 / \$435	SC725 Optical & Laser Scanning Technology: Devices, Systems & Applications (<i>Marshall</i>) 8:30 am to 5:30 pm, \$630 / \$715	NEW SC782 Zone Plate Antennas for Millimeter-Wave and Terahertz Frequencies (<i>Wiltse</i>) 8:30 am to 12:30 pm, \$285 / \$325	SC154 Electro-Optical Imaging System Performance (<i>Holst</i>) 8:30 am to 5:30 pm, \$530 / \$615
	SC157 MTF in Optical and Electro-Optical Systems (<i>Ducharme</i>) 8:30 am to 5:30 pm, \$495 / \$580	SC547 Terahertz Wave Technology and Applications (<i>Zhang</i>) 8:30 am to 12:30 pm, \$285 / \$325	NEW SC789 Introduction to Optical and Infrared Sensor Systems (<i>Shaw</i>) 1:30 to 5:30 pm, \$285 / \$325	SC068 Use of CCD and CMOS Sensors in Visible Imaging Applications (<i>Lomheim</i>) 8:30 am to 12:30 pm, \$285 / \$325
	SC067 Testing and Evaluation of E-O Imaging Systems (<i>Holst</i>) 8:30 am to 5:30 pm, \$525 / \$610			SC194 Multispectral and Hyperspectral Image Sensors (<i>Lomheim</i>) 1:30 to 5:30 pm, \$285 / \$325

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SC155 Infrared Systems Design (<i>Daniels</i>) 8:30 am to 5:30 pm, \$665 / \$750	SC178 Introduction to Radiometry and Photometry (<i>McCluney</i>) 8:30 am to 12:30 pm, \$395 / \$435		SC164 Dynamic Infrared Scene Projection (<i>Williams</i>) 1:30 to 5:30 pm, \$285 / \$325
SC134 Optical Design Fundamentals for Infrared Systems (<i>Riedl</i>) 8:30 am to 5:30 pm, \$500 / \$585	SC165 Uncooled Thermal Imaging Arrays, Systems, and Applications (<i>Kruse</i>) 8:30 am to 12:30 pm, \$320 / \$360		
SC628 IR Threat Detection Systems (<i>de Jong</i>) 1:30 to 5:30 pm, \$285 / \$325	SC278 Infrared Detectors (<i>Dereniak</i>) 1:30 to 5:30 pm, \$385 / \$435		

Thermosense

SC786 Practical NEW Thermography for Nondestructive Testing (<i>Shepard</i>) 8:30 am to 12:30 pm, \$285 / \$325		SC710 NIR and SWIR Imaging Applications (<i>Richards</i>) 8:30 am to 12:30 pm, \$325 / \$365	
		SC711 Techniques for Accurate Infrared Temperature Measurement (<i>Seffrin</i>) 1:30 to 5:30 pm, \$285 / \$325	

Professional Development Workshops

WS774 Essential NEW Interpersonal Skills for Technical Professionals (<i>Hinkle</i>) 8:30 am to 5:30 pm, \$465 / \$550
WS667 The Craft of Scientific Presentations: A Workshop on Technical Presentations (<i>Alley</i>) 8:30 am to 12:30 pm, \$105 / \$160
WS668 The Craft of Scientific Writing: A Workshop on Technical Writing (<i>Alley</i>) 1:30 to 5:30 pm, \$105 / \$160

Registration is required.
See SPIE Cashier to Register.

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One fee covers these conferences and all related events!

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DARPA and Cochair of DoD/DoJ Joint Program Steering Committee

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Maxtech International, Inc.

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Naval Surface Warfare Ctr. Panama City

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Consultant

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Millimeter wave myths and reality

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H. Bruce Wallace, MMW Concepts

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Chairs: William E. Thompson, Air Force Research Lab.; Gary Gimmestad, Georgia Institute of Technology

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Should we enhance the observing systems or improve coordination among the operating agencies: what is needed the most for security: a philosophical discussion

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Shahid Habib, Assistant Director, Earth Science Directorate, NASA
Goddard Space Flight Ctr.

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Prof. James Franson, Johns Hopkins Univ.

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Communications and Networking Technologies and Systems

Chair: **Raghveer M. Rao**, Rochester Institute of Technology

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Mon. 1:20 to 2:20 pm · Sun Ballroom C

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DSS07 Ad

Sensors, and Command, Control, Communications, and Intelligence (C3I) Technologies for Homeland Security and Homeland Defense V

Conference Chair: **Edward M. Carapezza**, DARPA and Cochair of DoD/DoJ Joint Program Committee Steering Group

Program Committee: **John G. Blitch**, Blitz Solutions Inc.; **Samuel W. Casscells**, The Univ. of Texas Health Science Ctr. at Houston; **Christina J. Csanadi**, Space and Naval Warfare Systems Ctr., San Diego; **George V. Cybenko**, Dartmouth College; **A. Trent DePersia**, Department of Homeland Security; **Mildred A. Donlon**, DARPA; **John S. Eicke**, Army Research Lab.; **David D. Ferris, Jr.**, Bureau of Engraving and Printing; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Kurt A. Henry**, U.S. Navy Medical Corps.; **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego; **Bahram Javidi**, Univ. of Connecticut; **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Pradeep K. Khosla**, Carnegie Mellon Univ.; **David Knowles**, U.S. Secret Service; **Scott R. Lillibridge**, The Univ. of Texas Health Science Ctr. at Houston; **Parsa Mirhaji**, The Univ. of Texas Health Science Ctr. at Houston; **Paul F. Morgan**, U.S. Special Operations Command; **Dennis J. Reimer**, National Memorial Institute for the Prevention of Terrorism; **Nino Srour**, Army Research Lab.

Monday 17 April

SESSION 1

Room: Sun Breakout 3-4 Mon. 9:00 to 9:50 am

Keynote Session

Chairs: **George V. Cybenko**, Dartmouth College;
Pradeep K. Khosla, Carnegie Mellon Univ.

Keynote Presentation

9:00 am: **Cyber security and cyber defense: state of the art and challenges for the future** (Invited Paper), P. K. Khosla, Carnegie Mellon Univ. [6201-01]

SESSION 2

Room: Sun Breakout 3-4 Mon. 9:50 am to 12:10 pm

Infrastructure Protection and Cyber Security I

Chairs: **George V. Cybenko**, Dartmouth College;
Pradeep K. Khosla, Carnegie Mellon Univ.

9:50 am: **Process detection in homeland security and defense applications**, G. V. Cybenko, V. H. Berk, Dartmouth College [6201-02]

10:10 am: **Data exfiltration and covert channels**, A. Giani, V. Berk, G. V. Cybenko, Dartmouth College [6201-03]

Coffee Break 10:30 to 10:50 am

10:50 am: **Adaptive cyber-attack modeling system**, P. G. Gonsalves, E. Dougherty, Charles River Analytics, Inc. [6201-04]

11:10 am: **Dynamics of process-based social networks**, W. W. Chung, R. Savell, G. V. Cybenko, Dartmouth College [6201-05]

11:30 am: **Detection of complex cyber attacks**, V. Berk, I. Gregorio de Souza, A. Barsamian, G. Bakos, M. Bates, A. Giani, D. Madory, G. V. Cybenko, Dartmouth College [6201-06]

11:50 am: **Adversarial modeling, detection, and estimation**, E. Santos, Jr., Q. Zhao, V. Berk, P. Thompson, G. V. Cybenko, Dartmouth College [6201-07]

Lunch Break 12:10 to 1:15 pm

SESSION 3

Room: Sun Breakout 3-4 Mon. 1:15 to 3:15 pm

Infrastructure Protection and Cyber Security II

Chairs: **George V. Cybenko**, Dartmouth College;
Pradeep K. Khosla, Carnegie Mellon Univ.

1:15 pm: **Incorporating fault tolerance in distributed agent-based systems by simulating biocomputing model of stress pathways**, A. K. Bansal, Kent State Univ. [6201-08]

1:35 pm: **SF-SCTP: a new transport protocol to support QoS for FCS applications**, J. Zou, M. U. Uyar, City College/CUNY; M. A. Fecko, S. Samtani, Telcordia Technologies, Inc. [6201-09]

1:55 pm: **DAHA: a novel mechanism for wormhole attack detection in wireless ad hoc networks**, C. Chigan, Michigan Technological Univ. ... [6201-10]

2:15 pm: **IACR: information-aware collaborative routing in wireless sensor networks**, J. S. Lee, C. W. Chen, Florida Institute of Technology [6201-11]

2:35 pm: **A generic packet-dropping detection mechanism augmented with efficient power saving in ad hoc networks**, C. Chigan, Michigan Technological Univ. [6201-12]

2:55 pm: **An adaptive distributed data aggregation based on RCPC for wireless sensor networks**, G. Hua, C. W. Chen, Florida Institute of Technology [6201-13]

Coffee Break 3:15 to 3:35 pm

SESSION 4

Room: Sun Breakout 3-4 Mon. 3:35 to 4:35 pm

Container Inspection Sensor Systems I

Chair: **Todd M. Hintz**,
Space and Naval Warfare Systems Ctr., San Diego

3:35 pm: **Finding concealed high-atomic numbered materials hidden in large cargo containers using dual-energy high-energy x-rays from a linear accelerator with the unique signature from photofission**, J. E. Clayton, P. J. Bjorkholm, Varian Medical Systems [6201-14]

3:55 pm: **Prototype instrument for noninvasive ultrasonic inspection and identification of fluids in sealed containers**, A. A. Diaz, B. J. Tucker, Pacific Northwest National Lab.; B. A. Eckenrode, Federal Bureau of Investigation [6201-16]

4:15 pm: **Self-sensing array (SSA) technology for homeland security applications**, B. S. Rogers, R. Whitten, J. D. Adams, Nevada Nanotech Systems, Inc. [6201-17]

SESSION 5

Room: Sun Breakout 3-4 **Mon. 4:35 to 5:35 pm**
Urban and Through-The-Wall Sensor Systems

Chair: Todd M. Hintz,

Space and Naval Warfare Systems Ctr., San Diego

4:35 pm: **Through-the-wall target localization using dual-frequency CW radars**, F. Ahmad, M. G. Amin, P. Setlur, Villanova Univ. [6201-18]

4:55 pm: **Detection and localization of persons behind obstacles using M-sequence through-the-wall radar**, R. Zetik, Technische Univ. Ilmenau (Germany); S. Crabbe, Stephen Crabbe Consulting (Germany); J. Krajnak, Technická Univ. v Košiciach (Slovak Republic); P. Peyerl, MEODAT GmbH (Germany); J. Sachs, R. Thomä, Technische Univ. Ilmenau (Germany) .. [6201-19]

5:15 pm: **High-resolution through-wall imaging**, A. Beerli, CAMERO (Israel) [6201-20]

Tuesday 18 April

SESSION 6

Room: Sun Breakout 3-4 **Tues. 8:00 to 8:50 am**
Keynote Session

Chairs: Edward M. Carapezza,

DARPA and DoD/DoJ Joint Program Committee Steering Group;
Bahram Javidi, Univ. of Connecticut

Keynote Presentation

8:00 am: **Photon counting three-dimensional passive sensing and object recognition** (*Invited Paper*), B. Javidi, Univ. of Connecticut; E. A. Watson, Air Force Research Lab.; S. Yeom, Univ. of Connecticut [6201-21]

SESSION 7

Room: Sun Breakout 3-4 **Tues. 8:50 to 9:50 am**
Vehicle and Weapons Tracking Systems

Chairs: Edward M. Carapezza, DARPA and DoD/DoJ Joint Program Committee Steering Group; **Bahram Javidi**, Univ. of Connecticut

8:50 am: **Vehicle-borne IED detection using the ULTOR™ correlation processor**, J. D. Burcham, Advanced Optical Systems [6201-22]

9:10 am: **Intelligence-aided multitarget tracking for urban operations: a case study - counter terrorism**, K. Bharadwaj, Northrop Grumman Corp.; A. Sinha, T. Kirubarajan, McMaster Univ. (Canada) [6201-23]

9:30 am: **Adaptive processing to ensure practical application of a multiple hypothesis tracking system**, B. A. Cronin, B. K. Norman, R. J. Dempster, S. S. Blackman, Raytheon Space and Airborne Systems [6201-24] (*Published in both proceedings volumes 6236 and 6201*)

Coffee Break 9:50 to 10:20 am

SESSION 8

Room: Sun Breakout 3-4 **Tues. 10:20 am to 12:00 pm**
Biological Agent Sensors and Systems

Chair: Todd M. Hintz,

Space and Naval Warfare Systems Ctr., San Diego

10:20 am: **Autonomous biochemical decontaminator (ABCD) against weapons of mass destruction**, B. P. Hyacinthe, Florida State Univ. [6201-25]

10:40 am: **Detection of salmonella typhimurium using a magnetostrictive biosensor with immobilized polyclonal antibody**, R. Guntupalli, J. Hu, R. S. Lakshmanan, J. Wan, S. Huang, H. Yang, J. M. Barbaree, T. Huang, B. A. Chin, Auburn Univ. [6201-26]

11:00 am: **Advances in Brillouin spectroscopy for the detection of chemical and biological hazards**, G. O. Rubel, U.S. Army Soldier and Biological Chemical Command; H. Fung, Auburn Science [6201-27]

11:20 am: **Scanning micro-electrodes for biological cell impedance measurement**, Y. Tao, R. J. Fasching, F. Prinz, Stanford Univ. [6201-28]

11:40 am: **Biochemical transport modeling and estimation in realistic environments**, M. Ortner, A. Nehorai, Univ. of Illinois at Chicago [6201-29]

Lunch/Exhibition Break 12:00 to 1:00 pm

SESSION 9

Room: Sun Breakout 3-4 **Tues. 1:00 to 2:20 pm**
Chemical Agent Sensors and Systems

Chair: Todd M. Hintz,

Space and Naval Warfare Systems Ctr., San Diego

1:00 pm: **A low-cost chemical sensor for fixed-security applications**, S. K. Holland, Univ. of Virginia; G. C. Lewin, Avir LLC; R. T. Zehr, J. D. Baker, G. Laufer, Univ. of Virginia; R. H. Krauss, Rammatek, LLC. [6201-30]

1:20 pm: **Water pollution monitoring using optical sensor based on transmitted light**, C. J. Wong, Univ. Sains Malaysia (Malaysia) [6201-31]

1:40 pm: **Using CT-Analyst as an integrated tool for CBR analysis**, A. Moses, J. Boris, Naval Research Lab. [6201-32]

2:00 pm: **Multispectral optical sensor based on light scattering for measuring total suspended solids**, C. J. Wong, Univ. Sains Malaysia (Malaysia) .. [6201-33]

SESSION 10

Room: Sun Breakout 3-4 **Tues. 2:20 to 5:30 pm**
Autonomous Air, Underwater, and Ground Vehicles

Chair: Todd M. Hintz,

Space and Naval Warfare Systems Ctr., San Diego

2:20 pm: **Analysis and design of multiwheeled vehicles**, T. Noh, W. Yoo, M. Kim, H. Noh, Pusan National Univ. (South Korea); N. Huh, S. Park, S. Yoon, WIA Co., Ltd. (South Korea) [6201-34]

2:40 pm: **Aerial surveillance platforms having 24/7 hover capability**, S. Johnson, Johnsonian Designs [6201-35]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Mobile acoustic sensor system for road-edge detection**, T. P. Jansson, T. Forrester, Physical Optics Corp.; B. E. Ambrose, F. S. Lin, M. I. Kazantzidis, Broaddata Communications, Inc. [6201-36]

3:50 pm: **Receiver structures for underwater acoustical communications using chirp slope keying**, E. J. Kaminsky Bourgeois, M. Barbu, Univ. of New Orleans [6201-37]

4:10 pm: **Autonomous robot for detecting subsurface voids and tunnels using microgravity**, S. S. Wilson, Western Kentucky Univ. [6201-38]

4:30 pm: **A power autonomous monopedal robot**, B. T. Krupp, Yobotics, Inc.; J. E. Pratt, Institute for Human and Machine Cognition [6201-39]

4:50 pm: **Concept design of a new-generation military vehicle**, C. Cantemir, G. Ursescu, G. Rizzoni, The Ohio State Univ. [6201-40]

5:10 pm: **Advanced designs for submersible warfighter vehicles**, H. August, Boeing Advanced Systems [6201-99]

Wednesday 19 April

SESSION 11

Room: Sun Breakout 3-4 **Wed. 8:00 to 8:50 am**
Keynote Session

Chairs: Edward M. Carapezza, DARPA and DoD/DoJ Joint Program Committee Steering Group; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.

Keynote Presentation

8:00 am: **The Network: a revolutionary capability for the warfighter** (*Invited Paper, Presentation Only*), J. Parmentola, U.S. Army [6201-41]

SESSION 12

Room: Sun Breakout 3-4 Wed. 8:50 to 10:30 am

Command, Control, Communications, and Intelligence (C3I) I

Chair: Jeffrey R. Heberley,

U.S. Army Armament Research, Development and Engineering Ctr.

- 8:50 am: **C3I standards for payload weaponry**, D. K. Freeman, Naval Surface Warfare Ctr. Panama City [6201-42]
- 9:10 am: **Multi-INT fusion to support port and harbor security and general maritime awareness**, L. J. Von Kahle, Scitor Corp. [6201-43]
- 9:30 am: **Case-based classification alternatives to ontologies for automated web-service discovery and integration**, R. V. Ladner, E. G. Warner, Naval Research Lab. [6201-44]
- 9:50 am: **An integrated e-SMILE command station for homeland security**, V. Ronda, Institute for Infocomm Research, Agency for Space, Technology and Research (Singapore) [6201-45]
- 10:10 am: **Development and calibration of pyroelectric radiometer standards at the NIST**, G. P. Eppeldauer, J. Zeng, L. M. Hanssen, National Institute of Standards and Technology [6201-46]
- Coffee Break 10:30 to 10:50 am

SESSION 13

Room: Sun Breakout 3-4 Wed. 10:50 am to 12:30 pm

Command, Control, Communications, and Intelligence (C3I) II

Chair: Jeffrey R. Heberley,

U.S. Army Armament Research, Development and Engineering Ctr.

- 10:50 am: **Wearable high-tech gear for homeland security personnel**, V. Ronda, Institute for Infocomm Research, Agency for Space, Technology and Research (Singapore); H. W. Choo, L. L. Ngiam, Defence Science & Technology Agency (Singapore); Z. Zhu, Institute for Infocomm Research, Agency for Space, Technology and Research (Singapore) [6201-47]
- 11:10 am: **Enabling private and public sector organizations as agents of homeland security**, D. H. Glassco, J. C. Glassco, Thing Intelligence Corp. (Canada) [6201-49]
- 11:30 am: **Architecture for platform, device, and location independent display, analysis, and manipulation of command and control information**, D. A. Goughnour, M. J. Saloniash, ElanTech, Inc. [6201-50]
- 11:50 am: **Development of NATO's recognized environmental picture**, J. F. Teufert, NATO C3 Agency (Netherlands) [6201-51]
- 12:10 pm: **Wake-up word speech recognition application for first responder communication enhancement**, V. Képuska, Florida Institute of Technology; J. Breitfeller, BreitIdeas Inc. [6201-52]
- Lunch/Exhibition Break 12:30 to 1:50 pm

SESSION 14

Room: Sun Breakout 3-4 Wed. 1:50 to 3:30 pm

Unattended Sensors and Sensor Networks I

Chairs: Jeffrey R. Heberley, U.S. Army Armament Research, Development and Engineering Ctr.; *Todd M. Hintz,* Space and Naval Warfare Systems Ctr., San Diego

- 1:50 pm: **Fully networked remote intrusion detection sensors for border monitoring and protection**, B. Jones, J. McQuiddy, B. McQuiddy, McQ Associates, Inc. [6201-53]
- 2:10 pm: **Wide-area sensor network**, S. Mukhopadhyay, Bechtel Nevada [6201-54]
- 2:30 pm: **Magnetic gradiometer for underwater detection applications**, S. Kumar, D. C. Skvoretz, M. J. Ebbert, C. R. Moeller, A. R. Perry, R. K. Ostrom, A. Tzouris, S. L. Bennett, P. V. Czipott, Quantum Magnetics, Inc.; G. Sulzberger, G. I. Allen, J. T. Bono, T. R. Clem, Naval Surface Warfare Ctr. Panama City [6201-55]
- 2:50 pm: **Design and testing of the new sensitive seismic cable**, A. Pakhomov, E. T. Goldburt, General Sensing Systems LLC [6201-56]
- 3:10 pm: **MEMS multi-mode and multi-parameter (4MP) integrated sensor arrays for homeland security**, P. G. Datskos, P. G. Datskos, Oak Ridge National Lab. [6201-57]
- Coffee Break 3:30 to 4:00 pm

SESSION 15

Room: Sun Breakout 3-4 Wed. 4:00 to 6:00 pm

Unattended Sensors and Sensor Networks II

Chairs: Jeffrey R. Heberley, U.S. Army Armament Research, Development and Engineering Ctr.; *Todd M. Hintz,* Space and Naval Warfare Systems Ctr., San Diego

- 4:00 pm: **Acoustic cueing for surveillance and security applications**, B. Ferguson, K. W. Lo, Defence Science and Technology Organisation (Australia) [6201-58]
- 4:20 pm: **Properties of randomly distributed sparse acoustic sensors for ground vehicle tracking and localization**, M. R. Azimi-Sadjadi, G. P. Wichern, Information System Technologies, Inc. [6201-59]
- 4:40 pm: **Multilevel fusion for networked ground sensors**, R. A. Knobler, McQ Associates, Inc. [6201-60]
- 5:00 pm: **Miniature magnetic sensor node for security applications**, Y. Dalichaouch, K. Mathis, T. McManus, H. S. Trammell, R. A. Shelby, Quantum Magnetics, Inc. [6201-61]
- 5:20 pm: **Sensor fusion algorithms for the detection of nuclear material at border crossings**, D. M. Nicol, Univ. of Illinois at Urbana-Champaign; R. P. Tsang, H. R. Ammerlahn, M. M. Johnson, Sandia National Labs. [6201-62]
- 5:40 pm: **Mobile security surveillance system**, A. U. Sokolnikov, Visual Solutions and Applications [6201-63]

Thursday 20 April

SESSION 16A

Room: Sun Breakout 3-4 Thurs. 8:00 to 8:50 am

Keynote Session

Chair: Edward M. Carapezza,

DARPA and DoD/DoJ Joint Program Committee Steering Group

Keynote Presentation

- 8:00 am: **National Institute of Justice, Science & Technology: law enforcement programs and challenges for the future** (*Invited Paper, Presentation Only*), J. S. Morgan, G. C. Tillery, National Institute of Justice [6201-64]

SESSION 16

Room: Sun Breakout 3-4 Thurs. 8:50 to 10:10 am

Counter-Sniper Systems

Chair: Todd M. Hintz,

Space and Naval Warfare Systems Ctr., San Diego

- 8:50 am: **Operational outcomes and variants of the SECURES® urban gunshot detection technology for law enforcement crime intervention strategies and force protection**, M. Litch, Planning Systems Inc. [6201-65]
- 9:10 am: **Reliable discrimination mortar launch/impact events using acoustic**, M. E. Hohil, S. V. Desai, U.S. Army Research, Development and Engineering Command [6201-66]
- 9:30 am: **Early attack reaction sensor (EARS): a handheld/man-wearable gunshot detection system for platform-independent application**, L. Thier, J. Chang, W. B. Mendyk, U.S. Army Armament Research, Development and Engineering Ctr.; S. Shaw, A. LaRow, W. Schoenborn, Planning Systems Inc. [6201-67]
- 9:50 am: **Integration of the PDCue® acoustic bullet detection system with the CROWS remote weapon system**, M. E. Hohil, U.S. Army Research, Development and Engineering Command [6201-68]
- Coffee Break 10:10 to 10:40 am

SESSION 17

Room: Sun Breakout 3-4 Thurs. 10:40 to 11:40 am

Laser and Radar Systems

Chair: Todd M. Hintz,

Space and Naval Warfare Systems Ctr., San Diego

- 10:40 am: **Airborne laser communications using wavelet packet modulation and its performance enhancement by equalization**, S. Lee, M. Kavehrad, The Pennsylvania State Univ. [6201-69]
- 11:00 am: **Spaceborne scanning lidar system (SSLS) upgrade path**, M. Nimelman, MacDonald, Dettwiler and Associates Ltd. (Canada); J. Tripp, Optech, Inc. (Canada) [6201-70]
- 11:20 am: **Extremely high-frequency holographic radar imaging of personnel and mail**, D. L. McMakin, D. M. Sheen, J. W. Griffin, W. M. Lechelt, Pacific Northwest National Lab. [6201-72]
- Lunch/Exhibition Break 11:40 am to 1:00 pm

SESSION 18

Room: Sun Breakout 3-4 Thurs. 1:00 to 3:20 pm

Electro-Optical and FO Systems

Chair: Todd M. Hintz,

Space and Naval Warfare Systems Ctr., San Diego

- 1:00 pm: **A multimode fiber sensor using magnetostrictive material: terfenol-D for magnetic-field sensing**, K. Wang, Z. Wei, H. Cui, Stevens Institute of Technology [6201-73]
- 1:20 pm: **Real-time fiber sensor system for shipboard distortion**, J. He, Beijing Normal Univ. (China) [6201-75]
- 1:40 pm: **Design and demonstration of ultra-high-speed fiber optic links for EO/IR sensors for tethered robotic applications**, A. K. Sood, Y. R. Puri, Magnolia Optical Technologies, Inc.; R. A. Bell, iRobot Corp. [6201-76]
- 2:00 pm: **A fiber Fabry-Perot gas sensor based on a FBG and a cleaved fiber end reflector**, K. Wang, Z. Wei, S. Li, H. Cui, Stevens Institute of Technology [6201-77]
- 2:20 pm: **Long-distance high-performance remote strain sensing with a fiber Fabry-Perot by radio-frequency laser modulation**, J. H. Chow, The Australian National Univ. (Australia); I. C. Littler, The Univ. of Sydney (Australia); M. B. Gray, D. E. McClelland, The Australian National Univ. (Australia) [6201-78]
- 2:40 pm: **Electro-optical signature analysis for personnel detection**, J. M. Cathcart, Georgia Institute of Technology [6201-79]
- 3:00 pm: **BLUE ROSE perimeter security and detection system**, F. A. Blackmon, J. Pollock, Naval Undersea Warfare Ctr. [6201-80]
- Coffee Break 3:20 to 3:50 pm

SESSION 19

Room: Sun Breakout 3-4 Thurs. 3:50 to 5:10 pm

Infrared and Low-Light-Level Systems

Chair: Todd M. Hintz,

Space and Naval Warfare Systems Ctr., San Diego

- 3:50 pm: **Comparative analysis of low-light level image sensors**, B. A. Fowler, C. Liu, Fairchild Imaging [6201-81]
- 4:10 pm: **Infrared and visible cooperative vehicle identification markings**, E. S. O'Keefe, P. N. Raven, QinetiQ Ltd. (United Kingdom) [6201-82]
- 4:30 pm: **Fusion-based techniques for automatic target recognition in FLIR images**, D. Kim, V. Maik, J. Shin, J. Paik, Chung-Ang Univ. (South Korea) [6201-83]
- 4:50 pm: **Multisensor fusion-based object detection and tracking using active shape model**, V. Maik, D. Lee, Chung-Ang Univ. (South Korea) . . [6201-84]

Friday 21 April

SESSION 20

Room: Sun Breakout 3-4 Fri. 8:00 to 9:40 am

Forensic Sciences, Technologies, and Systems I

Chair: Todd M. Hintz,

Space and Naval Warfare Systems Ctr., San Diego

- 8:00 am: **Blind watermarking via pixel modification with regular rule**, Y. Wang, Wuhan Univ. of Technology (China) [6201-86]
- 8:20 am: **Negative-ion mass spectrometry for characterization of energetic substances**, P. M. Fierro-Mercado, S. P. Hernández-Rivera, L. C. Pacheco-Londoño, N. Mina, Univ. de Puerto Rico Mayagüez [6201-88]
- 8:40 am: **Novel method for the preparation of explosives nanoparticles**, M. A. Barreto-Caban, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez [6201-89]
- 9:00 am: **Detection of explosive mixtures on surfaces using grazing angle probe: FTIR**, O. M. Primera-Pedrozo, S. P. Hernández-Rivera, L. C. Pacheco-Londoño, Y. M. Soto-Feliciano, Univ. de Puerto Rico Mayagüez [6201-90]
- 9:20 am: **Characterization of peroxide-based explosives by thermal analysis**, M. L. Ramirez, S. P. Hernández-Rivera, L. C. Pacheco-Londoño, Univ. de Puerto Rico Mayagüez [6201-91]
- Coffee Break 9:40 to 10:20 am

SESSION 21

Room: Sun Breakout 3-4 Fri. 10:20 am to 12:20 pm

Forensic Sciences, Technologies, and Systems II

Chair: Todd M. Hintz,

Space and Naval Warfare Systems Ctr., San Diego

- 10:20 am: **SERS of TNT in polymer embedded metal colloidal nanoparticle films**, M. d. R. Balaguera-Gelves, S. P. Hernández-Rivera, A. El Burai-Felix, Univ. de Puerto Rico Mayagüez [6201-92]
- 10:40 am: **Effect of water and common salts on the IMS and vibrational spectra of high-energy cyclic organic peroxides**, A. J. Peña-Quevedo, S. P. Hernández-Rivera, M. Ramos, N. Mina, Univ. de Puerto Rico Mayagüez [6201-93]
- 11:00 am: **Method development for identification and trace detection of high-energy amine peroxides by GC-MS, FT-NMR, and vibrational microscopy**, A. J. Peña-Quevedo, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez [6201-94]
- 11:20 am: **Theoretical and experimental vibrational and NMR studies of RDX**, R. Infante-Castillo, S. P. Hernández-Rivera, N. Mina, Univ. de Puerto Rico Mayagüez [6201-95]
- 11:40 am: **Enhanced Raman scattering of nitro-explosives on nanoparticles substrates: Au-Ag alloy, tin oxide, and scandium oxide**, J. I. Jerez-Rozo, S. P. Hernández-Rivera, M. E. Castro-Rosario, Univ. de Puerto Rico Mayagüez [6201-96]
- 12:00 pm: **Temperature dependence of detection limits of TNT on metallic surfaces using fiber optic coupled FTIR**, Y. M. Soto-Feliciano, S. P. Hernández-Rivera, O. M. Primera-Pedrozo, L. C. Pacheco-Londoño, Univ. de Puerto Rico Mayagüez [6201-97]

Related Courses

- SC547 **Terahertz Wave Technology and Applications (Zhang)** Wednesday 8:30 am to 12:30 pm
- SC584 **Night Vision Tools for Homeland Security (Kaplan)** Monday 1:30 pm to 5:30 pm
- SC628 **IR Threat Detection Systems (de Jong)** Monday 1:30 pm to 5:30 pm
- SC640 **Introduction to Sensor Networks (Rao)** Monday 8:30 am to 5:30 pm
- SC719 **Chemical & Biological Detection: Overview of Point and Standoff Sensing Technologies (Gardner)** Tuesday 1:30 pm to 5:30 pm
- SC766 **Information Processing for Video Surveillance (Ebrahimi, Dufaux)** Wednesday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Biometric Technology for Human Identification III

Conference Chairs: **Patrick J. Flynn**, Univ. of Notre Dame; **Sharath Pankanti**, IBM Thomas J. Watson Research Ctr.

Program Committee: **Josef Bigun**, Halmstad Univ. (Sweden); **Victoria T. Franques**, U.S. Dept. of Energy; **Paul Griffin**, Identix Corp.; **Anil K. Jain**, Michigan State Univ.; **Behrooz Kamgar-Parsi**, Naval Research Lab.; **Stan Z. Li**, Chinese Academy of Sciences (China); **David Maltoni**, Univ. degli Studi di Bologna (Italy); **Jiri Navratil**, IBM T.J. Watson Research Ctr.; **Jonathan Phillips**, National Institute of Standards and Technology; **Salil Prabhakar**, Digital Persona Inc.; **Nalini K. Ratha**, IBM T.J. Watson Research Ctr.; **Arun A. Ross**, West Virginia Univ.; **Sudeep Sarkar**, Univ. of South Florida; **Marios Savvides**, Carnegie Mellon Univ.; **Kuntal Sengupta**, Authentec Inc.; **Colin Soutar**, Bioscrypt Inc.; **B.V.K. Vijaya Kumar**, Carnegie Mellon Univ.; **Yunhong Wang**, Chinese Academy of Sciences (China); **Richard Wildes**, York Univ. (Canada); **Lawrence B. Wolff**, Equinox Corp.; **David Zhang**, The Hong Kong Polytechnic Univ. (Hong Kong China)

Monday 17 April

Introduction

Room: Sun Ballroom D Mon. 8:50 to 9:10 am

Chairs: **Patrick J. Flynn**, Univ. of Notre Dame;
Sharath Pankanti, IBM Thomas J. Watson Research Ctr.

SESSION 1

Room: Sun Ballroom D Mon. 9:10 to 10:30 am

Three-dimensional and IR Face

Chair: **Ioannis A. Kakadiaris**, Univ. of Houston

9:10 am: **Cross-sensor 3D face recognition performance**, T. C. Faltemier, K. W. Bowyer, Univ. of Notre Dame [6202-01]

9:30 am: **A framework for the recognition of 3D faces and expressions**, C. Li, A. B. Barreto, Florida International Univ. [6202-02]

9:50 am: **Face recognition with intensified NIR imagery**, D. A. Socolinsky, L. B. Wolff, Equinox Corp. [6202-03]

10:10 am: **Expression-invariant multispectral face recognition: you can smile now!**, I. A. Kakadiaris, G. Passalis, G. Toderici, N. Karampatziakis, N. Murtuza, Y. Lu, T. Theoharis, Univ. of Houston [6202-04]

Coffee Break 10:30 to 11:00 am

SESSION 2

Room: Sun Ballroom D Mon. 11:00 to 11:40 am

Two-dimensional Face I

Chair: **Marios Savvides**, Carnegie Mellon Univ.

11:00 am: **Face detection and recognition using geometrical features and a neural network verifier**, S. H. Yoon, J. H. Kim, North Carolina A&T State Univ.; G. T. Hur, Dongshin Univ. (South Korea) [6202-05]

11:20 am: **Using kernel correlation filters and class redundant feature analysis (CFA) with support vector machines on face recognition grand challenge (FRGC) phase-2 data for enhanced holistic face recognition**, M. Savvides, J. Heo, R. Abiantun, C. Xie, S. W. Park, B. Vijaya Kumar, Carnegie Mellon Univ. [6202-06]

Lunch Break 11:40 am to 1:30 pm

Panel Discussion

Room: Sun Ballroom D Mon. 1:30 to 3:00 pm

Biometrics Barriers

Chair: **Patrick J. Flynn**, Univ. of Notre Dame

Panelists: **Aran Ross**, West Virginia Univ.; **Marios Savvides**, Carnegie Mellon Univ.; **Yingzi Du**, Indiana Univ.-Purdue Univ. at Indiana;
Salil Prabhakar, Digital Persona Inc.;
Kuntal Sengupta, Authentec Inc.

Coffee Break 3:00 to 3:30 pm

SESSION 3

Room: Sun Ballroom D Mon. 3:30 to 5:30 pm

Fingerprint

Chair: **Sharath Pankanti**, IBM Thomas J. Watson Research Ctr.

3:30 pm: **An empirical study of sample size in ROC-curve analysis of fingerprint data**, J. C. Wu, C. L. Wilson, National Institute of Standards and Technology [6202-08]

3:50 pm: **Image versus feature mosaicing: a case study in fingerprints**, S. Shah, A. A. Ross, J. A. Shah, West Virginia Univ. [6202-09]

4:10 pm: **Comparison of classification methods for fingerprint verification for variable number of minutiae**, H. Srinivasan, S. N. Srihari, M. J. Beal, SUNY/Univ. at Buffalo [6202-10]

4:30 pm: **Comparison of ridge- and intensity-based perspiration liveness detection methods in fingerprint scanners**, B. Tan, S. C. Schuckers, Clarkson Univ. [6202-11]

4:50 pm: **A calibration model for fingerprint sensor interoperability**, R. Nadgir, A. A. Ross, West Virginia Univ. [6202-12]

5:10 pm: **Performance analysis metrics for 3D fingerprint scans**, A. Fatehpuria, D. L. Lau, L. G. Hasebrook, Univ. of Kentucky [6202-13]

Tuesday 18 April

SESSION 4

Room: Sun Ballroom D Tues. 8:00 to 9:40 am

Iris

Chair: **Yingzi Du**, Indiana Univ.-Purdue Univ. Indianapolis

8:00 am: **Image quality assessment for iris biometric**, N. D. Kalka, J. Zuo, V. Dorairaj, N. Schmid, B. Cukic, West Virginia Univ. [6202-14]

8:20 am: **Enhanced iris matching using estimation of in-plane nonlinear deformations**, J. Thornton, M. Savvides, V. Bhagavatula, Carnegie Mellon Univ. [6202-15]

8:40 am: **Using 2D Log-Gabor spatial filters for iris recognition**, Y. Du, Indiana Univ.-Purdue Univ. Indianapolis [6202-16]

9:00 am: **Iris recognition at a distance with expanded imaging volume**, R. Narayanswamy, CDM Optics, Inc. [6202-17]

9:20 am: **Active shape models for effective iris segmentation**, A. S. Abhyankar, S. Schuckers, Clarkson Univ. [6202-19]

Coffee Break 9:40 to 10:30 am

SESSION 5

Room: Sun Ballroom D Tues. 10:30 to 11:30 am

Two-dimensional Face II

10:30 am: **Sampling design for face recognition**, Y. Yan, L. A. Osadciw, Syracuse Univ. [6202-20]

10:50 am: **The effect of lighting direction/condition on the performance of face recognition algorithms**, G. F. Fahmy, West Virginia Univ. [6202-21]

11:10 am: **Faces from sketches: a subspace synthesis approach**, Y. Li, M. Savvides, Carnegie Mellon Univ. [6202-22]

Lunch/Exhibition Break 11:30 am to 1:30 pm

SESSION 6

Room: Sun Ballroom D Tues. 1:30 to 2:50 pm

Multibiometrics and Security

Chair: Michael E. Schuckers, St. Lawrence Univ.

1:30 pm: An outdoor biometric system: evaluation of normalization fusion schemes, H. D. Vajaria, T. Islam, P. Mohanty, S. Sarkar, R. T. Sankar, R. Kasturi, Univ. of South Florida [6202-24]

1:50 pm: Statistical inference for template aging, M. E. Schuckers, St. Lawrence Univ. [6202-25]

2:10 pm: Cryptographic key generation using handwritten signature, M. Freire-Santos, J. Fierrez-Aguilar, J. Ortega-Garcia, Univ. Autónoma de Madrid (Spain) [6202-26]

2:30 pm: Nonintrusive multibiometrics on a mobile device: a comparison of fusion techniques, L. Allano, S. Garcia-Salicetti, B. Ly-Van, Institut National des Télécommunications (France); A. C. Morris, J. Koreman, Univ. des Saarlandes (Germany); H. Sellahewa, S. A. Jassim, Buckingham Univ. (United Kingdom); B. Dorizzi, Institut National des Télécommunications (France) [6202-28]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

✓ Information fusion for palmprint authentication, X. Wu, Harbin Institute of Technology (China) [6202-29]

✓ Use of behavioral biometrics in intrusion detection and online gaming, R. V. Yampolskiy, V. Govindoraju, SUNY/Univ. at Buffalo [6202-33]

✓ Secret sharing using biometric traits, A. Kholmatov, B. A. Yanikoglu, E. Savas, A. Levi, Sabanci Univ. (Turkey) [6202-35]

✓ Knuckle-based hand correlation for user authentication, K. K. Sricharan, A. Reddy, A. Ramakrishnan, Indian Institute of Technology (India) . . . [6202-36]

✓ Multimodal biometrics system for efficient human recognition, P. Gupta, A. Rattani, H. Mehrotra, Indian Institute of Technology Kanpur (India); A. K. Kaushik, Ministry of Communication and Information Technology New Delhi (India) [6202-37]

✓ Strong authentication of remote users over insecure networks by using fingerprint-biometric and smart cards, M. K. Khan, J. Zhang, Southwest Jiaotong Univ. (China) [6202-38]

Related Courses

Biometric Technology for Human Identification III

SC633 Algorithms for Biometric Recognition (Vijaya Kumar) Thursday 1:30 pm to 5:30 pm

See SPIE Cashier to Register.



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Optics and Photonics in Global Homeland Security II

Conference Chairs: **Theodore T. Saito**, Lawrence Livermore National Lab.; **Daniel Lehrfeld**, Photonic Products Group, Inc.

Program Committee: **James M. Brase**, Lawrence Livermore National Lab.; **Susan F. Hollowell**, FAA Technical Ctr., TSA; **Dan J. Kroll**, Hach Co., Inc.; **Keith L. Lewis**, UK Electromagnetic Remote Sensing Defence Technology Ctr. (United Kingdom); **Ashok K. Sood**, Magnolia Optical Technologies, Inc.; **Roger W. Werne**, Lawrence Livermore National Lab.; **Ruth M. Woodward**, HT Consultants Ltd. (United Kingdom)

Wednesday 19 April

Opening Remarks

Room: Sun Ballroom D Wed. 10:30 to 10:50 am
T. T. Saito, Lawrence Livermore National Lab.

SESSION 1

Room: Sun Ballroom D Wed. 10:50 to 11:20 am
Overview and Status

Chair: **Theodore T. Saito**, Lawrence Livermore National Lab.

10:50 am: **Technology and homeland security** (*Invited Paper*), R. W. Werne, Lawrence Livermore National Lab. [6203-01]
Lunch/Exhibition Break 11:20 am to 1:00 pm

SESSION 2

Room: Sun Ballroom D Wed. 1:00 to 5:40 pm
Border Security

Chair: **Ashok K. Sood**, Magnolia Optical Technologies, Inc.

1:00 pm: **Session Overview**, Ashok K. Sood, Magnolia Optical Technologies, Inc.
1:10 pm: **An overview of EO/IR technology/sensors for border security applications** (*Invited Paper*), K. S. FreyVogel, The Pennsylvania State Univ. [6203-02]
1:40 pm: **EO/IR sensors for border security applications**, R. V. McDaniel, Kollsman, Inc. [6203-03]
2:10 pm: **Use of robotic vehicles with EO/IR sensors for border security applications** (*Invited Paper*), R. A. Bell, iRobot Corp. [6203-04]
2:40 pm: **Stand-off detection of high explosive using Raman scattering** (*Presentation Only*), J. C. Carter, Lawrence Livermore National Lab. [6203-05]
Coffee Break 3:10 to 3:40 pm
3:40 pm: **Multi-color IR sensors based on QWIP technology for security and surveillance applications**, M. Sundaram, A. R. Reisinger, QmagiQ, LLC [6203-06]
4:10 pm: **Networked thermal imaging and intelligent video technology for border security applications**, D. T. Dumpert, S. Dirksen, FLIR Systems, Inc. [6203-07]
4:40 pm: **Miniature EO/IR sensors for border security applications**, W. B. Hornback, Irvine Sensors Corp. [6203-08]

Panel Discussion

Room: Sun Ballroom D Wed. 5:10 to 5:40 pm
Border Security

Thursday 20 April

SESSION 3

Room: Sun Ballroom D Thurs. 8:00 to 11:20 am
Air Transportation Security: Counter MANPADS

Chairs: **Daniel Lehrfeld**, Photonic Products Group, Inc.;
Susan F. Hollowell, FAA Technical Ctr., TSA

8:00 am: **Welcome/Session Overview**, Daniel Lehrfeld, Photonic Products Group, Inc.
8:10 am: **DHS counter-MANPADS program update: phases II and III** (*Invited Paper*), J. D. Tuttle, U.S. Dept of Homeland Security [6203-09]
8:40 am: **Commercial aircraft protection: Northrop Grumman Guardian™ system for Counter-MANPADS**, J. D. Stanfill, L. Danielides, Northrop Grumman Corp. [6203-10]
9:05 am: **JETEYE™ IR missile protection for commercial airliners: "Gotcha Covered!"**, E. Keirstead, S. S. du Mont, BAE Systems North America . . [6203-11]
9:30 am: **Raytheon aircraft protection systems**, A. J. Simon, Raytheon Missile Systems [6203-12]
9:55 am: **L-3 Com AVISYS civil aviation self-protection system**, J. Carey, L3 AVISYS [6203-13]
Coffee Break 10:15 to 10:40 am
10:40 am: **Raytheon Vigilant Eagle counter-MANPADS system**, J. L. Vollin, Raytheon Missile Systems [6203-14]
11:00 am: **Countering MANPADS: study of new concepts and applications**, D. Maltese, J. Robineau, J. Audren, J. Aragones, C. Sailliot, Sagem SA (France) [6203-15]

SESSION 4

Room: Sun Ballroom D Thurs. 11:20 am to 12:30 pm
Drinking Water Security I

Chair: **Dan J. Kroll**, Hach Co., Inc.

11:20 am: **Session Overview**, Dan J. Kroll, Hach Co., Inc.
11:30 am: **Water security: public role and awareness** (*Invited Paper*), S. Arlosoroff, Mekorot-National Water Corp. (Israel) [6203-16]
12:00 pm: **The municipal viewpoint on water security** (*Invited Paper*), S. States, Pittsburgh Water and Sewer Authority [6203-17]
Lunch/Exhibition Break 12:30 to 1:30 pm

SESSION 5

Room: Sun Ballroom D Thurs. 1:30 to 3:30 pm

Drinking Water Security II

Chair: Dan J. Kroll, Hach Co., Inc.

1:30 pm: **Water quality change detection: multivariate classification and discrimination algorithms**, K. A. Klise, S. A. McKenna, Sandia National Labs. [6203-18]

1:50 pm: **Adaptive monitoring to enhance water sensor capabilities of contaminant detection in a drinking water system**, Y. J. Yang, R. C. Haught, U.S. Environmental Protection Agency [6203-19]

2:10 pm: **A fiber optic coupled probe for simple rapid detection of E. coli and total coliform bacteria in water**, S. Brown, E. J. Marcotte, C. Dunkinson, C. Gilmour, P. Aston, Queen's Univ. (Canada); P. Gallant, Pathogen Detection Systems (Canada) [6203-20]

2:30 pm: **Reagentless Raman detection of waterborne threats**, P. J. Treado, ChemImage Corp.; S. D. Christesen, A. Tripathi, R. Jabbour, J. L. Jensen, A. C. Samuels, U.S. Army Edgewood Chemical Biological Ctr.; K. S. Kalasinsky, Armed Forces Institute of Pathology; M. P. Nelson, J. S. Maier, S. D. Stewart, ChemImage Corp. [6203-21]

2:50 pm: **ATP monitoring technology for microbial growth control in potable water systems**, P. A. Whalen, LuminUltra Technologies Ltd. (Canada) . . [6203-22]

Panel Discussion

Room: Sun Ballroom D Thurs. 3:10 to 3:30 pm

The Role of SPIE and Water Security

Coffee Break 3:30 to 4:00 pm

SESSION 6

Room: Sun Ballroom D Thurs. 4:00 to 5:10 pm

Remote Sensing Images in Global Homeland Security

Chair: David W. Paglieroni, Lawrence Livermore National Lab.

4:00 pm: **Session Overview**, D. W. Paglieroni, Lawrence Livermore National Lab.

4:10 pm: **Using component weighting with gradient direction matching**, C. W. Grant, S. Nikolaev, D. W. Paglieroni, Lawrence Livermore National Lab. [6203-23]

4:30 pm: **Using gradients, alignment, and proximity to extract curves and connect roads**, B. Y. Chen, D. W. Paglieroni, Lawrence Livermore National Lab. [6203-24]

4:50 pm: **Exploiting data parallelism in the image content engine**, W. M. Miller, J. E. Garlick, G. F. Weinert, G. M. Abdulla, Lawrence Livermore National Lab. [6203-25]

Global Homeland Security Technical Group Meeting

Thursday 20 April · 5:15 to 6:30 pm · Room: Sun Ballroom D

Chair: Theodore T. Saito, Lawrence Livermore National Lab.

Join us! SPIE's Global Homeland Security Technical Group Meeting at DSS is key for planning the upcoming year as we pursue our mission "to stimulate and focus the optics and photonics community's contribution to enhance safety, improve the sense of well being, and to counter terrorist threats." We will have feedback from the activities at SPIE's Photonics West meeting (Jan 2006) including the special focus on Drinking Water Safety (chaired by Dan Kroll) and the meeting with a Water District. An update will also be given on our Port and Harbor Security subcommittee, chaired by Michael DeWeert. We will solicit input for future GHSTG conferences and activities. You need not be a technical group member to attend, and are invited to participate. Visit <http://spie.org/homelandsecurity> to learn more.

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Enhanced Raman spectroscopy of 2,4,6-trinitrotoluene and 2,4-dinitrotoluene in anatase and rutile titania nanocrystals**, S. P. Hernández-Rivera, E. de la Cruz, M. E. Castro-Rosario, Univ. de Puerto Rico Mayagüez [6203-31]
- ✓ **Optical limiter based on nonlinear grating for human eyes and detectors**, Y. Zhang, T. Sun, P. Yuan, Harbin Institute of Technology (China) [6203-32]
- ✓ **New study on laser release from the coastal earthquake in Tianjin, China: light radiation from pulsed discharges in water**, J. Zhang, Hebei Univ. (China) [6203-33]

Friday 21 April

SESSION 7

Room: Sun Ballroom D Fri. 8:00 to 10:00 am

Imaging and Data Processing for Global Homeland Security

Chair: Theodore T. Saito, Lawrence Livermore National Lab.

8:00 am: **Precision refractive zoom lens with long focal length**, J. M. Finlan, D. J. Manzi, L. Rutberg, J. P. O'Sullivan, Special Optics Manufacture & Design [6203-34]

8:20 am: **Panomorph lenses: a low-cost solution for panoramic surveillance**, J. Artonne, S. Thibault, ImmerVision (Canada) [6203-26]

8:40 am: **Advanced photonics sensors for homeland security**, G. E. Dovgalenko, ITT Technical Institute; D. Haley, Tidewater Community College; N. Noel, ITT Technical Institute [6203-27]

9:00 am: **Diffractive optics for use in illumination systems for defense and security applications**, R. E. Hutchins, J. L. Wargats, R. D. TeKolste, Digital Optics Corp. [6203-28]

9:20 am: **Optical encryption of personal identification information using orthogonal code**, M. N. Islam, M. S. Alam, Univ. of South Alabama [6203-29]

9:40 am: **An electronic digital correction investigation of specific distortion caused of the optical system**, A. A. Dandarov, J. Kartelov, G. Bayrakova, Technical Univ. of Sofia - Plovdiv Branch (Bulgaria) [6203-30]

Related Courses

- SC584 **Night Vision Tools for Homeland Security** (Kaplan) Monday 1:30 pm to 5:30 pm
- SC586 **When Sonar Isn't Enough: Marine Optics for Port Security** (DeWeert, Gilbert) Wednesday 8:30 am to 12:30 pm
- SC628 **IR Threat Detection Systems** (de Jong) Monday 1:30 pm to 5:30 pm
- SC766 **Information Processing for Video Surveillance** (Ebrahimi, Dufaux) Wednesday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Photonics for Port and Harbor Security II

Conference Chairs: **Michael J. DeWeert**, BAE Systems; **Theodore T. Saito**, Lawrence Livermore National Lab.; **Harry L. Guthmuller**, Naval Surface Warfare Ctr.

Program Committee: **James Z. Carter, Sr.**, USCG (Retired); **Christina J. Csanadi**, Space and Naval Warfare Systems Ctr., San Diego; **Georges R. Fournier**, Defence R&D Canada/Valcartier (Canada); **Gary D. Gilbert**, SPAWAR SYSCEN; **Anne W. Kusterbeck**, Naval Research Lab.; **Peter Michael**, Science Applications International Corp.; **William R. Owens**, Raytheon Co.; **Elisa Shabazian**, Lockheed Martin Canada (Canada); **Glenn T. Shwaery**, Univ. of New Hampshire

Tuesday 18 April

SESSION 1

Room: Tallahassee I Tues. 8:00 to 10:15 am

Cargo and Container Security

Chair: **Georges R. Fournier**, Defence R&D Canada/Valcartier (Canada)

8:00 am: **Session Overview**, Georges R. Fournier, Defence R&D Canada/Valcartier (Canada)

8:05 am: **Cargo container inspection using gravity gradiometry** (*Invited Paper*), B. Kirkendall, Lawrence Livermore National Lab.; Y. Li, Colorado School of Mines; D. W. Oldenburg, The Univ. of British Columbia (Canada) [6204-01]

8:35 am: **Vehicle and container control for the presence of a dirty bomb**, V. Valkovic, D. Sudac, Institut Ruder Boskovic (Croatia) [6204-02]

8:55 am: **Development of the next-generation container security device**, G. Welch Bennett, T. L. Haran, J. C. James, W. G. Robinson, J. E. Michaels, T. E. Michaels, Georgia Institute of Technology [6204-03]

9:15 am: **A general ConOps for container port cargo inspection**, D. B. Smith, Science Applications International Corp. [6204-04]

9:35 am: **Integrating smart container technology into existing shipping and law enforcement infrastructure**, K. Pysareva, Univ. of New Hampshire and National Infrastructure Institute; D. Ferriere, National Infrastructure Institute; A. Rucinski, Univ. of New Hampshire and National Infrastructure Institute [6204-05]

9:55 am: **Sensor fusion for container port cargo inspection** (*Invited Paper*), D. B. Smith, Science Applications International Corp. [6204-06]

Coffee Break 10:15 to 10:45 am

SESSION 2

Room: Tallahassee I Tues. 10:45 am to 12:00 pm

Diver Detection and Interdiction

Chair: **Glenn T. Shwaery**, Univ. of New Hampshire

10:45 am: **Session Overview**, Glenn T. Shwaery, Univ. of New Hampshire

10:50 am: **Nonlethal unfriendly swimmer and pipe defense combining sound and flash pulses using a new sparker** (*Invited Paper*), R. B. Schaefer, Phoenix Science & Technology, Inc. [6204-07]

11:20 am: **Feature-based passive acoustic detection of a diver**, R. Stoklin, A. M. Sutin, S. Radhakrishnan, M. Bruno, B. Fullerton, M. Rafferty, Stevens Institute of Technology [6204-08]

11:40 am: **Broadband Ocean Acoustic (BOA) Laboratory in Narragansett Bay: preliminary in situ harbor security measurements**, R. Carpenter, B. A. Cray, E. R. Levine, Naval Undersea Warfare Ctr. [6204-09]

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 3

Room: Tallahassee I Tues. 1:30 to 2:45 pm

Waterside and Sea-Surface Surveillance I

Chair: **Michael J. DeWeert**, BAE Systems

1:30 pm: **Session Overview**, Michael J. DeWeert, BAE Systems

1:35 pm: **Ultraviolet to millimeter wave: imaging systems of systems for maritime ISR, port security, and force protection**, M. J. DeWeert, BAE Systems [6204-10]

1:55 pm: **SeeCoast port surveillance** (*Invited Paper*), M. Seibert, B. Rhodes, N. A. Bomberger, BAE Systems Advanced Information Technologies ... [6204-11]

2:25 pm: **Effective protective surveillance for waterside-located chemical plants**, J. T. Love, D. K. Van Dover, Night Vision Equipment Co. [6204-12]

SESSION 4

Room: Tallahassee I Tues. 2:45 to 5:20 pm

Subsurface Change/Threat Detection

Chair: **Michael J. DeWeert**, BAE Systems

2:45 pm: **Session Overview**, Michael J. DeWeert, BAE Systems

2:50 pm: **Recent advancement in computer simulating performance of the sounding and detecting ocean lidars in very shallow waters** (*Invited Paper*), E. Zege, I. L. Katsev, A. S. Prikhach, B.I. Stepanov Institute of Physics (Belarus) [6204-13]

Coffee Break 3:20 to 3:50 pm

3:50 pm: **FAMIS sensor for imaging in turbid water** (*Invited Paper*), L. J. Mullen, A. Laux, Naval Air Warfare Ctr.; B. Cochenour, Ampac Inc.; E. P. Zege, Minsk Physics Institute (Belarus) [6204-14]

4:20 pm: **A flexible hyperspectral simulation tool for complex littoral environments**, A. A. Goodenough, R. V. Raqueno, M. Bellandi, S. D. Brown, J. R. Schott, Rochester Institute of Technology [6204-15]

4:40 pm: **An Autonomous Marine Optical System (AMOS) for monitoring the optical properties of port and harbor waters**, K. L. Carder, D. English, C. Du, Univ. of South Florida [6204-16]

5:00 pm: **An algorithm to retrieve coastal water optical and bottom properties from hyperspectral imagery**, A. Castrodad-Carru, M. Vélez-Reyes, J. A. Goodman, Univ. de Puerto Rico Mayagüez [6204-17]

Port and Harbor Security Subcommittee Meeting

Part of the Global Homeland Security Technical Group

Tuesday 18 April - 5:30 to 6:30 pm - Room: Tallahassee 1

Chair: **Michael J. DeWeert**, BAE Systems

This meeting will mark the three-year anniversary of the Port and Harbor Subcommittee of the Global Homeland Security Technical Group. Since this meeting occurs in the middle of the PHS conference, we will discuss which topics seem to be gaining the most attention, and promote the sessions still to come. This year's conference is organized by applications (container security, diver interdiction, etc.) instead of by technologies, in order to encourage cross-disciplinary collaborations. We will seek feedback on the effectiveness of the application-centric approach. We will also discuss the future direction of the PHS technical group — conferences, workshops, and what audiences we want to seek out. How can we scientists and engineers work effectively with the defenders and decision-makers to develop and deploy protective systems? We look forward to seeing you in Orlando, and to working on this important initiative.

Wednesday 19 April

SESSION 5

Room: Sun Ballroom D Wed. 8:00 to 9:35 am

Waterside and Sea-Surface Surveillance II

Chair: Theodore T. Saito, Lawrence Livermore National Lab.

8:00 am: **Session Overview**, Theodore T. Saito, Lawrence Livermore National Lab.

8:05 am: **Findings of the NATO Workshop on Data Fusion Technologies for Harbour Protection** (*Invited Paper*), E. Shahbazian, Lockheed Martin Canada (Canada); M. J. DeWeert, BAE Systems; G. L. Rogova, Encompass Consulting [6204-18]

8:35 am: **A system to detect and track targets in water channels**, W. Badawy, Smart Camera Technologies Inc. (Canada) [6204-19]

8:55 am: **Multi-INT fusion to support port and harbor security and general maritime awareness**, L. J. Von Kahle, Scitor Corp. [6204-21]

9:15 am: **Managing customer expectations to achieve customer satisfaction** (*Presentation Only*), T. Gibson, Science Applications International Corp. [6204-22]

Related Courses

SC584 **Night Vision Tools for Homeland Security** (*Kaplan*) Monday 1:30 pm to 5:30 pm

SC628 **IR Threat Detection Systems** (*de Jong*) Monday 1:30 pm to 5:30 pm

SC719 **Chemical & Biological Detection: Overview of Point and Standoff Sensing Technologies** (*Gardner*) Tuesday 1:30 pm to 5:30 pm

SC766 **Information Processing for Video Surveillance** (*Ebrahimi, Dufaux*) Wednesday 8:30 am to 5:30 pm

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Thermosense XXVIII

Conference Chairs: **Jonathan J. Miles**, James Madison Univ.; **G. Raymond Peacock**, Temperatures.com, Inc.; **Kathryn M. Knettel**, United Space Alliance

Program Committee: **Lee R. Allen**, Allen Applied Infrared Technology; **Nicolas P. Avdelidis**, TWI Technology Ctr. Wales (United Kingdom); **Douglas D. Burleigh**, Surfside Consulting; **Antonio Colantonio**, Public Works and Government Services Canada (Canada); **Fred Colbert**, Colbert Infrared Services, Inc.; **K. Elliott Cramer**, NASA Langley Research Ctr.; **Ralph B. Dinwiddie**, Oak Ridge National Lab.; **Ermanno G. Grinzato**, Consiglio Nazionale delle Ricerche (Italy); **Sheng-Jen Hsieh**, Texas A&M Univ.; **Herbert Kaplan**, Honeyhill Technical Co.; **Timo T. Kauppinen**, VTT Elektronikka (Finland); **Jack M. Kleinfeld**, Kleinfeld Technical Services, Inc.; **Dennis H. LeMieux**, Siemens AG; **Sven-Åke Ljungberg**, Univ. of Gävle (Sweden); **Robert P. Madding**, FLIR Systems, Inc.; **Xavier P. Maldague**, Univ. Laval (Canada); **Pierre Potet**, CEDIP Infrared Systems (France); **Piotr Pregowski**, Pregowski Infrared Services (Poland); **Austin A. Richards**, FLIR Systems, Indigo Operations; **Andrés E. Rozlosnik**, SI Termografía Infrarroja (Argentina); **Morteza Safai**, Boeing Co.; **Takahide Sakagami**, Osaka Univ. (Japan); **R. James Seffrin**, Infrasppection Institute; **Steven M. Shepard**, Thermal Wave Imaging, Inc.; **Gregory R. Stockton**, Stockton Infrared Thermograph; **Vladimir P. Vavilov**, Tomsk Polytechnic Univ. (Russia); **Lisa West Åkerblom**, FLIR Systems, Inc. (Sweden)

THERMOSENSE MISSION STATEMENT

The purpose of Thermosense is to promote the exchange of information pertaining to the use of infrared sensing and imaging instruments for diagnostics and controls. Presentations should address the solutions to problems and their reduction.

THERMOSENSE BACKGROUND

Thermosense is the oldest and largest international technical meeting focused on scientific, industrial and general uses of Infrared Imaging and Infrared Temperature

Measurements. Its regular printed proceedings are found in most scientific and engineering libraries, providing an unequalled depth and breadth of technical information and reference data. Further information regarding Thermosense can be found at: www.thermosense.org.

Meetings of related interest

American Society for Testing and Materials

Tues. 6:30 to 7:15 pm • Room: Sun Breakout 5-6

ASTM Subcommittee E20.02 on Radiation Thermometry Standards Committee Meeting

All interested parties who wish to participate in IR Temperature Measurement Standards Development are invited.

ISPOT

Wed 5:30 to 6:30 pm • Room: Sun Breakout 5-6

The International Society of Professional Thermographers, ISPoT, will hold a general membership meeting on Tuesday to discuss membership, review goals for 2006, committee assignments and conduct other business that arises.

Meeting of the SPIE International Thermosense Technical Group

Tues. 7:30 to 9:00 pm • Room: Sun Breakout 5-6

Chair: **Ralph Dinwiddie**, Oak Ridge National Lab.

The Thermal Sensing for Diagnostics and Control (Thermosense) Technical Group of SPIE provides a forum for information exchange on relevant matters among technical group members, committees involved in thermosense technology, and SPIE. This is the most direct method of providing feedback to SPIE on the conduct and content for future Thermosense conferences as well as on other thermosense activity. This year the group will host a Thermographic Image contest and reception with prizes

Contact Ralph Dinwiddie at: dinwiddieb@ornl.gov or by phone at 423-574-7599; fax 423-574-3920

All members and nonmembers interested in participating in this event, or those wishing to join in the coordination process for future conferences and related activities are encouraged to attend.

Monday 17 April

Vendor Presentations and Reception

What's news in Hardware and Software at the 2006 DSS Exhibition?

Mon. 5:30 to 8:00 pm • Room: Sun Breakout 5-6

Chairs: **G. Raymond Peacock**, Temperatures.com, Inc.; **Andrés E. Rozlosnik**, SI Termografía Infrarroja (Argentina)

For the second year, in conjunction with the Thermosense XXVIII Conference, hardware and software vendors will give brief presentations in what is new this year in their product lines that impact thermal imaging practices and applications.

Axsys Technologies

Presenter: **David Latimer**

Title: **EOSS ULRTI (Ultra Long Range Thermal Imaging System)**

CEDIP Defense and Security

Presenter: **Eric Guyot / Edouard Petitjean**

Title: **Defense & Security Business Activity and New Products**

CEDIP Industrial & Thermography

Presenter: **Pierre Bremond**

Title: **CEPID Infrared Cameras in Stress Analysis Applications**

FLIR Systems, Inc.

Presenter: **David Bursell**

Title: **What's New from FLIR Systems**

Goodrich Sensors Unlimited

Presenter: **Doug Malchow**

Title: **High-speed Windowing Imaging in the SWIR**

GORATEC Technology GmbH & Co. KG

Presenter: **Gottfried Rampl**

Title: **Sophisticated Software Solution for Online Recording and Analyzing of Thermal Imaging**

JCD Publishing Company

Presenter: **Gerald C. Holst**

Title: **MAVISS: New Imaging System Simulation Software**

Jenoptik Laser, Optik, Systeme GmbH

Presenter: **Heiko Richte**

Title: **First Commercial Megapixel IR Camera by ORI®-Technology**

Infrared Solutions

Presenter: **Roger Schmidt**

Title: **Commercial Fusion Camera-infrared and Visible**

Nippon Avionics Co., Ltd. (AVIO)

Presenter: **Yukinori Kimura**

Title: **New Thermal Video System from Nippon Avionics**

RedShift Systems

Presenter: **Stuart Nixdorff**

Title: **Affordable All-Condition Imaging: Making CMOS See Heat**

Thermoteknix, Ltd.

Presenter: **Richard Salisbury**

Title: **What's New in Thermal Imaging? Thermoteknix Pushes the Boundaries of Size and Performance**

Tuesday 18 April

SESSION 1

Room: Sun Breakout 5-6 **Tues. 8:00 to 9:40 am**

Infrared Thermometry and Calibration at NIST

Chairs: **G. Raymond Peacock**, Temperatures.com, Inc.;
Robert P. Madding, FLIR Systems, Inc.

8:00 am: **Design and characterization of Si and InGaAs pyrometers for NIST radiance temperature scale realization between 200°C and 962°C**, M. Noorma, S. N. Mekhontsev, V. B. Khromchenko, A. Gura, M. Litorja, L. M. Hanssen, National Institute of Standards and Technology [6205-01]

8:20 am: **Water heat pipe blackbody as reference spectral radiance source between 50°C and 250°C**, M. Noorma, National Institute of Standards and Technology and Helsinki Univ. of Technology (Finland); S. N. Mekhontsev, V. B. Khromchenko, M. Litorja, J. Zeng, L. M. Hanssen, National Institute of Standards and Technology [6205-02]

8:40 am: **IR spectral characterization of customer blackbody sources: first calibration results**, S. N. Mekhontsev, M. Noorma, L. M. Hanssen, National Institute of Standards and Technology [6205-03]

9:00 am: **The new NIST Advanced Infrared Radiometry and Imaging (AIRI) facility**, S. N. Mekhontsev, B. K. Tsai, M. Litorja, L. M. Hanssen, G. T. Fraser, National Institute of Standards and Technology [6205-04]

9:20 am: **Emissivity of IR calibrators with V-grooved surfaces: theory and measurement**, L. M. Hanssen, A. V. Prokhorov, S. N. Mekhontsev, National Institute of Standards and Technology [6205-06]

Coffee Break 9:40 to 10:30 am

SESSION 2

Room: Sun Breakout 5-6 **Tues. 10:30 am to 12:10 pm**

Radiation Thermometry, Calibration, and Research & Development I

Chairs: **G. Raymond Peacock**, Temperatures.com, Inc.;
Robert P. Madding, FLIR Systems, Inc.

10:30 am: **Variable temperature blackbody sources as primary standards**, K. Irani, Mikron Infrared, Inc. [6205-07]

10:50 am: **A universal blackbody calibration source for temperature span from ambient to 2300° C**, K. Irani, Mikron Infrared, Inc. [6205-08]

11:10 am: **In-line blackbody for in-process verification of infrared line-scanner calibration**, T. J. Orr, U. Rajput, M. Cilfone, Visteon Corp. [6205-09]

11:30 am: **Temperature uncertainty of IR thermal imager calibration**, G. R. Peacock, Temperatures.com, Inc. [6205-10]

11:50 am: **Radiation thermometry of semitransparent silicon wafers near room temperature**, T. Iuchi, Y. Ikeda, Toyo Univ. (Japan) [6205-11]

Lunch/Exhibition Break 12:10 to 1:10 pm

SESSION 3

Room: Sun Breakout 5-6 **Tues. 1:10 to 3:10 pm**

Radiation Thermometry, Calibration, and Research & Development II

Chairs: **Austin A. Richards**, FLIR Systems, Inc.;
G. Raymond Peacock, Temperatures.com, Inc.

1:10 pm: **Development of a new infrared thermography with inter-atmospheric window and an advanced image processing technique**, D. Sato, T. Komiyama, Concrete Soft Technical Engineering Corp. (Japan); T. Sakagami, S. Kubo, Osaka Univ. (Japan) [6205-12]

1:30 pm: **Advances in applications for aerial infrared thermography**, G. R. Stockton, Stockton Infrared Thermographic Services, Inc.; A. Tache, Stockton Infrared Thermographic Services [6205-13]

1:50 pm: **Thermal radiation properties of different metals**, W. Bauer, A. Moldenhauer, Univ. Duisburg-Essen (Germany); H. Oertel, GIWEP Muelheim (Germany) [6205-68]

2:10 pm: **Infrared astronomy with NASA's new Spitzer Space Telescope (Invited Paper)**, R. D. Gehrz, Univ. of Minnesota [6205-15]

2:50 pm: **Applications for a NIR filter wheel camera**, A. A. Richards, S. D'Souza, FLIR Systems, Inc. [6205-17]

Coffee Break 3:10 to 3:40 pm

SESSION 4

Room: Sun Breakout 5-6 **Tues. 3:40 to 5:30 pm**

Thermal Image Fusion Applications

Chairs: **Herbert Kaplan**, Honeyhill Technical Co.;
Kathryn M. Knettel, American Infrared Testing & Consulting, Inc.

3:40 pm: **Issues in advanced image registration for multi-UAV platform applications (Invited Paper)**, O. J. Watkins, M. I. Smith, J. P. Heather, Waterfall Solutions Ltd. (United Kingdom) [6205-16]

4:10 pm: **Superimposing visible and infrared images**, K. R. Johnson, T. McManus, R. N. Schmidt, Infrared Solutions, Inc. [6205-18]

4:30 pm: **ARISTMS: a new capability**, M. Wilson, P. Coulter, MilSys Technologies LLC [6205-19]

4:50 pm: **Robust thermal calibration and three-dimensional mapping of object surface temperatures**, S. Prakash, T. M. Caelli, T. Raupach, P. Y. Lee, The Australian National Univ. (Australia) [6205-20]

5:10 pm: **Summary Discussion**

Student Poster Briefs and Student Poster Awards
Tues. 5:30 to 5:50 pm

Chairs: **Jonathan J. Miles**, James Madison Univ.;
Morteza Safai, The Boeing Co.

Student posters will be presented as a 5-minute oral presentation. Student posters will also be displayed Tuesday evening in the main poster session.

Infrared Image Gallery Award
Tues. 5:50 to 6:30 pm · Room: Sun Breakout 5-6

Chairs: **Ralph B. Dinwiddie**, Oak Ridge National Lab.

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Wood crib fire free burning test in ISO room**, K. Xu, G. Griffin, G. Bradbury, V. Dowling, Commonwealth Scientific and Industrial Research Organisation (Australia) [6205-62]
- ✓ **Analysis of pulsed-thermographic sequences based on radon transform**, D. A. Gonzalez, Univ. de Cantabria (Spain); C. Ibarra-Castanedo, Univ. Laval (Canada); F. J. Madruga, Univ. de Cantabria (Spain); X. P. Maldague, Univ. Laval (Canada) [6205-63]
- ✓ **Quality control on radiant heaters manufacture**, D. A. Gonzalez, F. J. Madruga, Univ. de Cantabria (Spain); C. Ibarra-Castanedo, Univ. Laval (Canada); O. M. Conde, J. M. López-Higuera, Univ. de Cantabria (Spain) [6205-64]
- ✓ **Mathematical methods of identification of thermal characteristics of materials**, O. V. Lebedev, D. V. Kirzhanov, V. V. Avramenko, O. N. Budadin, Russian Academy of Sciences (Russia) [6205-65]
- ✓ **A model undergraduate research institute for study of emerging non-contact measurement technologies and techniques**, C. L. Dvornch, S. M. Bourne, C. M. Smith, J. Blandino, J. J. Miles, James Madison Univ. [6205-66]

Wednesday 19 April

SESSION 5

Room: Sun Breakout 5-6 **Wed. 8:20 to 10:20 am**

Process I

*Chairs: Herbert Kaplan, Honeyhill Technical Co.;
Morteza Safai, The Boeing Co.*

8:20 am: **Thermography of surface-treated saw blades and saw guides**, R. B. Dinwiddie, Oak Ridge National Lab.; T. E. Steffner, Better Than New, LLC [6205-21]

8:40 am: **IR imaging study on heater performance of outside rearview mirrors for automobiles**, H. Wang, Oak Ridge National Lab.; T. England, Delbar Products Inc. [6205-22]

9:00 am: **Dual-band MWIR/LWIR QWIP ratio radiometer for absolute skin temperature measurements**, G. M. Williams, A. M. Barter, Voxtel [6205-23]

9:20 am: **Final cook temperature monitoring**, J. M. Stewart, Georgia Institute of Technology [6205-24]

9:40 am: **Breast cancer monitoring using the thermography approach: induction trials in a university hospital in Greece (Presentation Only)**, N. P. Avdelidis, TWI Technology Ctr. Wales (United Kingdom); E. Athanassiou, A. Poultisidi, Univ. of Thessaly (Greece) [6205-25]

10:00 am: **Application of Dynamic Infrared Imaging (DIRI®) in reconstructive surgery**, M. Pawlowski, C. Wang, F. Jin, M. Salvitti, Advanced BioPhotonics, Inc.; X. Tenorio, Geneva Univ. Hospital (Switzerland) [6205-26]

Coffee Break 10:20 to 10:40 am

SESSION 6

Room: Sun Breakout 5-6 **Wed. 10:40 am to 12:20 pm**

Process II

*Chairs: Andrés E. Rozlosnik, SI Termografía Infrarroja (Argentina);
Herbert Kaplan, Honeyhill Technical Co.*

10:40 am: **Thermography and neural networks for SRAM voltage stress prediction**, S. Hsieh, K. Sharma, Texas A&M Univ. [6205-27]

11:00 am: **On-board SRAM signal density stress prediction**, S. Hsieh, K. Sharma, Texas A&M Univ. [6205-28]

11:20 am: **The effects of substrates and environmental pressure on the transient thermal response of a resistance temperature detector (RTD)**, J. Post, Jr., M. Imran, A. Bhattacharyya, Univ. of Arkansas/Little Rock . . [6205-29]

11:40 am: **Experimental determination of local convection heat transfer coefficient field using two-dimensional and dynamic of infrared thermography (2DD-IRT) method**, J. A. Paturski, F. Groeschel III, Paul Scherrer Institut (Switzerland) [6205-30]

12:00 pm: **Flow visualization of heated CO₂ gas using thermal imaging**, H. W. Yoon, National Institute of Standards and Technology [6205-31]

Annual Adronicus G. Kantsios Award

Wed. 12:20 to 12:30 pm · Room: Sun Breakout 5-6

*Presented by: Kathryn M. Knettel,
United Space Alliance*

Lunch/Exhibition Break 12:30 to 1:50 pm

SESSION 7

Room: Sun Breakout 5-6 **Wed. 1:50 to 2:50 pm**

Materials Evaluation and Quality Control

*Chairs: Pierre Bremond, CEDIP Infrared Systems (France);
Takahide Sakagami, Osaka Univ. (Japan);
Douglas D. Burleigh, Surfside Consulting*

1:50 pm: **Calorimetric analysis of some thermoplastic polymers**, C. André, V. Huon, S. Moreau, B. Wattrisse, J. M. Muracciole, R. Peyroux, Univ. Montpellier II (France); B. Pierre, CEDIP Infrared Systems (France) [6205-33]

2:10 pm: **An application of the differential thermographic technique for welded joints fatigue evaluation**, C. Casavola, U. Galletti, D. Modugno, Politecnico di Bari (Italy) [6205-34]

2:30 pm: **High-speed experimental analysis of orthogonal planing using high-speed infrared camera**, P. Guégan, A. Plotou, Ecole Centrale de Nantes (France); P. Bremond, CEDIP Infrared Systems (France) [6205-35]

Coffee Break 2:50 to 3:30 pm

SESSION 8

Room: Sun Breakout 5-6 **Wed. 3:30 to 5:20 pm**

Buildings and Environment

*Chairs: Timo T. Kauppinen, VTT Elektronikka (Finland);
Nicolas P. Avdelidis, TWI Technology Ctr. Wales (United Kingdom)*

3:30 pm: **First responder thermal imaging cameras: establishment of significant performance testing conditions**, F. Amon, J. M. Rowe, A. Hamins, National Institute of Standards and Technology [6205-37]

3:50 pm: **Techniques for thermographic imaging in sunlight and shadow**, K. M. Knettel, American Infrared Testing & Consulting, Inc. [6205-38]

4:10 pm: **The use of near-IR imaging in 19th Century artwork**, R. B. Dinwiddie, Oak Ridge National Lab.; S. Dean, FAMFIVE Productions [6205-39]

4:30 pm: **Certification of building thermographers: experiences after three courses**, T. T. Kauppinen, VTT Elektronikka (Finland); S. Paloniitty, Häme Polytechnic (Finland); J. Krankka, Rakennusteollisuuden Koulutuskeskus RATEKO (Finland) [6205-40]

4:50 pm: **Advanced techniques in IR thermography (Invited Paper)**, J. L. Grossman, Hi-Tech Inspection Services, Inc. [6205-41]

Thursday 20 April

SESSION 9

Room: Sun Breakout 5-6 **Thurs. 8:00 to 11:10 am**

NDT Theory and Applications

*Chairs: Douglas D. Burleigh, Surfside Consulting;
K. Elliott Cramer, NASA Langley Research Ctr.*

8:00 am: **Enhanced thermographic signal reconstruction**, S. M. Shepard, Y. Hou, J. R. Lhota, T. Ahmed, Thermal Wave Imaging, Inc. [6205-42]

8:20 am: **Discrete signal transforms as a tool for processing and analyzing pulsed thermographic data**, C. Ibarra-Castaneda, D. A. Gonzalez, F. Galmiche, X. P. Maldague, H. Bendada, Univ. Laval (Canada) [6205-43]

8:40 am: **Digitized frequency modulated thermal-wave imaging for nondestructive testing applications**, R. Mulaveesala, S. Tuli, Indian Institute of Technology Delhi (India) [6205-44]

9:00 am: **Transient thermal NDT & E of defects in building materials**, N. P. Avdelidis, TWI Technology Ctr. Wales (United Kingdom); D. Stavarakas, A. Moropoulou, National Technical Univ. of Athens (Greece) [6205-45]

9:20 am: **Peculiarities of detecting hidden corrosion in thick metals by transient IR thermography**, E. G. Grinzato, Consiglio Nazionale delle Ricerche (Italy) [6205-46]

9:40 am: **Signal-to-noise studies on thermographic data with fabricated defects for defence structures**, J. N. Zalameda, NASA Langley Research Ctr.; N. Rajic, Defence Science and Technology Organisation (Australia); M. Genest, National Research Council Canada (Canada) [6205-47]

Coffee Break 10:00 to 10:30 am

10:30 am: **Determining thermal diffusivity components in thick anisotropic composites**, V. P. Vavilov, Tomsk Polytechnic Univ. (Russia); D. D. Burleigh, Surfside Consulting [6205-48]

10:50 am: **Quantitative nondestructive evaluation of delamination damage in CFRP for space structures**, T. Sakagami, S. Kubo, Osaka Univ. (Japan); Y. Hyodo, T. Ogasawara, Japan Aerospace Exploration Agency (Japan); T. Nishimura, D. Imanishi, Osaka Univ. (Japan); M. R. Schmitt, Purdue Univ. [6205-49]

SESSION 10

Room: Sun Breakout 5-6 Thurs. 11:10 to 11:50 am
Space Shuttle NDT

Chairs: K. Elliott Cramer, NASA Langley Research Ctr.; Douglas D. Burleigh, Surfside Consulting

11:10 am: **Status of thermal NDT of space shuttle materials at NASA**, K. E. Cramer, W. P. Winfree, NASA Langley Research Ctr.; K. Hodges, NASA Johnson Space Ctr.; A. M. Koshti, The Boeing Co.; D. R. Ryan, United Space Alliance; W. W. Reinhardt, The Boeing Co. [6205-50]

11:30 am: **Development on on-orbit camera hardware**, M. J. Gazarik, NASA Langley Research Ctr. [6205-51]

Lunch/Exhibition Break 11:50 am to 1:10 pm

SESSION 11

Room: Sun Breakout 5-6 Thurs. 1:10 to 2:50 pm
NDT New Methods

Chairs: Douglas D. Burleigh, Surfside Consulting; K. Elliott Cramer, NASA Langley Research Ctr.

1:10 pm: **Detection of surface cracks, pits, and scratches in highly reflective and low-emissive materials by using laser beam trapping and infrared imaging technique**, M. Safai, The Boeing Co. [6205-52]

1:30 pm: **Potential and restrictions of eddy current lockin-thermography**, G. Riegert, A. Gleiter, G. Busse, Univ. Stuttgart (Germany) [6205-53]

1:50 pm: **Advanced ultrasound activated lockin-thermography for defect-selective depth-resolved imaging**, A. Gleiter, G. Riegert, G. Busse, Univ. Stuttgart (Germany) [6205-54]

2:10 pm: **Airborne detection of natural gas leaks from ground pipelines by using a laser system operating in visual, near-IR, and mid-IR wavelength bands**, V. P. Vavilov, Tomsk Polytechnic Univ. (Russia) [6205-55]

2:30 pm: **Thermographic identification of wetted insulation on pipelines in the Arctic oilfields**, J. J. Miles, James Madison Univ.; A. Dahlquist, C. Dash, ConocoPhillips Alaska Inc. [6205-56]

Coffee Break 2:50 to 3:20 pm

SESSION 12

Room: Sun Breakout 5-6 Thurs. 3:20 to 4:20 pm
NDT Building Materials and Concrete

Chairs: Douglas D. Burleigh, Surfside Consulting; K. Elliott Cramer, NASA Langley Research Ctr.

3:20 pm: **Bridge concrete deteriorating diagnosis by infrared thermography**, H. Shibata, N. Fukuyama, J. Sakuma, J. Mochizuki, Y. Kimura, Nippon Avionics Co Ltd (Japan) [6205-60]

3:40 pm: **Moisture and heat balance during building surveys**, O. V. Lebedev, O. N. Budadin, D. V. Kirzhanov, V. V. Avramenko, Russian Academy of Sciences (Russia) [6205-57]

4:00 pm: **Thermal testing of building envelopes**, O. V. Lebedev, Russian Academy of Sciences (Russia) and Technological institute WEMO (Russia); O. N. Budadin, D. V. Kirzhanov, V. V. Avramenko, Russian Academy of Sciences (Russia) [6205-58]

Related Courses

SC134 **Optical Design Fundamentals for Infrared Systems** (*Riedl*) Monday 8:30 am to 5:30 pm

SC152 **Infrared Focal Plane Arrays** (*Dereniak, Hubbs*) Tuesday 8:30 am to 12:30 pm

SC155 **Infrared Systems Design** (*Daniels*) Monday 8:30 am to 5:30 pm

SC164 **Dynamic Infrared Scene Projection** (*Williams*) Thursday 8:30 am to 12:30 pm

SC165 **Uncooled Thermal Imaging Arrays, Systems, and Applications** (*Kruse*) Tuesday 8:30 am to 5:30 pm

SC214 **Infrared Window and Dome Materials** (*Harris*) Thursday 8:30 am to 5:30 pm

SC278 **Infrared Detectors** (*Dereniak*) Tuesday 1:30 pm to 5:30 pm

SC584 **Night Vision Tools for Homeland Security** (*Kaplan*) Monday 1:30 pm to 5:30 pm

SC628 **IR Threat Detection Systems** (*de Jong*) Monday 1:30 pm to 5:30 pm

SC710 **NIR and SWIR Imaging Applications** (*Richards*) Wednesday 8:30 am to 12:30 pm

SC711 **Techniques for Accurate Infrared Temperature Measurement** (*Seffrin*) Wednesday 1:30 pm to 5:30 pm

SC786 **Practical Thermography for Nondestructive Testing** (*Shepard*) Monday 8:30 am to 12:30 pm

See SPIE Cashier to Register.



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Infrared Technology and Applications XXXII

Conference Chairs: **Bjørn F. Andresen**, EIOp Electrooptics Industries Ltd. (Israel); **Gabor F. Fulop**, Maxtech International Inc; **Paul R. Norton**, U.S. Army Night Vision & Electronic Sensors Directorate

Program Committee: **Christopher C. Alexay**, StingRay Optics; **Ken J. Ando**, Raytheon Vision Systems; **Raymond S. Balcerak**, DARPA; **Karl-Heinz Bers**, FGAN-FOM (Germany); **Philippe F. Bois**, Thales Research and Technology (France); **Wolfgang A. Cabanski**, AIM Infrarot-Module GmbH (Germany); **John T. Caulfield**, Cyan Systems; **Jean-Pierre Chatard**, ULIS (France); **David J. Clarke**, SELEX Sensors & Airborne Systems Ltd. (United Kingdom); **Michael E. Couture**, OASYS Technology, LLC; **Peter N. J. Dennis**, QinetiQ (United Kingdom); **John W. Devitt**, L-3 Communications Cincinnati Electronics, Inc.; **Michael T. Eismann**, Air Force Research Lab.; **Martin H. Ettenberg**, Sensors Unlimited, Goodrich Corp.; **Sarath D. Gunapala**, Jet Propulsion Lab.; **Jeffrey L. Johnson**, Rockwell Scientific Co., LLC; **Masafumi Kimata**, Ritsumeikan Univ. (Japan); **Herbert Korf**, AIM Infrarot-Module GmbH (Germany); **Paul W. Kruse**, Consultant, Infrared Technology; **Paul D. LeVan**, Air Force Research Lab.; **Mark A. Massie**, Nova Sensors; **Paul L. McCarley**, Air Force Research Lab.; **Paul F. McManamon III**, Air Force Research Lab.; **John L. Miller**, FLIR Systems, Inc.; **A. Fenner Milton**, U.S. Army Night Vision & Electronic Sensors Directorate; **Ofer Neshet**, Semiconductor Devices (Israel); **Peter W. Norton**, BAE Systems; **Francis P. Pantuso**, U.S. Army Night Vision & Electronic Sensors Directorate; **Herbert K. Pollehn**, Army Research Lab.; **Gabby Sarusi**, EIOp Electrooptics Industries Ltd. (Israel); **Myron J. Scholten**, DRS Infrared Technologies LP; **Venkataraman S. Swaminathan**, Army Research Lab.; **Meimei Z. Tidrow**, Missile Defense Agency; **Philippe M. Tribolet**, Sofradir (France)

Monday 17 April

Opening Remarks

Room: Sun Ballroom A **Mon. 8:00 to 8:10 am**

Chair: **Bjørn F. Andresen**, EIOp Electrooptics Industries Ltd. (Israel)

SESSION 1

Room: Sun Ballroom A **Mon. 8:10 to 9:30 am**

SWIR Imaging Technologies

Chair: **John L. Miller**, FLIR Systems, Inc.

8:10 am: **From visible to infrared: a new detector approach**, P. Chorier, B. Terrier, M. Vuillermet, P. M. Tribolet, Sofradir (France); G. L. Destefanis, CEA-LETI (France) [6206-01]

8:30 am: **Low dark current high-performance HgCdTe SWIR infrared detector advances with ion implantation**, R. Olshove, G. Garwood, J. W. Bangs, M. Newton, Raytheon Vision Systems; H. R. Vydyanath, Avyd Devices, Inc. [6206-02]

8:50 am: **Photon upconversion devices (Invited Paper)**, H. C. Liu, National Research Council Canada (Canada) [6206-03]

9:10 am: **Camera for laser beam profiling from 1.0 to 2.0 μm wavelength with an indium gallium-arsenide-based focal plane array**, R. M. Brubaker, M. H. Ettenberg, B. M. Onat, N. G. Masaun, P. E. Dixon, Sensors Unlimited, Goodrich Corp. [6206-04]

SESSION 2

Room: Sun Ballroom A **Mon. 9:30 to 10:00 am**

Challenges on Earth and Beyond

Chair: **Bjørn F. Andresen**, EIOp Electrooptics Industries Ltd. (Israel)

9:30 am: **From infrared imaging to Space (Invited Paper)**, G. H. Olsen, Sensors Unlimited, Goodrich Corp. [6206-05]

See page 6 for further details.

Coffee Break 10:00 to 10:30 am

SESSION 3

Room: Sun Ballroom A **Mon. 10:30 am to 12:10 pm**

SWIR Range-Gated Imaging

Chair: **Martin H. Ettenberg**, Sensors Unlimited, Goodrich Corp.

10:30 am: **1 mm APDs in InGaAs with InAlAs and InP multiplication layers: performance characteristics**, P. A. McDonald, J. C. Boisvert, T. Isshiki, P. Yuan, R. Sudharsanan, Spectrolab, Inc. [6206-06]

10:50 am: **Advances in laser-gated imaging in an airborne environment**, J. Henderson, J. Copley, G. Harvey, D. Humphreys, S. Duncan, SELEX Sensors and Airborne Systems Ltd. (United Kingdom) [6206-07]

11:10 am: **Advanced multifunctional detectors for laser-gated imaging applications (Invited Paper)**, I. Baker, P. Thorne, D. Owton, K. Trundle, SELEX Sensors and Airborne Systems Infrared Ltd. (United Kingdom) [6206-08]

11:30 am: **A 640 x 512 InGaAs camera for range-gated and staring applications**, T. J. Martin, R. M. Brubaker, M. H. Ettenberg, M. Lin, M. A. Blessinger, V. Burzi, T. M. Sudol, Sensors Unlimited, Goodrich Corp. [6206-09]

11:50 am: **On the safe use of long-range laser active imager in the near-infrared for homeland security**, D. Bonnier, S. Lelièvre, L. Demers, Obzerv Technologies Inc. (Canada) [6206-10]

Lunch Break 12:10 to 1:30 pm

SESSION 4

Room: Sun Ballroom A **Mon. 1:30 to 4:20 pm**

QWIP FPAs and Applications

Chairs: **Sarath D. Gunapala**, Jet Propulsion Lab.; **Philippe F. Bois**, Thales Research & Technology (France)

1:30 pm: **Optimization of corrugated-QWIPs for large format, high-quantum efficiency, and multicolor FPAs (Invited Paper)**, K. Choi, C. J. Monroy, V. S. Swaminathan, Army Research Lab.; M. Leung, T. Tamir, Polytechnic Univ.; J. W. Devitt, D. P. Forrai, D. Endres, L-3 Communications Cincinnati Electronics, Inc. [6206-11]

1:50 pm: **High-quantum-efficiency C-QWIP FPA-based IR cameras**, J. W. Devitt, D. Forrai, R. L. Rawe, D. Endres, L-3 Communications Cincinnati Electronics, Inc.; K. K. Choi, V. S. Swaminathan, Army Research Lab. ... [6206-12]

2:10 pm: **QWIP development status at Thales Research and Technology**, E. M. Costard, E. Belhaire, P. F. Bois, A. Nedelcu, X. Marcadet, Thales Research & Technology (France) [6206-13]

2:30 pm: **Single-color and dual-band QWIP production results**, A. Manissadjian, M. Vuillermet, D. Gohier, Sofradir (France); E. M. Costard, A. Nedelcu, Thales Research & Technology (France) [6206-14]

2:50 pm: **MOVPE growth of QWIP detectors using tBAs as an alternative arsenic precursor**, C. Asplund, H. Malm, H. H. Martijn, Acreo AB (Sweden) [6206-15]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Two-color quantum-well infrared photodetector focal plane arrays**, J. Bundas, K. Patnaude, R. Dennis, D. Burrows, R. Cook, A. R. Reisinger, M. Sundaram, QmagiQ, LLC; R. G. Benson, J. T. Woolaway II, J. D. Schlesselmann, S. M. Petronio, FLIR Systems, Inc. [6206-16]

4:00 pm: **Thales long-wave advanced IR QWIP cameras**, W. Johnston, R. Craig, S. Crawford, Thales (United Kingdom); F. H. Gauthier, O. Cocle, Thales (France); P. F. Bois, Thales Research & Technology (France) [6206-17]

SESSION 5

Room: Sun Ballroom A **Mon. 4:20 to 5:20 pm**
QDIP FPA Advances

Chair: Venkataraman S. Swaminathan, Army Research Lab.

4:20 pm: **Quantum-dot infrared photodetectors and focal plane arrays**, M. Razeghi, W. Zhang, H. Lim, S. Tsao, J. Szafraniec, M. Taguchi, A. Quivy, B. Movaghar, Northwestern Univ. [6206-18]

4:40 pm: **Long-wavelength infrared (LWIR) quantum-dot infrared photodetector (QDIP) focal plane array**, S. D. Gunapala, S. V. Bandara, D. Z. Ting, C. J. Hill, E. R. Blazejewski, Jet Propulsion Lab. [6206-19]

5:00 pm: **The promise of quantum-dot infrared photodetectors** (*Invited Paper*), E. Towe, D. Pal, Carnegie Mellon Univ. [6206-20]

Standby Presentation

An analysis of gamma radiation effects on ZnS- and CdTe-passivated HgCdTe photodiodes, M. Y. Lee, Korea Advanced Institute of Science and Technology (South Korea); Y. H. Kim, i3system Corp. (South Korea); N. H. Lee, Korea Atomic Energy Research Institute (South Korea); S. Sivananthan, Univ. of Illinois at Chicago; Y. S. Lee, H. Lee, Korea Advanced Institute of Science and Technology (South Korea) [6206-100]

Tuesday 18 April

SESSION 6

Room: Sun Ballroom A **Tues. 8:00 to 9:40 am**
Advances in Novel Cooled FPAs

Chair: Venkataraman S. Swaminathan, Army Research Lab.

8:00 am: **Dilute antimonide nitrides for very long-wavelength infrared applications**, T. Ashley, L. Buckle, G. W. Smith, QinetiQ Ltd. (United Kingdom); B. N. Murdin, Univ. of Surrey (United Kingdom); P. H. Jefferson, L. F. J. Piper, T. D. Veal, C. F. McConville, Univ. of Warwick (United Kingdom) [6206-21]

8:20 am: **High-performance InAlSb MWIR detectors operating at 100 K and beyond**, P. C. Klipstein, E. Harush, E. Jacobsohn, O. Klin, T. Markovitz, E. Saguy, J. Oiknine-Schlesinger, I. Shtrichman, M. Yassen, E. Weiss, Semiconductor Devices (Israel) [6206-22]

8:40 am: **Type-II superlattice photodetectors for MWIR to VLWIR focal plane arrays** (*Invited Paper*), M. Razeghi, A. D. Hood, D. M. Hoffman, M. B. Nguyen, P. Delaunay, E. J. Michel, Y. Wei, Northwestern Univ. [6206-23]

9:00 am: **Room-temperature operation of InAs/GaSb SLS infrared photovoltaic detectors with cut-off wavelength ~5 μm**, E. A. Plis, S. Annamalai, K. T. Posani, S. J. Lee, S. Krishna, The Univ. of New Mexico [6206-24]

9:20 am: **Progress on MBE grown type-II superlattice photodiodes**, C. J. Hill, J. Li, J. M. Mumolo, S. D. Gunapala, Jet Propulsion Lab. [6206-25]

SESSION 7

Room: Sun Ballroom A **Tues. 9:40 to 10:10 am**
Applications of Infrared Focal Plane Arrays in China

Chair: Bjørn F. Andresen, ElOp Electrooptics Industries Ltd. (Israel)

9:40 am: **Application of infrared and multispectrum optical payload technology in Chinese spaceborne and airborne remote sensing** (*Invited Paper*), J. Wang, G. Chen, Q. Feng, R. Shu, Shanghai Institute of Technical Physics (China) [6206-26]

Coffee Break 10:10 to 10:40 am

SESSION 8

Room: Sun Ballroom A **Tues. 10:40 to 11:50 am**
Development of 3rd Generation Infrared Imagers I

Chair: Paul R. Norton,

U.S. Army Night Vision & Electronic Sensors Directorate

10:40 am: **Bi-color and dual-band HgCdTe infrared focal plane arrays at Defir** (*Invited Paper*), G. L. Destefanis, P. Ballet, J. P. Baylet, P. Castelein, F. Rothan, J. Rothman, J. Chamonal, A. Million, CEA-LETI (France); B. Terrier, E. Sanson, P. Costa, P. M. Tribolet, L. Vial, Sofradir (France) [6206-27]

11:00 am: **Competitive technologies of third-generation infrared photon detectors** (*Invited Paper*), A. Rogalski, Wojskowa Akademia Techniczna (Poland) [6206-28]

11:30 am: **Material growth, device design, and applications for uncooled LWIR HgCdTe detectors**, A. Piotrowski, J. F. Piotrowski, VIGO System Ltd. (Poland) [6206-29]

Lunch/Exhibition Break 11:50 am to 1:00 pm

SESSION 9

Room: Sun Ballroom A **Tues. 1:00 to 5:50 pm**
Development of 3rd Generation Infrared Imagers II

Chairs: Paul R. Norton, U.S. Army Night Vision & Electronic Sensors Directorate; David J. Clarke, SELEX Sensors and Airborne Systems Ltd. (United Kingdom); Peter N. J. Dennis, QinetiQ (United Kingdom); Paul L. McCarley, Air Force Research Lab.

1:00 pm: **Digital output for high-performance MCT MWIR staring arrays**, P. Fillon, F. P. Pistone, P. M. Tribolet, S. Dugalleix, Sofradir (France) [6206-30]

1:20 pm: **Combined non-uniformity and bad pixel correction for superpixelated infrared imagery**, N. I. Rummelt, Air Force Research Lab.; T. Cicchi, J. P. Curzan, Nova Sensors [6206-31]

1:40 pm: **3rd generation 1280 x 720 FPA development status at Raytheon Vision Systems**, D. F. King, W. A. Radford, R. W. Graham, E. A. Patten, S. M. Johnson, R. E. Bornfreund, J. Vodicka, T. F. McEwan, Raytheon Vision Systems; J. A. Roth, B. Nosh, J. E. Jensen, HRL Labs., LLC [6206-32]

2:00 pm: **Adaptive spectral imager for space-based sensing** (*Invited Paper*), P. Vujkovic-Cvijin, N. Goldstein, M. J. Fox, Spectral Sciences, Inc.; S. D. Higbee, Air Force Research Lab.; L. S. R. Becker, U.S. Army Space and Missile Defense Command; T. K. Ooi, U.S. Army Aviation and Missile Research, Development and Engineering Ctr. [6206-33]

2:20 pm: **Bispectral thermal imaging with quantum-well infrared photodetectors and InAs/GaSb type-II superlattices** (*Invited Paper*), R. H. Rehm, M. Walther, H. Schneider, J. Fleißner, J. Schmitz, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany); J. Ziegler, W. A. Cabanski, R. Breiter, AIM Infrarot-Muodule GmbH (Germany) [6206-34]

2:40 pm: **Imaging applications of large-format variable acuity superpixel imagers**, M. A. Massie, J. P. Curzan, Nova Sensors; P. L. McCarley, Air Force Research Lab. [6206-35]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Affordable high-performance MW & LW IRFPAs made from HgCdTe grown by MOVPE** (*Invited Paper*), C. Jones, L. G. Hipwood, C. Shaw, R. A. Catchpole, M. Ordish, C. D. Maxey, J. Fitzmaurice, H. W. Lau, M. Wilson, A. D. Parsons, J. Gillespie, L. Baggaley, M. Wallis, SELEX Sensors and Airborne Systems Infrared Ltd. (United Kingdom) [6206-38]

4:00 pm: **Molecular beam epitaxy grown long-wavelength infrared HgCdTe on compliant Si substrates**, P. S. Wijewarnasuriya, Y. Chen, G. N. Brill, N. K. Dhar, Army Research Lab.; M. Carmody, J. M. Arias, Rockwell Scientific Co., LLC [6206-40]

4:20 pm: **Three-color MOVPE MCT diodes** (*Invited Paper*), L. G. Hipwood, C. Jones, C. D. Maxey, H. W. Lau, J. Fitzmaurice, R. A. Catchpole, M. Ordish, SELEX-SAS Infrared Ltd. (United Kingdom) [6206-37]

4:50 pm: **Efficiency of image processing architectures near the focal plane array**, J. T. Caulfield, Cyan Systems [6206-39]

5:10 pm: **Integrated infrared detectors and readout circuits**, J. W. Cairns, L. Buckle, G. J. Pryce, J. E. Hails, J. Giess, M. A. Crouch, D. J. Hall, A. J. Hydes, A. Graham, C. J. Hollier, D. J. Lees, T. Ashley, QinetiQ Ltd. (United Kingdom) [6206-41]

5:30 pm: **Development of high-performance radiation-hardened antireflection coatings for LWIR and multicolor IR focal plane arrays**, A. K. Sood, Y. R. Puri, Magnolia Optical Technologies, Inc.; L. S. R. Becker, U.S. Army Space and Missile Defense Command; M. Z. Tidrow, Missile Defense Agency; G. N. Brill, P. S. Wijewarnasuriya, N. K. Dhar, Army Research Lab.; J. Yahoda, Diamonex Inc.; P. Boieriu, C. Fulk, S. Sivananthan, EPIR Technologies, Inc. [6206-42]

Standby Presentation

Low-power MWIR sensor with pixel A/D achieves 32-bit quantization level at 30 fps, W. J. Mandl, Amain Electronics Co., Inc. [6206-93]

Wednesday 19 April

SESSION 10

Room: Sun Ballroom A Wed. 8:00 to 10:00 am

Uncooled FPAs and Applications I

*Chairs: Paul W. Kruse, Consultant, IR Technology;
Gabor F. Fulop, Maxtech International Inc*

- 8:00 am: **Uncooled thermal imaging sensor and application advances**, P. W. Norton, BAE Systems North America [6206-43]
- 8:20 am: **First demonstration of 640 x 480 uncooled amorphous silicon IRFPA with 25 μm pixel pitch**, J. Tissot, B. Fiègue, C. Trouilleau, P. Robert, A. Crastes, C. Minassian, O. Legras, ULIS (France) [6206-44]
- 8:40 am: **Uncooled IRFPA with chip scale vacuum package**, H. Hata, Y. Nakaki, H. Inoue, Y. Kosasayama, Y. Ohta, H. Fukumoto, T. Seto, K. Kama, M. Takeda, Mitsubishi Electric Corp. (Japan); M. Kimata, Ritsumeikan Univ. (Japan) [6206-45]
- 9:00 am: **High sensitivity 640 x 512 (20 μm pitch) microbolometer FPAs** (*Invited Paper*), D. F. Murphy, Raytheon Vision Systems [6206-46]
- 9:20 am: **Development of generic building blocks of uncooled thermal imaging systems under the Israeli MOEMS consortium**, G. Sarusi, EIOp Electrooptics Industries Ltd. (Israel) [6206-63]
- 9:40 am: **VO_x-based uncooled microbolometric detectors: recent developments at SCD**, A. Fraenkel, Z. Kopolovich, SemiConductor Devices (Israel) [6206-47]
- Coffee Break 10:00 to 10:30 am

SESSION 11

Room: Sun Ballroom A Wed. 10:30 to 11:50 am

Novel Uncooled Technologies I

*Chair: Francis P. Pantuso,
U.S. Army Night Vision & Electronic Sensors Directorate*

- 10:30 am: **Thermal-impedance simulations of antenna-coupled microbolometers**, F. J. Gonzalez, Univ. Autónoma de San Luis Potosi (Mexico) [6206-49]
- 10:50 am: **Highly sensitive infrared imager with direct optical readout** (*Invited Paper*), A. Flusberg, Science Research Lab., Inc.; S. M. Deliwala, Analog Devices, Inc. [6206-50]
- 11:10 am: **Antenna-coupled microbolometers for multispectral infrared imaging**, A. Weling, P. F. Henning, Foster-Miller, Inc.; D. P. Neikirk, S. Han, The Univ. of Texas at Austin [6206-51]
- 11:30 am: **Multilayer Fabry-Perot microbolometers for 2-color infrared detection**, S. Han, D. P. Neikirk, The Univ. of Texas at Austin [6206-52]
- Lunch/Exhibition Break 11:50 am to 1:30 pm

SESSION 12

Room: Sun Ballroom A Wed. 1:30 to 2:00 pm

Keynote Session

Chair: Gabor F. Fulop, Maxtech International Inc

Keynote Presentation

- 1:30 pm: **Army advances in EO/IR technology** (*Invited Paper, Presentation Only*), A. F. Milton, U.S. Army Night Vision & Electronic Sensors Directorate [6206-53]

SESSION 13

Room: Sun Ballroom A Wed. 2:00 to 3:20 pm

Novel Uncooled Technologies II

*Chair: Francis P. Pantuso,
U.S. Army Night Vision & Electronic Sensors Directorate*

- 2:00 pm: **A new approach for quantum infrared detection at room temperature** (*Invited Paper*), V. Garber, E. Baskin, A. Fayer, D. C. Sirica Ltd. (Israel) [6206-54]
- 2:20 pm: **High-sensitivity uncooled microcantilever infrared imaging arrays** (*Invited Paper*), S. R. Hunter, G. S. Maurer, G. Simelgor, L. Jiang, Multispectral Imaging, Inc. [6206-55]
- 2:40 pm: **Infrared imaging using uncooled MEMS IR devices**, N. V. Lavrik, P. G. Datskos, S. Rajic, Oak Ridge National Lab.; D. P. Forrai, E. K. Nelson, J. W. Devitt, L-3 Communications Cincinnati Electronics, Inc.; B. V. McIntyre, The Pennsylvania State Univ. [6206-56]
- 3:00 pm: **FEA simulation, design, and fabrication of an uncooled MEMS capacitive thermal detector for infrared FPA imaging**, W. Wang, V. Upadhyay, C. Munoz, J. Bumgarner, Univ. of South Florida; O. J. Edwards, Zyberwear, Inc. [6206-57]
- Coffee Break 3:20 to 3:50 pm

SESSION 14

Room: Sun Ballroom A Wed. 3:50 to 5:50 pm

Uncooled FPAs and Applications II

*Chairs: Masafumi Kimata, Ritsumeikan Univ. (Japan);
Jean-Luc Tissot, ULIS (France)*

- 3:50 pm: **Silicon MOEMS-based IR sensors for the high-volume security market**, K. C. Liddiard, Electro-optic Sensor Design (Australia) [6206-58]
- 4:10 pm: **Lightweight uncooled TWS equipped with catadioptric optics and microscan mechanism** (*Invited Paper*), A. Bergeron, H. Jerominek, Institut National d'Optique (Canada); P. Laou, Defence R&D Canada/Valcartier (Canada); M. Doucet, F. Lagacé, N. J. Desnoyers, S. Bernier, L. Mercier, M. Boucher, M. Jacob, C. Alain, T. D. Pope, Institut National d'Optique (Canada) . . . [6206-59]
- 4:30 pm: **Dual-band dual field-of-view TWS prototype**, A. Bergeron, H. Jerominek, Institut National d'Optique (Canada); P. Laou, Defence R&D Canada/Valcartier (Canada); M. Doucet, F. Lagacé, N. J. Desnoyers, S. Bernier, L. Mercier, M. Boucher, M. Jacob, C. Alain, T. D. Pope, Institut National d'Optique (Canada) [6206-60]
- 4:50 pm: **Linear microbolometer arrays for space and terrestrial imaging**, T. D. Pope, A. Bergeron, C. Alain, F. Williamson, H. Jerominek, C. Grenier, F. Cayer, B. Tremblay, P. Bourqui, S. Garant, Institut National d'Optique (Canada); L. Ngo-Phong, Canadian Space Agency (Canada) [6206-103]
- 5:10 pm: **Development of infrared goggle and prototype**, K. Tsuchimoto, S. Komatsubara, M. Fujikawa, T. Otsuka, Nippon Avionics Co., Ltd. (Japan) [6206-62]
- 5:30 pm: **Bolometers running backward: the synergy between uncooled IR sensors and dynamic IR scene projectors** (*Presentation Only*), P. T. Bryant, Left Coast Consulting; S. L. Solomon, Acumen Consulting; J. B. James, Santa Barbara Infrared, Inc. [6206-48]

Thursday 20 April

SESSION 15

Room: Sun Ballroom A Thurs. 8:00 am to 12:00 pm

IRST/Target Acquisition: Systems and Technologies I

Chairs: **Herbert K. Pollehn**, Army Research Lab.;
Gil A. Tidhar, Optigo Systems, Ltd. (Israel)

8:00 am: **Integration of a dual-band IR data acquisition system using low-cost PV320 uncooled BST-based cameras**, J. P. Havlicek, C. Nguyen, Univ. of Oklahoma; G. Fan, V. B. Venkataraman, Oklahoma State Univ. [6206-64]

8:20 am: **Operational benefits of IR MWS as panoramic vision and piloting system** (*Invited Paper*), S. Nadav, Elisra Electronic Systems Ltd. (Israel) [6206-65]

8:40 am: **FPGA-based processor for high-frame-rate target detection on cluttered backgrounds using foveal LVASI™ sensors**, V. I. Ovod, C. R. Baxter, M. A. Massie, Nova Sensors; N. I. Rummelt, P. L. McCarley, Air Force Research Lab. [6206-66]

9:00 am: **Infrared search and track for ballistic missile defense** (*Invited Paper, Presentation Only*), M. Z. Tidrow, Missile Defense Agency [6206-67]

9:30 am: **Missile warning and countermeasure systems integrated testing, by threat simulation and countermeasure analysis in the field**, D. Cabib, R. A. Buckwald, M. Lavi, A. Gil, J. Dolev, CI Systems Ltd. (Israel) [6206-70]

9:50 am: **SCD solutions for missile warning system applications**, O. Neshet, S. Elkind, T. Markovitz, Semiconductor Devices (Israel) [6206-69]

Coffee Break 10:10 to 10:40 am

10:40 am: **AIM thermal imagers for reconnaissance and targeting applications**, R. Breiter, W. A. Cabanski, AIM Infrarot-Module GmbH (Germany) [6206-68]

11:00 am: **IRST testing methodologies**, P. B. W. Schwering, TNO (Netherlands) [6206-71]

11:20 am: **An advanced integrated payload**, R. Haber, ElOp Electrooptics Industries Ltd. (Israel); L. Neumann, Kollman, Inc. [6206-121]

11:40 am: **Optimizing optics for IRST with small fill-factor focal plane arrays**, G. A. Tidhar, Optigo Systems, Ltd. (Israel) [6206-73]

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 16

Room: Sun Ballroom A Thurs. 1:30 to 4:40 pm

IRST/Target Acquisition: Systems and Technologies II

Chairs: **Gil A. Tidhar**, Optigo Systems, Ltd. (Israel);
Michael T. Eismann, Air Force Research Lab.

1:30 pm: **Versatile low-power multispectral video fusion hardware**, L. B. Wolff, D. A. Socolinsky, C. K. Eveland, Equinox Corp. [6206-74]

1:50 pm: **Aural stealth of portable cryogenically cooled infrared imagers**, A. M. Veprik, H. Vilenchick, R. Broyde, N. Pundak, Ricor-Cryogenic & Vacuum Systems (Israel) [6206-75]

2:10 pm: **A naval infrared search and track demonstrator and its fusion with other ship sensors**, M. Everett, D. C. Manson, A. Brook, G. Davidson, QinetiQ Ltd. (United Kingdom) [6206-76]

2:30 pm: **Multispectral IR detection modules and applications**, M. O. Muenzberg, R. Breiter, W. A. Cabanski, J. C. Wendler, J. Ziegler, AIM Infrarot-Module GmbH (Germany); R. Rehm, M. Walther, Fraunhofer-Institut für Angewandte Festkörperphysik (Germany) [6206-77]

2:50 pm: **Imaging by shape**, B. E. Allman, latia Ltd. (Australia); K. A. Nugent, The Univ. of Melbourne (Australia) [6206-78]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Optomechanical design for real-time image processing**, B. Ellison, C. I. Archer, FLIR Systems, Inc. [6206-79]

4:00 pm: **Radiometric calibration stability of the FIRST: a longwave infrared hyperspectral imaging sensor**, M. Chamberland, V. Farley, A. J. Villemare, A. Vallières, TELOPS Inc. (Canada); J. Legault, Telops USA Inc. [6206-80]

4:20 pm: **The NGST long-wave hyperspectral imaging spectrometer: sensor hardware and data processing**, B. T. Lottman, M. A. Folkman, S. R. Sandor-Leahy, J. Shepanski, H. Miller, Jr., Northrop Grumman Space Technology [6206-81]

Standby Presentations

Face recognition in low-light environments using fusion of thermal infrared and intensified imagery, D. A. Socolinsky, A. Lundberg, L. B. Wolff, Equinox Corp. [6206-122]

Pedestrian tracking using thermal infrared imaging, F. M. Porikli, J. Katz, E. Goubet, Mitsubishi Electric Research Labs. [6206-104]

Navigation bias compensation algorithm using the aerial image sequence, A. Notik, J. Krips, Elisra Electronic Systems Ltd. (Israel) [6206-105]

SESSION 17

Room: Sun Ballroom A Thurs. 4:40 to 6:00 pm

HgCdTe

Chair: **Philippe M. Tribolet**, Sofradir (France)

4:40 pm: **MWIR focal plane arrays made with HgCdTe grown by MBE on germanium substrates**, G. L. Destefanis, CEA-LETI (France); P. M. Tribolet, Sofradir (France); P. Ballet, J. Zanatta, O. Gravrand, C. Langeron, J. Chamonal, A. Million, CEA-LETI (France); S. Mibord, P. Costa, A. Combette, Sofradir (France) [6206-82]

5:00 pm: **Carrier transport characterization of high-density plasma-induced p-to-n type converted HgCdTe material**, B. A. Park, C. A. Musca, J. M. Dell, K. J. Winchester, L. Faraone, The Univ. of Western Australia (Australia) . [6206-83]

5:20 pm: **SWIR to LWIR HDVIP HgCdTe detector array performance**, A. I. D'Souza, M. G. Stapelbroek, L. C. Dawson, P. Ely, C. Yoneyama, J. P. Reekstin, DRS Sensors & Targeting Systems, Inc.; H. Shih, M. R. Skokan, T. H. Teherani, J. E. Robinson, DRS Infrared Technologies LP [6206-84]

5:40 pm: **From LWIR to VLWIR FPAs made with HgCdTe at Defir**, G. L. Destefanis, E. De Borniol, O. Gravrand, CEA-LETI (France); A. Manissadjian, P. M. Tribolet, C. Pautet, P. Chorier, Sofradir (France) [6206-85]

✓ Posters-Thursdays

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

✓ Posters/Oral Standby Presentations

✓ **An analysis of gamma radiation effects on ZnS- and CdTe-passivated HgCdTe photodiodes**, M. Y. Lee, Korea Advanced Institute of Science and Technology (South Korea); Y. H. Kim, i3system Corp. (South Korea); N. H. Lee, Korea Atomic Energy Research Institute (South Korea); S. Sivananthan, Univ. of Illinois at Chicago; Y. S. Lee, H. Lee, Korea Advanced Institute of Science and Technology (South Korea) [6206-100]

✓ **Pedestrian tracking using thermal infrared imaging**, F. M. Porikli, J. Katz, E. Goubet, Mitsubishi Electric Research Labs. [6206-104]

✓ **Navigation bias compensation algorithm using the aerial image sequence**, A. Notik, J. Krips, Elisra Electronic Systems Ltd. (Israel) [6206-105]

✓ **Fixed pattern noise compensation technique and implementation for IRFPA-based staring system using a Fourier transform**, A. Kumar, S. Sarkar, R. P. Agarwal, Indian Institute of Technology (India) [6206-106]

✓ **Face recognition in low-light environments using fusion of thermal infrared and intensified imagery**, D. A. Socolinsky, A. Lundberg, L. B. Wolff, Equinox Corp. [6206-122]

✓ **Narrow-band infrared filters with broad field of view**, T. D. Rahlmow, Jr., J. E. Lazo-Wasem, E. J. Gratrix, Rugate Technologies, Inc. [6206-123]

✓ Posters

✓ **Novel high-efficiency and cost-effective filters and windows for infrared detectors**, T. Weyh, H. Bernitzki, E. Gittler, H. Lauth, JENOPTIK Laser, Optik, Systeme GmbH (Germany) [6206-90]

✓ **Optically readable room-temperature infrared imaging**, Q. Zhang, Univ. of Science and Technology of China (China); D. Chen, Institute of Microelectronics (China); X. Wu, Univ. of Science and Technology of China (China) [6206-102]

✓ **Spectral filtration of images in the IR spectral region with use of a total internal reflection phenomenon and multibeam interference**, L. D. Saginov, A. M. Filachev, A. Kononov, A. N. Sviridov, V. L. Bakumenko, K. O. Boltar, Orion Research and Production Association (Russia) [6206-107]

- ✓ **A no-reference quality metric for evaluating deinterlaced video frames**, E. P. Lam, C. A. Leddy, S. R. Nash, H. A. Parks, Raytheon Co. [6206-108]
- ✓ **SPICE modeling of resistive, diode, and pyroelectric bolometer cells**, H. Vogt, Fraunhofer-Institut für Mikroelektronische Schaltungen und Systeme (Germany) [6206-109]
- ✓ **Improvement of cooldown time of LSF9599 flexure-bearing SADA cooler**, W. L. van de Groep, J. C. Mullie, P. C. Bruins, J. Dam, T. Benschop, A. de Koning, Thales Cryogenics B.V. (Netherlands) [6206-110]
- ✓ **Modeling and experimental results of low-background extrinsic double-injection IR detector response**, N. B. Zaletaev, A. M. Filachev, V. P. Ponomarenko, V. I. Stafeev, Orion Research and Production Association (Russia) [6206-111]
- ✓ **Standoff infrared detection of explosives at laboratory scale**, S. P. Hernández-Rivera, L. C. Pacheco-Londoño, O. M. Primera-Pedrozo, M. L. Ramirez, O. Ruiz, Univ. de Puerto Rico Mayagüez [6206-112]
- ✓ **Resonant cavity enhanced HgCdTe photodetectors**, J. G. A. Wehner, R. H. Sewell, C. A. Musca, J. M. Dell, L. Faraone, The Univ. of Western Australia (Australia) [6206-113]
- ✓ **A dynamic resistance nonuniformity compensation circuit for uncooled microbolometer detector arrays**, T. Akin, O. O. Yildirim, Middle East Technical Univ. (Turkey) [6206-116]
- ✓ **Thermal infrared panoramic imaging sensor**, M. A. Gutin, Applied Science Innovations, Inc.; E. K. Tsui, U.S. Army Tank-automotive and Armaments Command; O. N. Gutin, X. Wang, A. Gutin, Applied Science Innovations, Inc. [6206-118]

Friday 21 April

SESSION 18

Room: Sun Ballroom A Fri. 8:00 to 10:20 am

Infrared Optics and Applications

*Chairs: Christopher C. Alexay, StingRay Optics;
Michael E. Couture, OASYS Technology, LLC*

- 8:00 am: **Molded GASIR® infrared optics for automotive applications**, Y. M. Guimond, Y. Bellec, S. Dervaux, Umicore IR Glass (France) [6206-86]
- 8:20 am: **Using molded chalcogenide glass technology to improve performance and reduce cost in a compact wide-angle thermal imaging lens**, G. C. Curatu, B. Binkley, D. A. Tinch, LightPath Technologies, Inc. [6206-87]
- 8:40 am: **MEMS mirror arrays for use in optical spectrometric detection**, S. Samson, S. Kedia, V. Upadhyay, R. Parniawski, Univ. of South Florida [6206-88]
- 9:00 am: **Applying the Buchdahl dispersion model to infrared hybrid refractive-diffractive achromats**, Y. Pi, P. J. Reardon, The Univ. of Alabama in Huntsville [6206-89]
- 9:20 am: **IR and visible wideband protection filter**, R. Oron, A. Donval, B. A. Nemet, M. Oron, R. Shvartzter, KiloLambda Technologies, Ltd. (Israel) [6206-117]
- 9:40 am: **Germanium soup**, T. A. Palmer, C. C. Alexay, StingRay Optics [6206-91]
- 10:00 am: **Survey and analysis of fore-optics for hyperspectral imaging systems**, J. Fisher, Brandywine Optics, Inc.; W. C. Welch, Welch Mechanical Designs, LLC [6206-92]

Standby Presentation

Narrow-band infrared filters with broad field of view, T. D. Rahmlow, Jr., J. E. Lazo-Wasem, E. J. Gratrix, Rugate Technologies, Inc. [6206-123]

Coffee Break 10:20 to 10:40 am

SESSION 19

Room: Sun Ballroom A Fri. 10:40 am to 12:40 pm

Selected Papers on Infrared Technologies and Sensors

Chair: John L. Miller, FLIR Systems, Inc.

- 10:40 am: **A long-range hand-held thermal imager**, N. Alfasi, ElOp Electrooptics Industries Ltd. (Israel); W. E. Seibel, Kollsman, Inc. [6206-119]
 - 11:00 am: **A versatile, producible, digital InSb FPA architecture**, B. Krashefski, M. A. Goodnough, J. M. Elliott, L. Hahn, T. Molyneux, J. Scott, Lockheed Martin Santa Barbara Focalplane [6206-94]
 - 11:20 am: **Performance improvements for pyroelectric infrared detectors**, V. Norkus, D. Chvedov, G. U. Gerlach, Technische Univ. Dresden (Germany); R. Köhler, DIAS Infrared GmbH (Germany) [6206-95]
 - 11:40 am: **A 32 x 32 array of polycrystalline PbSe opens up the market of very low-cost MWIR sensitive photon detectors**, G. Vergara, L. J. Gómez, V. Villamayor, M. Álvarez, M. C. Torquemada, M. T. Rodrigo, M. Verdú, F. J. Sánchez, R. Almazán, J. Plaza, J. Diezhandino, P. Rodríguez, I. Catalán, M. T. Montojo, Ctr. de Investigación y Desarrollo de la Armada (Spain) . . [6206-96]
 - 12:00 pm: **Advanced readout integrated circuit signal processing**, A. W. Hairston, BAE Systems North America [6206-98]
 - 12:20 pm: **Synergistic security surveillance automation**, G. L. Francisco, L-3 Communications Infrared Products [6206-99]
- Standby Presentation*
- Fixed pattern noise compensation technique and implementation for IRFPA-based staring system using a Fourier transform**, A. Kumar, S. Sarkar, R. P. Agarwal, Indian Institute of Technology (India) [6206-106]

Related Courses

- SC067 **Testing and Evaluation of E-O Imaging Systems (Holst)** Tuesday 8:30 am to 5:30 pm
- SC134 **Optical Design Fundamentals for Infrared Systems (Riedl)** Monday 8:30 am to 5:30 pm
- SC152 **Infrared Focal Plane Arrays (Dereniak, Hubbs)** Tuesday 8:30 am to 12:30 pm
- SC154 **Electro-Optical Imaging System Performance (Holst)** Friday 8:30 am to 5:30 pm
- SC155 **Infrared Systems Design (Daniels)** Monday 8:30 am to 5:30 pm
- SC164 **Dynamic Infrared Scene Projection (Williams)** Thursday 8:30 am to 12:30 pm
- SC165 **Uncooled Thermal Imaging Arrays, Systems, and Applications (Kruse)** Tuesday 8:30 am to 5:30 pm
- SC214 **Infrared Window and Dome Materials (Harris)** Thursday 8:30 am to 5:30 pm
- SC278 **Infrared Detectors (Dereniak)** Tuesday 1:30 pm to 5:30 pm
- SC545 **Infrared Characterization of Sources and Backgrounds (Jacobs)** Monday 8:30 am to 5:30 pm
- SC628 **IR Threat Detection Systems (de Jong)** Monday 1:30 pm to 5:30 pm
- SC710 **NIR and SWIR Imaging Applications (Richards)** Wednesday 8:30 am to 12:30 pm
- SC713 **Engineering Approach to Imaging System Design (Holst)** Monday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

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Infrared Imaging Systems: Design, Analysis, Modeling, and Testing XVII

Conference Chair: **Gerald C. Holst**, JCD Publishing

Program Committee: **Piet Bijl**, TNO Human Factors (Netherlands); **Ronald G. Driggers**, U.S. Army Night Vision & Electronic Sensors Directorate; **David P. Forrai**, L-3 Communications Cincinnati Electronics, Inc.; **Thomas Holland**, Naval Surface Warfare Ctr.; **Marta L. Kowalczyk**, Institute for Defense Analyses; **Keith A. Krapels**, Office of Naval Research; **Terrence S. Lomheim**, The Aerospace Corp.; **Stephen W. McHugh**, Santa Barbara Infrared, Inc.; **Luanne P. Obert**, U.S. Army Night Vision & Electronic Sensors Directorate; **Hector M. Reyes**, Raytheon Co.; **Michael A. Soel**, FLIR Systems, Inc.; **John J. Szymanski**, Los Alamos National Lab.; **Curtis M. Webb**, Northrop Grumman Corp.

Wednesday 19 April

SESSION 1

Room: Sun Ballroom C Wed. 8:30 to 10:10 am

Modeling I

Chairs: **Piet Bijl**, TNO Human Factors (Netherlands); **Ronald G. Driggers**, U.S. Army Night Vision & Electronic Sensors Directorate

8:30 am: **Angular distance traveled across the eye as figure of merit for moving target detection** (*Invited Paper*), B. L. O'Kane, U.S. Army Night Vision & Electronic Sensors Directorate; G. L. Page, Booz Allen Hamilton Inc. . . . [6207-01]

9:10 am: **Modeling defined field of regard (FOR) search and detection in urban environments**, D. M. Deaver, DCS Corp.; S. K. Moyer, U.S. Army Night Vision & Electronic Sensors Directorate [6207-02]

9:30 am: **Characteristics of infrared imaging systems which benefit from superresolution reconstruction**, K. A. Krapels, Office of Naval Research [6207-03]

9:50 am: **Detector integration time effects on third-generation FLIR performance**, P. Richardson, R. G. Driggers, B. S. Miller, U.S. Army Night Vision & Electronic Sensors Directorate [6207-04]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Sun Ballroom C Wed. 10:40 am to 12:00 pm

Modeling II

Chairs: **Marta L. Kowalczyk**, Institute for Defense Analyses; **Keith A. Krapels**, Office of Naval Research

10:40 am: **System engineering trades for the LWIR hyperspectral imager**, R. E. Hanna, REH Technical Services, Inc. [6207-05]

11:00 am: **Atmospheric turbulence effects on third-generation FLIR performance**, P. Richardson, U.S. Army Night Vision & Electronic Sensors Directorate [6207-06]

11:20 am: **Adaptive deblurring of noisy images**, S. S. Young, Army Research Lab.; R. G. Driggers, B. P. Teaney, E. L. Jacobs, U.S. Army Night Vision & Electronic Sensors Directorate [6207-07]

11:40 am: **Modeling of IR sensor performance in cold weather**, V. A. Hodgkin, U.S. Army Night Vision & Electronic Sensors Directorate [6207-08]

Lunch/Exhibition Break 12:00 to 1:00 pm

SESSION 3

Room: Sun Ballroom C Wed. 1:00 to 3:00 pm

Modeling III

Chairs: **Terrence S. Lomheim**, The Aerospace Corp.; **Hector M. Reyes**, Raytheon Co.

1:00 pm: **Current infrared target acquisition approach for military sensor design and wargaming** (*Invited Paper*), R. G. Driggers, U.S. Army Night Vision & Electronic Sensors Directorate [6207-09]

1:40 pm: **Recursive adaptive frame integration limited**, M. K. Rafailov, The Boeing Co. [6207-10]

2:00 pm: **Effects of image compression on sensor performance**, P. D. O'Shea, U.S. Army Night Vision & Electronic Sensors Directorate [6207-11]

2:20 pm: **Using a targeting metric to predict the utility of an EO imager as a pilotage aid**, R. H. Vollmerhausen, Consultant [6207-12]

2:40 pm: **Effects of image enhancement on search in the urban terrain**, N. M. Devitt, U.S. Army Night Vision & Electronic Sensors Directorate; S. S. Young, Army Research Lab. [6207-13]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Sun Ballroom C Wed. 3:30 to 4:50 pm

Modeling IV

Chairs: **Michael A. Soel**, FLIR Systems, Inc.; **Luanne P. Obert**, U.S. Army Night Vision & Electronic Sensors Directorate

3:30 pm: **Applicability of TOD, MRT, DMRT and MTD for dynamic image enhancement techniques**, P. Bijl, TNO Human Factors (Netherlands); K. Schutte, TNO-FEL (Netherlands); M. A. Hogervorst, TNO Human Factors (Netherlands) [6207-14]

3:50 pm: **Threat object identification performance for LADAR imagery: comparison of 2D versus 3D imagery**, M. A. Chaudhuri, U.S. Army Night Vision & Electronic Sensors Directorate; K. A. Krapels, Office of Naval Research; R. G. Driggers, U.S. Army Night Vision & Electronic Sensors Directorate [6207-15]

4:10 pm: **A new approach for object measurement under out-of-focus situation**, Y. Du, Indiana Univ.-Purdue Univ. Indianapolis [6207-16]

4:30 pm: **Modeling the effects of image contrast on thermal target acquisition performance**, J. G. Hixson, E. L. Jacobs, B. P. Teaney, U.S. Army Night Vision & Electronic Sensors Directorate [6207-17]

Thursday 20 April

SESSION 5

Room: Sun Ballroom C Thurs. 8:00 to 10:00 am

Joint Session with conference 6208

Chairs: **Stephen W. McHugh**, Santa Barbara Infrared, Inc.;
James A. Buford, Jr., U.S. Army Aviation and Missile Research,
Development and Engineering Ctr.; **Robert Lee Murrer, Jr.**,
Millennium Engineering and Integration Co.

- 8:00 am: **Can IR scene generators reduce total system costs?**, R. P. Ginn, Acumen Scientific [6207-18]
- 8:20 am: **Bolometers running backward: the synergy between uncooled IR sensors and dynamic IR scene projectors**, P. T. Bryant, Left Coast Consulting; S. L. Solomon, Acumen Consulting; J. B. James, Santa Barbara Infrared, Inc. [6207-19]
- 8:40 am: **Are reconstructions filters necessary?**, G. C. Holst, JCD Publishing [6207-20]
- 9:00 am: **Radiometric calibration of a longwave FPA camera for IR scene projector characterization**, R. M. Patchan, D. T. Prendergast, Johns Hopkins Univ. [6208-43]
- 9:20 am: **Blackbody characterization and analysis for infrared scene projection**, D. H. Crider, U.S. Air Force [6208-44]
- 9:40 am: **Resistor array infrared projector nonuniformity correction: search for performance improvement**, R. A. Joyce, L. Swierkowski, O. M. Williams, Defence Science and Technology Organisation (Australia) [6208-45]
- Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Sun Ballroom C Thurs. 10:30 am to 12:10 pm
Systems and Testing I

Chairs: **David P. Forrai**, L-3 Communications Cincinnati Electronics, Inc.;
Thomas Holland, Naval Surface Warfare Ctr.;
Curtis M. Webb, Northrop Grumman Corp.

- 10:30 am: **High-performance spectroradiometer for very accurate radiometric calibrations and testing of projected infrared sources**, D. Cabib, A. Gil, R. A. Buckwald, CI Systems Ltd. (Israel) [6207-21]
- 10:50 am: **Radiometric dynamic scene processing for uncooled IRFPAs**, L. R. Gauthier, Jr., L. M. Howser, D. T. Prendergast, M. P. Mattix, Johns Hopkins Univ. [6207-22]
- 11:10 am: **Radiometric calibration and operation of IR target projectors**, S. W. McHugh, G. P. Matis, B. W. Rich, J. T. Grigor, S. G. White, Santa Barbara Infrared, Inc. [6207-23]
- 11:30 am: **Characterization of a flux-dependent nonlinearity in the response of an LWIR HgCdTe FPA**, A. G. Hayes, G. J. Swanson, R. J. Patel, MIT Lincoln Lab. [6207-24]
- 11:50 am: **Separation of presampling and postsampling modulation transfer functions in infrared sensor systems**, R. L. Espinola, J. T. Olson, V. A. Hodgkin, E. L. Jacobs, U.S. Army Night Vision & Electronic Sensors Directorate [6207-25]
- Lunch/Exhibition Break 12:10 to 1:30 pm

SESSION 7

Room: Sun Ballroom C Thurs. 1:30 to 3:10 pm
Systems and Testing II

Chairs: **Stephen W. McHugh**, Santa Barbara Infrared, Inc.;
John J. Szymanski, Los Alamos National Lab.

- 1:30 pm: **Test techniques for high-performance thermal imaging system characterization**, D. P. Forrai, R. C. Fischer, T. C. Back, L-3 Communications Cincinnati Electronics, Inc. [6207-26]
- 1:50 pm: **Advanced manpower and time saving testing concept for development, production, and maintenance of electro-optical systems**, D. Cabib, S. Nirkin, C. Ben Yaakov, M. Lavi, CI Systems Ltd. (Israel) [6207-27]
- 2:10 pm: **First responder thermal imaging cameras: development of performance metrics and test methods**, F. Amon, A. Hamins, National Institute of Standards and Technology [6207-28]
- 2:30 pm: **LCD display screen performance testing for handheld thermal imaging cameras**, J. B. Dinaburg, National Institute of Standards and Technology and Univ. of Maryland/College Park; F. Amon, National Institute of Standards and Technology [6207-29]
- 2:50 pm: **Standard target set for field sensor performance measurements**, J. D. O'Connor, U.S. Army Night Vision & Electronic Sensors Directorate [6207-30]

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Performances of multichannel commander's sighting system for military land vehicle application**, Y. Choi, Agency for Defence Development (South Korea) [6207-31]
- ✓ **Advances in thermal imaging technology in the first responder arena**, F. Amon, N. Bryner, National Institute of Standards and Technology [6207-32]
- ✓ **An image enhancement methodology and FPGA-based implementation combining fuzzy logic and image convolution for an infrared imaging system**, A. Kumar, S. Sarkar, R. P. Agarwal, Indian Institute of Technology/Roorkee (India) [6207-33]
- ✓ **A new nonuniformity correction algorithm for infrared line scanners**, J. Sui, W. Jin, L. Dong, Beijing Institute of Technology (China) [6207-34]

Related Courses

- SC067 **Testing and Evaluation of E-O Imaging Systems (Holst)** Tuesday 8:30 am to 5:30 pm
- SC134 **Optical Design Fundamentals for Infrared Systems (Riedl)** Monday 8:30 am to 5:30 pm
- SC152 **Infrared Focal Plane Arrays (Dereniak, Hubbs)** Tuesday 8:30 am to 12:30 pm
- SC154 **Electro-Optical Imaging System Performance (Holst)** Friday 8:30 am to 5:30 pm
- SC155 **Infrared Systems Design (Daniels)** Monday 8:30 am to 5:30 pm
- SC164 **Dynamic Infrared Scene Projection (Williams)** Thursday 8:30 am to 12:30 pm
- SC165 **Uncooled Thermal Imaging Arrays, Systems, and Applications (Kruse)** Tuesday 8:30 am to 5:30 pm
- SC214 **Infrared Window and Dome Materials (Harris)** Thursday 8:30 am to 5:30 pm
- SC278 **Infrared Detectors (Dereniak)** Tuesday 1:30 pm to 5:30 pm
- SC545 **Infrared Characterization of Sources and Backgrounds (Jacobs)** Monday 8:30 am to 5:30 pm
- SC628 **IR Threat Detection Systems (de Jong)** Monday 1:30 pm to 5:30 pm
- SC713 **Engineering Approach to Imaging System Design (Holst)** Monday 8:30 am to 5:30 pm
- SC725 **Optical & Laser Scanning Technology: Devices, Systems & Applications (Marshall)** Wednesday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Technologies for Synthetic Environments: Hardware-in-the-Loop Testing XI

Conference Chair: **Robert Lee Murrer, Jr.**, Millennium Engineering and Integration Co.

Cochair: **James A. Buford, Jr.**, U.S. Army Aviation and Missile Research, Development & Engineering Ctr.

Program Committee: **Mary A. Amick**, U.S. Air Force; **David B. Beasley**, Optical Sciences Corp.; **Paul T. Bryant**, Left Coast Consulting; **Charles F. Coker**, Air Force Research Lab.; **Naresh C. Das**, Army Research Lab.; **George C. Goldsmith II**, Air Force Research Lab.; **Alexander G. Hayes**, MIT Lincoln Lab.; **John Lannon**, Research Triangle Institute; **Heard S. Lowry III**, Aerospace Testing Alliance; **Mark A. Manzardo**, Ball Aerospace & Technologies Corp.; **Scott B. Mobley**, U.S. Army Aviation and Missile Research, Development & Engineering Ctr.; **Randy A. Nicholson**, Aerospace Testing Alliance; **Robert M. Patchan**, Johns Hopkins Univ.; **Donald R. Snyder**, Air Force Research Lab.; **Steven L. Solomon**, Acumen Consulting; **Tony R. A. Thompson**, Air Force Research Lab.; **Owen M. Williams**, Defence Science And Technology Organisation (Australia)

Tuesday 18 April

SESSION 1

Room: Sun Breakout 1-2 Tues. 8:00 to 10:00 am

HWIL Facilities, Tools, and Applications

Chairs: **Robert Lee Murrer, Jr.**, Millennium Engineering and Integration Co.; **George C. Goldsmith II**, Air Force Research Lab.; **Scott B. Mobley**, U.S. Army Aviation and Missile Command; **Alexander G. Hayes**, MIT Lincoln Lab.

8:00 am: **The MIT Lincoln Laboratory Optical Systems Test Facility overview**, D. C. Harrison, A. G. Hayes, L. A. Jiang, E. L. Hines, J. M. Richardson, MIT Lincoln Lab. [6208-01]

8:20 am: **Air Force electronic warfare evaluation simulator(AFEWES) infrared test and evaluation capabilities**, H. D. Jackson II, T. L. Blair, B. A. Ensor, U.S. Air Force [6208-02]

8:40 am: **A composite pointing error analysis of a five-axis flight/target motion simulator with and infrared scene projector**, R. W. Mitchell, Ideal Aerosmith, Inc. [6208-03]

9:00 am: **The infrared and semi-active laser simulation capabilities at the AMSTAR tri-mode system simulation HWIL facility**, D. A. Saylor, J. W. Morris, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; M. Lowry, U.S. Army Redstone Technical Test Ctr. [6208-04]

9:20 am: **Modern design of far-field target motion simulators**, R. Hauser, ACUTRONIC Switzerland Ltd. (Switzerland) [6208-05]

9:40 am: **Object-oriented design in HWIL simulations**, H. J. Richard, A. Lowman, Simulation Technologies, Inc.; J. W. Morris, U.S. Army Aviation and Missile Command; R. Youngren, Simulation Technologies, Inc. [6208-06]

Coffee Break 10:00 to 10:20 am

SESSION 2

Room: Sun Breakout 1-2 Tues. 10:20 am to 12:40 pm

Low-Background Testing of IR Sensors

Chairs: **James A. Buford, Jr.**, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; **Randy A. Nicholson**, Aerospace Testing Alliance; **Donald R. Snyder**, Air Force Research Lab.; **Tony R. A. Thompson**, Air Force Research Lab.

10:20 am: **On-site low-background IR chambers for IR FPA sensor test and characterization**, G. L. Jensen, Mission Research Corp. [6208-07]

10:40 am: **Application of scene projection technologies in the AEDC cryo-vacuum space simulation chambers**, H. S. Lowry III, D. H. Crider, M. F. Breeden, U.S. Air Force [6208-08]

11:00 am: **The Seeker Experimental System Laboratory at MIT Lincoln Laboratory**, A. G. Hayes, D. C. Harrison, K. I. Schultz, E. L. Hines, J. M. Richardson, L. A. Jiang, MIT Lincoln Lab. [6208-09]

11:20 am: **Cryogenic complex scene test capability for 1 and 2-color sensors at KHLS**, E. W. Glattke, MacAulay-Brown, Inc. [6208-10]

11:40 am: **Calibration and characterization of a cold chamber in support of hardware-in-the-loop testing and modeling of infrared seekers**, R. D. Tschiegg, Johns Hopkins Univ. [6208-11]

12:00 pm: **Steering and positioning targets for HWIL IR testing at cryogenic conditions**, D. W. Perkes, Mission Research Corp. [6208-12]

12:20 pm: **Radiometric calibration and mission simulation testing of sensor systems in the AEDC 7V and 10V chambers**, R. A. Nicholson, Aerospace Testing Alliance [6208-46]

Lunch/Exhibition Break 12:40 to 1:30 pm

SESSION 3

Room: Sun Breakout 1-2 Tues. 1:30 to 5:40 pm

Joint Session with conference 6239

Chairs: **Heard S. Lowry III**, Aerospace Testing Alliance; **Victoria R. Hahn**, Raytheon Missile Systems

1:30 pm: **FLUENT-based modeling of rocket exhaust signatures**, J. L. Rapanotti, Defence R&D Canada/Valcartier (Canada) [6239-28]

1:50 pm: **Acquisition and analysis of a spectral and bidirectional database of urban materials over Toulouse (France)**, S. Lachérade, S. Pallotta, C. Miesch, X. Briottet, B. Tanguy, ONERA (France); H. Le Man, IGN (France) [6239-29]

2:10 pm: **Scene generation**, V. R. Hahn, Raytheon Missile Systems ... [6239-30]

2:30 pm: **Automatic 3D virtual scenes modeling for multisensors simulation**, T. Cathala, J. Latger, OKTAL Synthetic Environment (France); A. Y. Le Goff, DGA/DCE/CELAR (France); P. Gozard, DGA/DSP/Tour DGA (France) [6239-31]

2:50 pm: **The Standoff Aerosol Active Signature Testbed (SAAST) at Lincoln Laboratory**, J. M. Richardson, J. C. Aldridge, D. C. Harrison, A. G. Hayes, E. L. Hines, L. A. Jiang, K. I. Schultz, MIT Lincoln Lab. [6239-32]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Real-time target motion animation for missile warning system testing**, R. L. Sundberg, T. C. Perkins, Spectral Sciences, Inc.; J. F. Cordell, Z. Tun, Naval Air Systems Command; M. M. Owen, AMEWAS, Inc. [6208-13]

4:00 pm: **Automatic generation of high-fidelity urban scenes for sensor simulation**, M. R. Stevens, C. S. Monnier, M. S. Snorrason, S. Kapali, Charles River Analytics, Inc. [6208-14]

4:20 pm: **Comparison of MMW ground vehicle signatures**, A. V. Saylor, Simulation Technologies, Inc. [6208-15]

4:40 pm: **Multiclass correlated clutter map for high-resolution radar simulation**, P. Vanderford, Simulation Technologies, Inc.; J. W. Morris, U.S. Army Aviation and Missile Command; B. Sanders, R. F. Olson, Jr., D. Satterfield, Simulation Technologies, Inc. [6208-16]

5:00 pm: **Three-dimensional modeling of large targets and clutter utilizing Ka-band monopulse SAR**, J. A. Ray, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; D. P. Barr, R. Shurtz, R. Channell, Simulation Technologies, Inc. [6208-17]

5:20 pm: **Fast line-of-sight imagery for target and exhaust-plume signatures (FLITES) scene generation program**, D. R. Crow, Kinetics, Inc. [6208-18]

Wednesday 19 April

SESSION 4

Room: Sun Breakout 1-2 Wed. 8:00 am to 12:00 pm

Scene Simulation: Enabling Techniques

Chairs: David B. Beasley, Optical Sciences Corp.;
Paul T. Bryant, Left Coast Consulting;
Naresh C. Das, Army Research Lab.;

Mark A. Manzardo, Ball Aerospace & Technologies Corp.

8:00 am: **New scene projector developments**, D. A. Saylor, J. A. Buford, Jr., U.S. Army Aviation and Missile Research, Development and Engineering Ctr. [6208-19]

8:20 am: **Advancement and applications of the micromirror array projector technology**, D. B. Beasley, J. Crosby, T. Messer, M. C. Cornell, M. W. Bender, J. Formby, Optical Sciences Corp. [6208-20]

8:40 am: **Development of hyperspectral image projectors for testing infrared systems**, J. P. Rice, J. E. Neira, S. W. Brown, National Institute of Standards and Technology [6208-21]

9:00 am: **MWIR LED array for high-temperature target simulation**, N. C. Das, Army Research Lab. [6208-22]

9:20 am: **Visible/UV image projector for sensor testing**, R. P. Ginn, S. L. Solomon, Acumen Scientific; G. C. Goldsmith II, Air Force Research Lab. [6208-23]

9:40 am: **Cold background infrared scene simulation device**, V. K. Malyutenko, V. V. Bogatyrenko, O. Y. Malyutenko, S. Chyrchuk, Institute of Semiconductor Physics (Ukraine) [6208-24]

Coffee Break 10:00 to 10:20 am

10:20 am: **Digital beam former based on an electronically steerable antenna for HWIL target simulation for US Army AMRDEC**, A. A. Avakian, M. Aretskin, A. B. Brailovsky, D. Jia, M. Felman, I. Gordion, I. V. Gurin, V. V. Khodos, V. I. Litvinov, V. A. Manasson, L. S. Sadovnik, G. A. Voronel, WaveBand Corp. [6208-25]

10:40 am: **Novel photonic infrared scene generator**, J. Zhao, Agiltron, Inc. [6208-26]

11:00 am: **High-temperature materials for resistive IRSPs**, S. L. Solomon, Acumen Scientific [6208-27]

11:20 am: **Fast multispectral liquid-crystal-on-silicon spatial light modulators**, M. A. Handschy, J. R. McNeil, Displaytech, Inc.; J. L. West, G. Zhang, Kent State Univ.; A. V. Glushchenko, Univ. of Colorado at Colorado Springs [6208-28]

11:40 am: **Fabry Perot-based high-dynamic range infrared scene projector**, W. S. Chan, NovaSpectra Inc. [6208-29]

Lunch/Exhibition Break 12:00 to 1:00 pm

SESSION 5

Room: Sun Breakout 1-2 Wed. 1:00 to 4:00 pm

Resistor Array Scene Projectors: Design, Development, and Characterization

Chairs: Owen M. Williams, Defence Science and Technology Organisation (Australia); Mary A. Amick, U.S. Air Force;
Heard S. Lowry III, U.S. Air Force;
Steven L. Solomon, Acumen Scientific

1:00 pm: **Resistor array infrared projector temperature resolution: revisited**, O. M. Williams, L. Swierkowski, Defence Science and Technology Organisation (Australia); B. A. Sieglinger, MacAulay-Brown, Inc.; G. C. Goldsmith II, Air Force Research Lab. [6208-30]

1:20 pm: **Resistor array performance errors associated with extended targets**, R. B. Sisko, Aegis Technologies Group Inc. [6208-31]

1:40 pm: **Characterization and comparison of 128 x 128 element nuclear optical dynamic display system (NODDS) resistive arrays**, A. G. Hayes, D. C. Harrison, F. J. Caraco, MIT Lincoln Lab. [6208-32]

2:00 pm: **Resistor array RNUC band response converter**, R. B. Sisko, Aegis Technologies Group Inc. [6208-33]

2:20 pm: **Procedures and results for two-color HWIL sensor testing: radiometric and spatial calibration of the projectors**, B. A. Sieglinger, MacAulay-Brown, Inc. [6208-34]

2:40 pm: **LFRA: developments in large-format resistive arrays & advanced IRSP system technologies**, J. B. James, Santa Barbara Infrared, Inc. [6208-35]

Coffee Break 3:00 to 3:20 pm

3:20 pm: **A new modular optical system for large format scene projection**, C. C. Alexay, T. A. Palmer, StingRay Optics [6208-36]

3:40 pm: **OASIS: cryogenically-optimized resistive arrays & IRSP subsystems for space-background IR simulation**, J. B. James, Santa Barbara Infrared, Inc. [6208-37]

SESSION 6

Room: Sun Breakout 1-2 Wed. 4:00 to 5:40 pm

Scene Generation: Real-Time Hardware Solutions

Chairs: Charles F. Coker, Air Force Research Lab.; John Lannon, Research Triangle Institute; Robert M. Patchan, Johns Hopkins Univ.

4:00 pm: **A low-latency scene generator for accurately presenting point and small targets to infrared seekers**, D. T. Winters, A. S. Boteler, H. N. Oguz, Johns Hopkins Univ. [6208-38]

4:20 pm: **Real-time zoom anti-aliasing improvement using programmable graphics processing units**, E. Gouthas, O. M. Williams, Defence Science and Technology Organisation (Australia) [6208-39]

4:40 pm: **A novel approach to implementing geometric transformations in FPGAs**, W. L. Herald, MacAulay-Brown, Inc. [6208-40]

5:00 pm: **Integration of open interface PC scene generators with legacy scene projectors using COTS DVI converter hardware**, T. Nordland, Quantum3D, Inc. and CG2, Inc.; D. S. Cosby, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; B. S. Schultz, Davidson Technologies Inc. [6208-41]

5:20 pm: **Real-time scene generation using high-speed pixel processing hardware and open source software**, M. W. Price, InterSpace Electronics; D. S. Cosby, U.S. Army Research, Development and Engineering Command [6208-42]

Thursday 20 April

SESSION 7

Room: Sun Ballroom C Thurs. 8:00 to 10:00 am

Joint Session with conference 6207

Chairs: James A. Buford, Jr., U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; Robert Lee Murrer, Jr., Millennium Engineering and Integration Co.;
Stephen W. McHugh, Santa Barbara Infrared, Inc.

8:00 am: **Can IR scene generators reduce total system costs?**, R. P. Ginn, Acumen Scientific [6207-18]

8:20 am: **Bolometers running backward: the synergy between uncooled IR sensors and dynamic IR scene projectors**, P. T. Bryant, Left Coast Consulting; S. L. Solomon, Acumen Consulting; J. B. James, Santa Barbara Infrared, Inc. [6207-19]

8:40 am: **Are reconstructions filters necessary?**, G. C. Holst, JCD Publishing [6207-20]

9:00 am: **Radiometric calibration of a longwave FPA camera for IR scene projector characterization**, R. M. Patchan, D. T. Prendergast, Johns Hopkins Univ. [6208-43]

9:20 am: **Blackbody characterization and analysis for infrared scene projection**, D. H. Crider, U.S. Air Force [6208-44]

9:40 am: **Resistor array infrared projector nonuniformity correction: search for performance improvement**, R. A. Joyce, L. Swierkowski, O. M. Williams, Defence Science and Technology Organisation (Australia) [6208-45]

Coffee Break 10:00 to 10:30 am

Airborne Intelligence, Surveillance, Reconnaissance (ISR) Systems and Applications III

Conference Chair: **Dan Henry**, Recon/Optical, Inc.

Conference Co-Chair: **Stephan H. Wyatt**, QuickSet International Inc.

Wednesday 19 April

Track Keynote Presentation	
Room: Osceola Ballroom D	Wed. 8:35 to 9:20 am
8:35 am: Introduction	
<i>Chairs: Roger Appleby, QinetiQ Ltd. (United Kingdom); David A. Wikner, Army Research Lab.</i>	
8:40 am: Millimeter wave myths and reality	
<i>(Invited Paper, Presentation Only)</i>	
H. B. Wallace , MMW Concepts	

Break 9:20 to 9:30 am

SESSION 1

Room: Destin 1-2 **Wed. 9:30 am to 12:20 pm**

9:30 am: **A novel multiple target tracking system for UAV platforms**, S. X. Yi, L. Zhang, D. Tunnell, Genex Technologies, Inc. [6209-01]

9:50 am: **Image-registration-based local noise reduction for noisy video sequences**, N. Jiang, Arizona State Univ.; G. P. Abousleman, General Dynamics C4 Systems; J. Si, Arizona State Univ. [6209-02]

10:10 am: **Methodology study for development of a motion imagery quality metric**, J. M. Irvine, D. M. Cannon, J. R. Miller, Science Applications International Corp.; J. Bartolucci, The Boeing Co.; L. D. Gibson, Science Applications International Corp.; C. P. Fenimore, J. W. Roberts, I. Aviles, National Institute of Standards and Technology; M. Brennan, The Boeing Co.; A. P. Bozell, L. Simon, S. A. Israel, Science Applications International Corp. [6209-03]

Coffee Break 10:30 to 11:00 am

11:00 am: **Knowledge-based understanding of aerial surveillance video**, H. Cheng, D. Butler, Sarnoff Corp. [6209-04]

11:20 am: **Autonomous UAV-based mapping of large-scale urban firefights**, S. R. Snarski, J. Lupo, Applied Research Associates, Inc.; K. F. Scheibner, Lawrence Livermore National Lab.; S. Shaw, Planning Systems Inc.; R. S. Roberts, Lawrence Livermore National Lab.; A. Larow, J. Forren, Planning Systems Inc.; A. Kott, Defense Advanced Research Projects Agency ... [6209-05]

11:40 am: **Trends in COTS storage solutions for data acquisition systems**, O. Tsur, M-Systems, Inc. (Israel) [6209-06]

12:00 pm: **Real-time video mosaicking robust to dynamic scenes**, N. Jiang, Arizona State Univ.; G. P. Abousleman, General Dynamics C4 Systems; J. Si, Arizona State Univ. [6209-07]

Lunch/Exhibition Break 12:20 to 1:30 pm

SESSION 2

Room: Destin 1-2 **Wed. 1:30 to 5:40 pm**

1:30 pm: **ISAR image analysis using the curvelet transform**, H. C. Morris, San José State Univ.; M. M. De Pass, Claremont Graduate Univ. [6209-08]

1:50 pm: **DB-110 reconnaissance system: the 3rd generation system**, M. A. Iyengar, Goodrich Corp. [6209-09]

2:10 pm: **Real-time viewer for real-time orthorectification system**, D. P. Gordon, D. Kuo, Cardio Logic, Inc. [6209-10]

2:30 pm: **Demonstration of real-time automatic target identification from a surrogate UAV**, P. N. Randall, J. M. Nothard, J. J. Wood, J. D. Cowell, QinetiQ Ltd. (United Kingdom) [6209-11]

2:50 pm: **Results of the sub-thirty-pound high-resolution miniSAR demonstration**, D. F. Dubbert, A. D. Sweet, G. R. Sloan, A. W. Doerry, Sandia National Labs. [6209-12]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **COCOA: tracking in aerial imagery**, S. Ali, Univ. of Central Florida [6209-13]

4:00 pm: **Video encoding platform based on cell processor blade for digital video surveillance systems**, V. Sheinin, A. Jagmohan, B. Paulovicks, H. Yeo, T. Horvath, L. A. Allman, E. Khorasani, F. Savino, IBM Thomas J. Watson Research Ctr. [6209-14]

4:20 pm: **Low-light-level EMCCD color camera**, G. B. Heim, Ball Aerospace & Technologies Corp.; W. W. Frame, Strom Engineering Corp.; J. M. Burkepile, Ball Aerospace & Technologies Corp. [6209-15]

4:40 pm: **Detect and track targets in water channels**, W. Badawy, Smart Camera Technologies (Canada) [6209-16]

5:00 pm: **Raytheon advanced targeting forward-looking infrared (ATFLIR) pod**, G. P. Uyeno, Raytheon Co. [6209-17]

5:20 pm: **Parallel algorithm for linear feature detection from airborne lidar data**, M. Mareboyana, M. A. Matties, P. Chi, Bowie State Univ. [6209-18]

Thursday 20 April

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

✓ **Advanced Sensors, Technologies, and Techniques**, M. Shah, Princeton Instruments, Inc. [6209-19]

✓ **Omni-view sensor system design for automated aerial surveillance**, B. A. Weber, J. A. Penn, Army Research Lab. [6209-20]

✓ **Lightweight and thermally stable optics materials for large-aperture laser systems**, A. Ahmad, Raytheon Co. [6209-21]

Related Courses

SC067 **Testing and Evaluation of E-O Imaging Systems (Holst)** Tuesday 8:30 am to 5:30 pm

SC154 **Electro-Optical Imaging System Performance (Holst)** Friday 8:30 am to 5:30 pm

SC713 **Engineering Approach to Imaging System Design (Holst)** Monday 8:30 am to 5:30 pm

SC725 **Optical & Laser Scanning Technology: Devices, Systems & Applications (Marshall)** Wednesday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Radar Sensor Technology X

Conference Chairs: **Robert N. Trebits**, Georgia Institute of Technology; **James L. Kurtz**, Univ. of Florida

Program Committee: **Edward W. Burke**, Army Research Lab.; **Armin W. Doerry**, Sandia National Labs.; **John E. Gray**, Naval Surface Warfare Ctr.; **Todd A. Kastle**, Air Force Research Lab.; **Jeffrey P. Sichina**, Army Research Lab.; **Lars M. Wells**, Sandia National Labs.

Thursday 20 April

SESSION 1

Room: Naples 3 Thurs. 8:30 to 10:10 am

SAR Techniques

Chair: **Robert N. Trebits**, Georgia Institute of Technology

- 8:30 am: **Synthetic aperture radar simulation for image sensitivity assessment**, S. P. McCarty, W. D. Williams, E. R. Keydel, Science Applications International Corp. [6210-01]
- 8:50 am: **A portfolio of fine resolution Ku-band miniSAR images: part I**, A. D. Sweet, D. F. Dubbert, A. W. Doerry, G. R. Sloan, V. D. Gutierrez, Sandia National Labs. [6210-02]
- 9:10 am: **Geometrical optics analysis of clear-air refractive-index perturbations on SAR images**, R. N. Shagam, F. M. Dickey, A. W. Doerry, Sandia National Labs. [6210-03]
- 9:30 am: **Detection of underground target using ultrawideband borehole radar and SAR image formation**, L. H. Nguyen, D. C. Wong, B. Stanton, G. D. Smith, T. Dogaru, A. J. Sullivan, K. I. Ranney, M. A. Ressler, K. A. Kappra, J. P. Sichina, Army Research Lab. [6210-04]
- 9:50 am: **High-resolution imaging of objects located within a wall**, E. F. Grenaker III, G. A. Showman, J. M. Trostel, V. B. Sylvester, Georgia Tech Research Institute [6210-05]
- Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Naples 3 Thurs. 10:40 am to 12:20 pm

Radar Signal Processing and Imaging I

Chair: **James L. Kurtz**, Univ. of Florida

- 10:40 am: **Ultrawideband imaging radar based on OFDM: system simulation analysis**, D. S. Garmatyuk, Miami Univ. [6210-06]
- 11:00 am: **Modeling of FM broadcast signals with applications in bistating radar imaging**, B. C. Flores, R. Sullivan, The Univ. of Texas at El Paso . [6210-07]
- 11:20 am: **Interferometer and ultrawideband radar receiver**, M. Li, Consultant. [6210-08]
- 11:40 am: **Classification of targets using optimized ISAR Euler imager**, C. S. Baird, W. T. Kersey, R. H. Giles, Univ. of Massachusetts/Lowell; W. E. Nixon, U.S. Army National Ground Intelligence Ctr. [6210-09]
- 12:00 pm: **See-through-the-wall detection and classification of scattering primitives**, J. A. Marble, A. O. Hero III, Univ. of Michigan [6210-10]
- Lunch/Exhibition Break 12:20 to 1:30 pm

SESSION 3

Room: Naples 3 Thurs. 1:30 to 3:10 pm

Radar Signal Processing and Imaging II

Chair: **James L. Kurtz**, Univ. of Florida

- 1:30 pm: **The design of a matched filter for phase noise and some of its applications**, J. E. Gray, Naval Surface Warfare Ctr. [6210-11]
- 1:50 pm: **Performance estimates of radar STAP processing on the IBM/Sony/Toshiba cell processor**, L. Cico, J. S. Greene, L. L. McLeod, Mercury Computer Systems, Inc. [6210-12]
- 2:10 pm: **Wideband radar imaging using chaotic-based maps**, B. Verdin, B. C. Flores, The Univ. of Texas at El Paso [6210-13]
- 2:30 pm: **Doppler correction for high-velocity targets using a relativistic approach**, H. A. Ochoa, B. C. Flores, The Univ. of Texas at El Paso [6210-14]
- 2:50 pm: **Statistical analysis of Bernoulli, logistic, and tent maps with applications to radar signal design**, H. Garces, B. C. Flores, The Univ. of Texas at El Paso [6210-15]
- Coffee Break 3:10 to 3:40 pm

SESSION 4

Room: Naples 3 Thurs. 3:40 to 5:20 pm

Radar Systems and Techniques I

Chair: **Robert N. Trebits**, Georgia Institute of Technology

- 3:40 pm: **Distributed position-adaptive UAV radar concepts for building geometries with multiple signal-leakage points**, A. K. Mitra, Air Force Research Lab. [6210-16]
- 4:00 pm: **Current test results for the Athena radar responsive tag**, R. C. Ormsher, Sandia National Labs. [6210-17]
- 4:20 pm: **Angular super-resolution via scanned time/angle correlation (STAC) implementation and testing utilizing an ultrasonic transceiver**, J. C. McIntosh, A. M. Kennedy, J. A. Mills, Intellectual Properties, Inc. [6210-18]
- 4:40 pm: **High resolution, long range radar imaging at 94GHz**, D. A. Robertson, D. G. Macfarlane, Univ. of St. Andrews (United Kingdom) [6210-19]
- 5:00 pm: **S-band polarimetric combined short-pulse scatterometer-radiometer for platform and vessel application**, A. K. Arakelyan, ECOSERV Remote Observation Ctr. Co. Ltd. (Armenia) and Institute of radiophysics & Electronics (Armenia) [6210-20]

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Cross-well radar as a noninvasive technique for detection of compounds**, M. F. Serrano-Guzman, I. Y. Padilla, R. Rodriguez, Univ. de Puerto Rico Mayagüez [6210-27]
- ✓ **A portfolio of fine resolution Ku-band miniSAR images: part II**, A. D. Sweet, D. F. Dubbert, A. W. Doerry, G. R. Sloan, V. D. Gutierrez, Sandia National Labs. [6210-28]

Friday 21 April

SESSION 5

Room: Naples 3 Fri. 9:00 to 10:40 am

Radar Systems and Techniques II

Chairs: **James L. Kurtz**, Univ. of Florida; **Robert N. Trebits**, Georgia Institute of Technology

- 9:00 am: **Analysis of micro-Doppler signals using linear FM basis decomposition**, P. Setlur, F. Ahmad, M. G. Amin, Villanova Univ. [6210-21]
- 9:20 am: **Recent ARL borehole radar experiments**, K. I. Ranney, B. Stanton, A. J. Sullivan, G. D. Smith, M. A. Ressler, D. C. Wong, L. H. Nguyen, K. A. Kappra, J. C. Costanza, J. P. Sichina, G. A. Kirose, Army Research Lab. [6210-22]
- 9:40 am: **Signature exploitation and sensor capability**, J. A. Malas, Air Force Research Lab.; K. M. Pasala, Univ. of Dayton [6210-24]
- 10:00 am: **Assessment of ultrawide-band radar for roadside IED detection**, O. Kegege, J. Li, H. Foltz, The Univ. of Texas-Pan American [6210-25]
- 10:20 am: **Identification of electromagnetic parameters of a wall and determination of radar signal level behind a wall**, H. C. Khatri, C. Le, Army Research Lab. [6210-26]

Passive Millimeter-Wave Imaging Technology IX

Conference Chairs: Roger Appleby, QinetiQ Ltd. (United Kingdom); David A. Wikner, Army Research Lab.

Wednesday 19 April

Track Keynote Presentation	
Room: Osceola Ballroom D	Wed. 8:35 to 9:20 am
8:35 am: Introduction	
<i>Chairs: Roger Appleby, QinetiQ Ltd. (United Kingdom); David A. Wikner, Army Research Lab.</i>	
8:40 am: Millimeter wave myths and reality	
<i>(Invited Paper, Presentation Only)</i>	
H. B. Wallace, MMW Concepts	

Break 9:20 to 9:30 am

SESSION 2

Room: Gainesville 1-2 Wed. 9:30 to 11:10 am

Systems

Chair: Neil A. Salmon, QinetiQ Ltd. (United Kingdom)

9:30 am: **A 94GHz dual-mode imaging "radarometer" for remote sensing**, D. A. Robertson, D. G. Macfarlane, Univ. of St. Andrews (United Kingdom) [6211-02]

9:50 am: **Passive millimeter-wave imagery of helicopter obstacles in a sand environment**, D. A. Wikner, Army Research Lab. [6211-03]

Coffee Break 10:10 to 10:30 am

10:30 am: **Passive millimeter-wave camera with interferometric processing**, H. Nomi, NEC Corp. (Japan) [6211-04]

10:50 am: **Low cost passive millimeter-wave imaging for object detection/intelligent imaging**, R. Emrick, Motorola, Inc. [6211-05]

SESSION 3

Room: Gainesville 1-2 Wed. 11:10 am to 12:30 pm

Modeling

Chair: Roger Appleby, QinetiQ Ltd. (United Kingdom)

11:10 am: **An improved polarimetric model for millimeter radiometry**, A. N. Pergande, Lockheed Martin Missiles and Fire Control [6211-06]

11:30 am: **Scene simulation for submillimeter wave imaging and the description of scattering effects**, N. A. Salmon, QinetiQ Ltd. (United Kingdom) [6211-07]

11:50 am: **Passive microwave retrieval of land surface properties**, M. Owe, NASA Goddard Space Flight Ctr.; R. A. de Jeu, Vrije Univ. Amsterdam (Netherlands) [6211-08]

12:10 pm: **Framework of passive millimeter-wave scene simulation based on material classification**, H. Park, S. Kim, H. Lee, Y. Kim, Gwangju Institute of Science and Technology (South Korea); J. Lee, S. Park, Poongsan Corp. (South Korea); J. Ki, I. Yoon, KCEI (South Korea) [6211-09]

Lunch/Exhibition Break 12:30 to 1:30 pm

SESSION 4

Room: Gainesville 1-2 Wed. 1:30 to 3:30 pm

Security

Chair: David A. Wikner, Army Research Lab.

1:30 pm: **Cylindrical millimeter-wave imaging technique and applications**, D. M. Sheen, D. L. McMakin, T. E. Hall, Pacific Northwest National Lab. [6211-10]

1:50 pm: **Millimeter wave imaging system for personnel screening: scanning 10⁷ points a second and using no moving parts**, Z. I. Baharav, G. S. Lee, R. C. Taber, Agilent Technologies, Inc. [6211-11]

2:10 pm: **Security scanning at 94GHz**, R. N. Anderton, R. Appleby, P. R. Coward, P. J. Kent, S. Price, G. N. Sinclair, J. E. Beale, QinetiQ Ltd. (United Kingdom) [6211-12]

2:30 pm: **Active and passive terahertz imaging for security applications**, M. R. Hogbin, Home Office Scientific Development Branch (United Kingdom) [6211-13]

2:50 pm: **A compact real time passive terahertz imager**, C. M. Mann, ThruVision Ltd. (United Kingdom) [6211-14]

3:10 pm: **Radiometric measurements of dielectric material properties at MMW frequencies for security applications**, M. Peichl, S. Dill, H. Suess, DLR Standort Oberpfaffenhofen (Germany) [6211-15]

Coffee Break 3:30 to 3:50 pm

SESSION 5

Room: Gainesville 1-2 Wed. 3:50 to 5:30 pm

Components and Technology

Chair: David A. Wikner, Army Research Lab.

3:50 pm: **Optical techniques for sparse-aperture millimeter-wave imaging**, C. A. Schuetz, S. Shi, G. J. Schneider, J. A. Murakowski, Univ. of Delaware; M. S. Mirotznik, The Catholic Univ. of America; D. W. Prather, Univ. of Delaware [6211-16]

4:10 pm: **Ultra sensitive silicon sensor for passive millimeter wave imaging**, N. Bluzer, Northrop Grumman Corp. [6211-17]

4:30 pm: **Unamplified direct detection sensor for passive millimeter-wave imaging**, J. J. Lynch, J. H. Schaffner, P. H. Lawyer, D. Choudhury, H. P. Moyer, J. A. Foschaar, J. N. Schulman, D. H. Chow, HRL Labs., LLC [6211-18]

4:50 pm: **Sb-heterostructure diode detector W-band NEP and NEDT optimization**, H. P. Moyer, R. L. Bowen, J. N. Schulman, D. H. Chow, S. Thomas III, J. J. Lynch, K. S. Holabird, HRL Labs., LLC [6211-19]

5:10 pm: **Ultra-resolution and indication of objects**, E. N. Terentiev, M.V. Lomonosov Moscow State Univ. (Russia); N. E. Terentiev, PointBreak.ru (Russia) [6211-20]

Related Courses

SC067 **Testing and Evaluation of E-O Imaging Systems (Holst)** Tuesday 8:30 am to 5:30 pm

SC154 **Electro-Optical Imaging System Performance (Holst)** Friday 8:30 am to 5:30 pm

SC782 **Zone Plate Antennas for Millimeter-Wave and Terahertz Frequencies (Wiltse)** Thursday 8:30 am to 12:30 pm

See SPIE *Chasier* to Register.

Terahertz for Military and Security Applications IV

Conference Chairs: **Dwight L. Woolard**, Army Research Lab.; **R. Jennifer Hwu**, Innosys, Inc.

Cochairs: **Mark J. Rosker**, Defense Advanced Research Projects Agency; **James O. Jensen**, U.S. Army Edgewood Chemical Biological Ctr.

Monday 17 April

SESSION 1

Room: Osceola Ballroom A Mon. 8:30 to 10:00 am

Novel Terahertz Devices and Concepts I

Chair: **Dwight L. Woolard**, Army Research Lab.

8:30 am: **Conductive biomolecules and their THz vibrational interactions: key aspects of bioelectronics** (*Invited Paper*), M. A. Stroschio, M. Dutta, Univ. of Illinois at Chicago [6212-01]

9:00 am: **Simulations of retinal-based electronic components for application to THz frequency sensing platforms**, Y. Luo, Univ. of Virginia; D. L. Woolard, Army Research Lab.; B. L. Gelmont, Univ. of Virginia. [6212-02]

9:20 am: **Designed self-organization for molecular optoelectronics**, M. L. Norton, D. Neff, I. Towler, S. Day, Z. Grambos, M. Shremshock, H. Butts, Y. Samiso, Marshall Univ. [6212-03]

9:40 am: **Molecular-based processing and transfer of information in the terahertz domain for military and security applications**, J. M. Seminario, J. Sotelo, L. Yan, Y. Ma, Texas A&M Univ. [6212-04]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Osceola Ballroom A Mon. 10:30 am to 12:00 pm

Novel Terahertz Devices and Concepts II

Chair: **R. Jennifer Hwu**, Innosys, Inc.

10:30 am: **Dilute magnetic semiconductor superlattices** (*Invited Paper*), H. L. Grubin, Univ. of Hartford [6212-05]

11:00 am: **Terahertz gain on intersubband transitions in multilayer delta-doped p-GaAs structures**, M. V. Dolquikh, A. V. Muravjov, R. E. Peale, Univ. of Central Florida; D. F. Bliss, C. Lynch, D. W. Weyburne, W. R. Buchwald, Air Force Research Lab. [6212-06]

11:20 am: **An optically triggered I-RTD hybrid device for continuous-wave generation of THz oscillations**, D. L. Woolard, Army Research Lab.; W. Zhang, North Carolina State Univ.; E. R. Brown, Univ. of California/Santa Barbara; B. L. Gelmont, Univ. of Virginia; R. J. Trew, North Carolina State Univ. . . [6212-07]

11:40 am: **Microfabricated traveling wave tubes for terahertz regime radiation sources**, S. Sengele, H. Jiang, J. H. Booske, D. W. van der Weide, S. Limbach, Univ. of Wisconsin/Madison [6212-08]

Lunch Break 12:00 to 1:10 pm

SESSION 3

Room: Osceola Ballroom A Mon. 1:10 to 3:00 pm

Novel Terahertz Devices and Concepts III

Chair: **James O. Jensen**,

U.S. Army Edgewood Chemical Biological Ctr.

1:10 pm: **THz phonon-polariton spectroscopic imaging** (*Invited Paper*), M. Yamaguchi, M. Wang, P. Suarez, Rensselaer Polytechnic Institute ... [6212-09]

1:40 pm: **Field effect transistors and field effect transistor arrays for subwavelength terahertz sensing**, M. S. Shur, Rensselaer Polytechnic Institute [6212-10]

2:00 pm: **Simulation results of novel diffractive element in THz waveband**, I. V. Minin, O. V. Minin, Novosibirsk State Technical Univ. (Russia); C. Chen, J. Mititu, D. W. Prather, Univ. of Delaware [6212-11]

2:20 pm: **SETraNS: a simulation code for quantum transport within nanoscale semiconductors**, G. Recine, Stevens Institute of Technology and Univ. of Virginia and North Carolina State Univ.; M. S. Lasater, C. T. Kelley, North Carolina State Univ.; D. L. Woolard, Army Research Lab. and North Carolina State Univ.; P. Zhao, North Carolina State Univ. [6212-12]

2:40 pm: **Noise in THz detectors and generators**, P. H. Handel, A. G. Tournier, Univ. of Missouri/St. Louis [6212-13]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Osceola Ballroom A Mon. 3:30 to 5:20 pm

Terahertz Science and Applications I

Chair: **Elliott R. Brown**, Univ. of California/Santa Barbara

3:30 pm: **Terahertz optical properties of clothing, building, packaging, and absorbing materials** (*Invited Paper*), A. J. Gatesman, A. Danylov, T. M. Goyette, J. C. Dickinson, Univ. of Massachusetts/Lowell; R. H. Giles, Univ. of Massachusetts Lowell; J. Waldman, Univ. of Massachusetts/Lowell; W. E. Nixon, U.S. Army National Ground Intelligence Ctr. [6212-14]

4:00 pm: **Understanding the terahertz spectra of high explosives**, T. M. Korter, D. G. Allis, A. M. Fedor, D. A. Prokhorova, Syracuse Univ. [6212-16]

4:20 pm: **Terahertz characterization of fire damage to carbon fiber composite materials**, N. E. Karpowicz, Rensselaer Polytechnic Institute; D. G. Dawes, Battelle Memorial Institute; X. Zhang, Rensselaer Polytechnic Institute . [6212-17]

4:40 pm: **An analysis of the THz frequency signatures in the cellular components of biological agents**, A. Bykhovski, T. Globus, T. Khromova, B. L. Gelmont, Univ. of Virginia; D. L. Woolard, Army Research Lab. [6212-18]

5:00 pm: **An overview of THz sensing and imaging for noninvasive nondestructive detection and identification of harmful materials**, M. B. Campbell, M. DeWitt, SPARTA, Inc.; E. J. Heilweil, National Institute of Standards and Technology [6212-19]

Tuesday 18 April

SESSION 5

Room: Osceola Ballroom A Tues. 8:00 to 10:00 am

Terahertz Science and Applications II

Chair: James O. Jensen,

U.S. Army Edgewood Chemical Biological Ctr.

8:00 am: **Concealed weapon and device identification using terahertz imaging sensors** (*Invited Paper*), C. C. Franck, Science Applications International Corp. [6212-20]

8:30 am: **THz resonance spectra of bacillus subtilis cells and spores in artificial matrice** (*Invited Paper*), T. Globus, T. Khromova, Univ. of Virginia; D. L. Woolard, Army Research Lab.; A. C. Samuels, U.S. Army Edgewood Chemical Biological Ctr. [6212-21]

9:00 am: **Standoff distance detection of the explosive material RDX with pulsed THz waves**, H. Zhong, A. Redo, Y. Chen, X. Zhang, Rensselaer Polytechnic Institute [6212-22]

9:20 am: **Spectra of rotational transitions for diatomic and triatomic molecules in the THz region**, H. Sun, Y. J. Ding, Lehigh Univ.; Y. B. Zotova, ArkLight, Inc. [6212-23]

9:40 am: **Using air as the nonlinear medium for THz wave generation**, X. Xie, J. Xu, M. Yamaguchi, X. Zhang, Rensselaer Polytechnic Institute [6212-24]

Coffee Break 10:00 to 10:40 am

SESSION 6

Room: Osceola Ballroom A Tues. 10:40 to 11:50 am

Terahertz Science and Applications III

Chair: Mark J. Rosker, Defense Advanced Research Projects Agency

10:40 am: **Time domain terahertz detection of concealed threats in luggage and personnel** (*Invited Paper*), D. A. Zimdars, J. S. White, G. Stuk, A. Chernovsky, G. Fichter, S. L. Williamson, Picometrix, Inc. [6212-25]

11:10 am: **THz spectra of 4-NT and 2,6-DNT**, Y. Chen, Rensselaer Polytechnic Institute; H. Liu, X. Zhang, Rensselaer Polytechnic Institute [6212-26]

11:30 am: **Terahertz imaging of subjects with concealed weapons**, J. C. Dickinson, A. J. Gatesman, T. M. Goyette, J. Waldman, Univ. of Massachusetts/Lowell; W. E. Nixon, U.S. Army National Ground Intelligence Ctr. [6212-28]

Lunch/Exhibition Break 11:50 am to 1:30 pm

SESSION 7

Room: Osceola Ballroom A Tues. 1:30 to 3:20 pm

Terahertz Technology I

Chair: Dwight L. Woolard, Army Research Lab.

1:30 pm: **Toward a focal-plane array technology in the THz region** (*Invited Paper*), E. R. Brown, M. Jacob-Mitos, A. C. Young, J. D. Zimmerman, A. C. Gossard, Univ. of California/Santa Barbara; H. Kazemi, Rockwell Scientific Co., LLC [6212-29]

2:00 pm: **Recent developments in people screening using terahertz technology**, M. C. Kemp, TeraView Ltd. (United Kingdom) [6212-30]

2:20 pm: **Mail inspection using THz imaging: a comparison of three different systems**, M. A. Salhi, K. Baaske, M. Koch, F. Rutz, T. Hasek, Technische Univ. Braunschweig (Germany) [6212-31]

2:40 pm: **Terahertz technology for imaging and spectroscopy**, T. W. Crowe, Virginia Diodes, Inc. [6212-32]

3:00 pm: **Solid state detector arrays for terahertz applications**, C. M. Mann, ThruVision Ltd. (United Kingdom) [6212-33]

Coffee Break 3:20 to 3:50 pm

SESSION 8

Room: Osceola Ballroom A Tues. 3:50 to 5:40 pm

Terahertz Technology II

Chair: R. Jennifer Hwu, Innosys, Inc.

3:50 pm: **An array of antenna-coupled superconducting microbolometers for passive indoors real-time THz imaging** (*Invited Paper*), A. R. Luukanen, MilliLab (Finland); P. Helistö, J. S. Penttilä, H. Seppä, H. Sipola, VTT Information Technology (Finland); C. R. Dietlein, Univ. of Colorado at Boulder; E. N. Grossman, National Institute of Standards and Technology [6212-34]

4:20 pm: **Terahertz interferometric and synthetic aperture imaging**, J. F. Federici, A. Bandyopadhyay, A. Sengupta, A. Sinyukov, D. E. Gary, R. B. Barat, Z. Michalopoulos, New Jersey Institute of Technology; D. A. Zimdars, Picometrix, Inc [6212-35]

4:40 pm: **THz quasi-optics applications in security**, I. V. Minin, Novosibirsk State Technical Univ. (Russia) [6212-36]

5:00 pm: **Adaptive nonintrusive terahertz identification**, A. U. Sokolnikov, Visual Solutions and Applications [6212-37]

5:20 pm: **Characterization of transmission lines at IR frequency**, T. A. Mandviwala, College of Optics and Photonics/Univ. of Central Florida; B. A. Lail, Florida Institute of Technology; G. Boreman, College of Optics and Photonics/Univ. of Central Florida [6212-38]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

✓ **Design of a compact low-cost THz imaging scanner**, H. C. Schau, Raytheon Co. [6212-39]

✓ **Miniature field-deployable terahertz source**, M. G. Mayes, Applied Physical Electronics, L.C. [6212-40]

Related Courses

SC067 **Testing and Evaluation of E-O Imaging Systems** (*Holst*) Tuesday 8:30 am to 5:30 pm

SC154 **Electro-Optical Imaging System Performance** (*Holst*) Friday 8:30 am to 5:30 pm

SC547 **Terahertz Wave Technology and Applications** (*Zhang*) Wednesday 8:30 am to 12:30 pm

SC782 **Zone Plate Antennas for Millimeter-Wave and Terahertz Frequencies** (*Wiltse*) Thursday 8:30 am to 12:30 pm

See SPIE Cashier to Register.

Non-Intrusive Inspection Technologies

Conference Chairs: **George Vourvopoulos**, Science Applications International Corp.; **F. Patrick Doty**, Sandia National Labs.

Program Committee: **Claudio Bruschini**, CBR Scientific Consulting (Switzerland); **Andrey V. Kuznetsov**, V.G. Khlopin Radium Institute (Russia); **Richard C. Lanza**, Massachusetts Institute of Technology; **Christopher O'Donnell**, Naval EOD Technology Div.; **Victor J. Orphan**, Science Applications International Corp.; **James A. Petrousky**, Transportation Security Lab.; **Brian D. Sowerby**, Commonwealth Scientific & Industrial Research Organisation (Australia); **Jean-Louis Szabo**, Commissariat à l'Energie Atomique (France); **Giuseppe Viesti**, Istituto Nazionale Di Fisica Nucleare (Italy)

Monday 17 April

SESSION 1

Room: Sarasota 1-2 Mon. 8:30 to 11:50 am

Non-Intrusive Inspection Technologies I

Chair: **George Vourvopoulos**, Science Applications International Corp.

8:30 am: **Mapping bulk detection technologies into promising applications** (Invited Paper, Presentation Only), H. E. Martz, Lawrence Livermore National Lab.; P. J. Griffin, Sandia National Labs. [6213-01]

9:00 am: **Hard x-ray focusing optics for concealed object detection**, T. P. Jansson, M. Gertsenshteyn, Physical Optics Corp. [6213-02]

9:20 am: **Fast-neutron/gamma-ray radiography scanner for the detection of contraband in air cargo containers**, J. Tickner, B. D. Sowerby, J. E. Eberhardt, Y. Liu, S. Rainey, R. Stevens, Commonwealth Scientific & Industrial Research Organisation (Australia) [6213-03]

9:40 am: **Gamma/x-ray linear pushbroom stereo for 3D cargo inspection**, Z. Zhu, City College/CUNY [6213-04]

Coffee Break 10:00 to 10:30 am

10:30 am: **The EURITRACK project: development of a tagged neutron inspection system for cargo containers**, B. Perot, G. Perret, J. Ma, A. Mariani, CEA Cadarache (France); J. Szabo, G. Sannie, CEA Saclay (France); G. Viesti, G. Nebbia, S. Pesente, M. Lunardon, S. Moretto, D. Fabris, P. Formisano, A. Zenoni, G. Bonomi, A. Donzella, A. Fontana, G. Boghen, Istituto Nazionale di Fisica Nucleare (Italy); V. Valkovic, D. Sudac, Institut Ruder Boškovic (Croatia); M. Moszynski, T. Batsch, M. Gierlik, D. Wolski, Soltan Institute for Nuclear Studies (Poland); W. Klamra, P. Isaksson, Kungliga Tekniska Högskolan (Sweden); P. Le Tourneur, M. Lhuissier, EADS SODERN (France); A. Colonna, C. Tintori, CAEN S.p.A. (Italy); P. Peerani, V. Sequeira, M. Salvato, Joint Research Ctr. (Italy) [6213-06]

10:50 am: **SENNA: device for explosives' detection based on nanosecond neutron analysis**, A. V. Kuznetsov, A. Evsenin, O. Osetrov, D. Vakhtin, V.G. Khlopin Radium Institute (Russia); I. Gorshkov, Applied Science and Technology Ctr. (Russia) [6213-07]

11:10 am: **Portable neutron generator with 9 pixels Si α detector**, V. M. Bystritsky, V. G. Kadyshchevsky, A. P. Kobzev, Y. Rogov, M. Sapozhnikov, A. Sissakian, V. Slepnev, N. Zamiatin, Joint Institute for Nuclear Research (Russia); E. P. Bogolubov, T. A. Khasaev, Y. P. Presnyakov, V. Ryzhkov, All-Russia Research Institute of Automatics (Russia) [6213-08]

11:30 am: **PELAN for non-intrusive inspection of ordnance, containers, and vehicles**, D. T. Holstlin, C. Shyu, G. Vourvopoulos, Science Applications International Corp. [6213-10]

Lunch Break 11:50 am to 1:30 pm

SESSION 2

Room: Sarasota 1-2 Mon. 1:30 to 5:10 pm

Non-Intrusive Inspection Technologies II

Chair: **George Vourvopoulos**, Science Applications International Corp.

1:30 pm: **Radiation safety impacts to the design of photon inspection systems for large volume interrogations** (Invited Paper), J. L. Jones, D. R. Norman, Idaho National Lab.; F. Harmon, A. W. Hunt, Idaho State Univ. [6213-11]

2:00 pm: **Pulsed-neutron interrogation for detection of concealed special nuclear materials**, F. H. Ruddy, J. G. Seidel, R. W. Flammang, B. Petrovic, A. R. Dulloo, T. V. Congedo, Westinghouse Electric Co. [6213-12]

2:20 pm: **Prototype Compton imager for special nuclear material**, E. A. Wulf, B. F. Philips, J. D. Kurfess, E. I. Novikova, Naval Research Lab.; C. Fitzgerald, Loyola College in Maryland [6213-13]

2:40 pm: **Detection of nuclear material by photon activation inside containers**, M. Gmar, V. Blideanu, F. Carrel, J. David, D. Doré, M. Giacri, F. Lainé, B. Poumarède, D. Ridikas, A. Vanlauwe, CEA Saclay (France) [6213-14]

3:00 pm: **Non-intrusive system for fast unambiguous detection of special nuclear materials and high explosives**, J. P. Farrell, J. R. Powell, Brookhaven Technology Group, Inc. [6213-15]

Coffee Break 3:20 to 3:50 pm

3:50 pm: **FNIT: the Fast Neutron Imaging Telescope for SNM detection**, U. M. Bravar, J. R. Macri, M. L. McConnell, J. M. Ryan, Univ. of New Hampshire; E. O. Flueckiger, M. R. Moser, Univ. Bern (Switzerland) [6213-16]

4:10 pm: **Comparison of shielded uranium passive gamma-ray detection methods**, B. F. Philips, E. I. Novikova, E. A. Wulf, J. D. Kurfess, Naval Research Lab. [6213-17]

4:30 pm: **3D computational and experimental radiation transport assessments of PuBe sources and graded moderators for parcel screening**, G. Ghita, N. Huang, G. Sjoden, J. E. Baciak, Univ. of Florida [6213-18]

4:50 pm: **NIRST: a satellite-based IR instrument for fire and sea surface temperature measurement**, H. Marraco, Comisión Nacional de Actividades Espaciales (Argentina); L. P. Ngo, Canadian Space Agency (Canada) ... [6213-19]

Tuesday 18 April

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

✓ **Compact flash x-ray system for radiographic applications**, M. G. Mayes, J. R. Mayes, M. B. Lara, C. W. Hatfield, Applied Physical Electronics, L.C. [6213-05]

✓ **Microwave system for secret remote inspection of person (MS-SRIP)**, A. V. Kuznetsov, V.G. Khlopin Radium Institute (Russia); V. Averianov, I. Gorshkov, Applied Science and Technology Ctr. (Russia); A. Evsenin, V.G. Khlopin Radium Institute (Russia) [6213-20]

✓ **Detection of explosives, shielded nuclear materials, and other hazardous substances in cargo containers**, A. V. Kuznetsov, A. Evsenin, O. Osetrov, D. Vakhtin, V.G. Khlopin Radium Institute (Russia); I. Gorshkov, Applied Science and Technology Ctr. (Russia) [6213-21]

Related Course

SC547 **Terahertz Wave Technology and Applications** (Zhang) Wednesday 8:30 am to 12:30 pm

See SPIE Cashier to Register.

Laser Radar Technology and Applications XI

Conference Chairs: **Gary W. Kamerman**, FastMetrix, Inc.; **Monte D. Turner**, Defense Advanced Research Projects Agency

Program Committee: **Ravil R. Agishev**, Kazan State Univ. (Russia); **Philip Gatt**, Coherent Technologies, Inc.; **Jeffrey W. Grantham**, Northrop Grumman Corp.; **Clarke E. Harris**, FastMetrix, Inc.; **Robert O. Hauge**, Defense Advanced Research Projects Agency; **Richard M. Heinrichs**, MIT Lincoln Lab.; **James C. Lamoreux**, NASA Johnson Space Ctr.; **Vasyl V. Molebny**, National Technical Univ. of Ukraine (Ukraine); **William A. Neuman**, Lawrence Livermore National Lab.; **Vladimir L. Pavlovitch**, Polyus Research and Development Institute (Russia); **C. Russell Philbrick**, The Pennsylvania State Univ.; **Michael W. Roth**, Johns Hopkins Univ.; **Jean-Robert Simard**, Defense R&D Canada (Canada); **Upendra N. Singh**, NASA Langley Research Ctr.; **Bevan D. Staple**, Ball Aerospace & Technologies Corp.; **Ove K. Steinvall**, Swedish Defence Research Agency (Sweden); **David M. Tratt**, Jet Propulsion Lab.

Wednesday 19 April

SESSION 1

Room: **Osceola Ballroom A** Wed. 8:00 to 11:50 am

- 8:00 am: **Actives infrared systems: possible roles in BMD?**, A. Paleologue, Commissariat à l'Energie Atomique (France) [6214-01]
- 8:20 am: **Efficient alignment of multiple large, complex LIDAR models**, M. Z. Brown, C. A. Hresko, K. E. Murphy, T. B. Criss, M. W. Roth, Johns Hopkins Univ. [6214-02]
- 8:40 am: **Resolution study of wind parameter estimates by a coherent Doppler lidar system**, J. Y. Beyon, California State Univ.; G. J. Koch, NASA Langley Research Ctr. [6214-03]
- 9:00 am: **Noise normalization and windowing functions for VALIDAR in wind parameter estimation**, J. Y. Beyon, California State Univ./Los Angeles; G. J. Koch, NASA Langley Research Ctr.; Z. Li, California State Univ./Los Angeles [6214-04]
- 9:20 am: **Target detection in lidar range images using shadow analysis**, G. Kuntimad, W. H. Delashmit, Lockheed Martin Corp. [6214-05]
- 9:40 am: **Novel approaches to helicopter obstacle warning**, C. Seidel, C. Samuelis, M. Wegner, T. Rumpf, T. Münsterer, I. Schwartz, EADS Deutschland GmbH (Germany) [6214-06]
- 10:00 am: **A hybrid 3D sensor (NEPTEC TriDAR) for object tracking and inspection**, X. Zhu, C. Smith, Neptec Design Group Ltd. (Canada); F. Babin, National Optics Institute (Canada) [6214-07]
- Coffee Break 10:20 to 10:50 am
- 10:50 am: **Impact of condensation upon LIDAR observables from aluminized solid propellant rocket contrails**, E. G. Rabarijaona, R. A. Reed, U.S. Air Force [6214-08]
- 11:10 am: **Fusion of current technologies with real-time 3D MEMS lidar for novel security and defense applications**, J. P. Siepmann, LightTime, LLC [6214-10]
- 11:30 am: **Phase insensitive LIDAR for long open path CO2 sensing**, A. Deev, S. Wu, California Institute of Technology [6214-11]
- Lunch/Exhibition Break 11:50 am to 1:30 pm

SESSION 2

Room: **Osceola Ballroom A** Wed. 1:30 to 5:20 pm

- 1:30 pm: **Data collection and simulation of high range resolution laser radar for surface mine detection**, O. K. Steinvall, T. R. Chevalier, H. Larsson, Swedish Defence Research Agency (Sweden) [6214-12]
- 1:50 pm: **Segmentation and classification of airborne laser scanner data for ground and building detection**, G. Tolt, Å. Persson, J. Landgård, U. L. Söderman, Swedish Defence Research Agency (Sweden) [6214-13]
- 2:10 pm: **Optical fuzing technology**, C. M. von der Lippe, U.S. Army Research, Development and Engineering Command; J. J. Liu, Army Research Lab. [6214-14]
- 2:30 pm: **Mid-infrared all solid state DIAL for remote sensing of hazardous chemical agents**, V. V. Vaicikauskas, Institute of Physics (Lithuania); Z. Kuprionis, EKSPLA Ltd. (Lithuania); V. Kabelka, M. Kaucikas, Institute of Physics (Lithuania) [6214-15]
- 2:50 pm: **Status of the NIST LADAR performance evaluation facility**, G. S. Cheok, A. M. Lytle, K. S. Saidi, National Institute of Standards and Technology [6214-17]
- Coffee Break 3:10 to 3:40 pm

- 3:40 pm: **First-principles-based LIDAR simulation environment for scenes with participating mediums**, S. D. Brown, D. D. Blevins, J. R. Schott, Rochester Institute of Technology [6214-18]
- 4:00 pm: **Characterization of InGaAs/InP APD arrays for SWIR imaging applications**, J. C. Boisvert, P. Yuan, P. A. McDonald, T. Isshiki, A. Masalykin, R. Sudharsanan, Spectrolab Inc. [6214-19]
- 4:20 pm: **Semi-automated DIRSIG scene modeling from 3D LIDAR and passive imaging sources**, S. R. Lach, U.S. Air Force and Rochester Institute of Technology; J. P. Kerekes, Rochester Institute of Technology [6214-20]
- 4:40 pm: **Modified photon-transfer characterization applied to 3D flash LADAR detectors**, R. P. Earhart, L. Ruppert, C. L. Centamore, G. B. Heim, Ball Aerospace & Technologies Corp. [6214-21]
- 5:00 pm: **AGLITE: a multiwavelength lidar for aerosol**, G. E. Bingham, T. D. Wilkerson, V. V. Zavyalov, J. A. Swasey, J. J. Hancock, B. G. Crowther, Utah State Univ.; S. S. Cornelsen, Utah State Univ. and Campbell Scientific; C. Marchant, J. N. Cutts, D. C. Huish, C. L. Earl, J. M. Andersen, M. L. Cox, Utah State Univ. [6214-22]

Thursday 20 April

SESSION 3

Room: **Osceola Ballroom A** Thurs. 8:30 am to 12:20 pm

- 8:30 am: **A simulation model for optimizing lidar scan performance during flight operations**, R. T. Pack, R. R. Fullmer, S. E. Budge, Utah State Univ.; D. Saunders, Naval Air Warfare Center [6214-23]
- 8:50 am: **Generic simulation of multi-element lidar scanner dynamics**, D. T. Omer, B. Call, R. R. Fullmer, R. T. Pack, Utah State Univ. [6214-24]
- 9:10 am: **Simulation and modeling of return waveforms from a lidar beam footprint in LadarSIM**, B. C. Leishman, S. E. Budge, R. T. Pack, Utah State Univ. [6214-25]
- 9:30 am: **Chirped AM lidar for anti-ship missile tracking and force protection 3D imaging: update**, B. C. Redman, Army Research Lab. [6214-26]
- 9:50 am: **Photon counting chirped amplitude modulation lidar**, B. C. Redman, W. C. Ruff, M. M. Giza, Army Research Lab. [6214-28]
- 10:10 am: **Active range of the Optical Systems Test Facility at MIT Lincoln Laboratory**, L. A. Jiang, D. C. Harrison, A. G. Hayes, E. L. Hines, J. M. Richardson, K. I. Schultz, MIT Lincoln Lab. [6214-27]
- Coffee Break 10:30 to 11:00 am
- 11:00 am: **Engineering AlGaInAs avalanche photodiodes for single photon counting**, A. S. Huntington, Voxel [6214-29]
- 11:20 am: **Pulse-burst coherent-lidar signal spectral segmentation and summation for robust target frequency estimation**, D. G. Youmans, SPARTA, Inc. [6214-30]
- 11:40 am: **High-energy single-mode all solid state and tunable UV laser transmitter**, N. S. Prasad, U. N. Singh, NASA Langley Research Ctr.; D. J. Armstrong, Sandia National Labs.; F. E. Hovis, Fibertek, Inc. [6214-31]
- 12:00 pm: **Applications of high resolution laser radar for 3D multispectral imaging**, H. Heiselberg, Danish Defense Research Establishment (Denmark) [6214-32]

Atmospheric Propagation III

Conference Chairs: **Cynthia Y. Young**, Univ. of Central Florida; **G. Charmaine Gilbreath**, Naval Research Lab.

Program Committee: **Larry C. Andrews**, Univ. of Central Florida; **Gary J. Baker**, Lockheed Martin Corp.; **Harris R. Burris, Jr.**, Research Support Instruments/Naval Research Lab.; **James R. Buss**, Office of Naval Research; **Lewis F. DeSandre**, Air Force Research Lab.; **Frank D. Eaton**, Air Force Research Lab.; **Kenneth J. Grant**, Defence Science and Technology Organisation (Australia); **Alan H. Greenaway**, Heriot-Watt Univ. (United Kingdom); **Norman S. Kopeika**, Ben-Gurion Univ. of the Negev (Israel); **Christopher I. Moore**, Naval Research Lab.; **Hakki H. Refai**, Univ. of Oklahoma; **Sergio R. Restaino**, Naval Research Lab.; **Jennifer C. Ricklin**, Defense Advanced Research Projects Agency; **Jonathan M. Saint Clair**, The Boeing Co.; **Ove K. Steinvall**, Swedish Defence Research Agency (Sweden)

Thursday 20 April

SESSION 1

Room: Osceola Breakout 1-2..... Thurs. 8:00 to 10:20 am

Propagation in the Marine Environment

- 8:00 am: **Measurement of optical refraction across the Chesapeake Bay** (*Invited Paper*), W. P. Hooper, Naval Research Lab. [6215-01]
- 8:40 am: **Characterization of the marine atmosphere for free-space optical communication**, L. M. Wasiczko, C. I. Moore, Naval Research Lab.; H. R. Burris, Jr., Research Support Instruments, Inc. and Naval Research Lab.; M. R. Suite, Naval Research Lab.; M. F. Stell, Research Support Instruments, Inc.; W. S. Rabinovich, Naval Research Lab. [6215-02]
- 9:00 am: **Humidity contribution to the strength of turbulence parameter Cn2**, C. O. Font Jimenez, Univ. de Puerto Rico Mayagüez; E. S. Oh, Naval Research Lab.; M. P. Chang, Univ. de Puerto Rico Mayagüez; G. C. Gilbreath, Naval Research Lab. [6215-03]
- 9:20 am: **Initial measurements of atmospheric parameters in marine environment**, F. E. Strömquist Vetelino, C. Y. Young, Univ. of Central Florida; K. J. Grant, Defence Science and Technology Organisation (Australia); L. M. Wasiczko, Naval Research Lab.; H. R. Burris, Jr., Research Support Instruments, Inc.; C. I. Moore, R. Mahon, M. R. Suite, Naval Research Lab.; K. A. Corbett, B. A. Clare, Defence Science and Technology Organisation (Australia); G. C. Gilbreath, W. S. Rabinovich, Naval Research Lab. [6215-04]
- 9:40 am: **Mitigation of scintillation noise in a 32-km maritime path**, K. J. Grant, Defence Science and Technology Organisation (Australia); C. I. Moore, Naval Research Lab.; H. R. Burris, Jr., Research Support Instruments, Inc.; R. Mahon, W. S. Rabinovich, L. A. Swingen, Naval Research Lab.; M. F. Stell, Research Support Instruments, Inc.; M. R. Suite, L. M. Wasiczko, G. C. Gilbreath, Naval Research Lab.; B. A. Clare, K. A. Corbett, Defence Science and Technology Organisation (Australia) [6215-05]
- 10:00 am: **Bit-error rate and packet testing in free-space optical communication links over water**, M. R. Suite, Naval Research Lab.; H. R. Burris, Jr., Research Support Instruments, Inc.; C. I. Moore, Naval Research Lab.; M. F. Stell, Research Support Instruments, Inc.; L. M. Wasiczko, Naval Research Lab.; W. Freeman, Smart Logic, Inc.; W. S. Rabinovich, W. J. Scharpf, Naval Research Lab. [6215-06]
- Coffee Break 10:20 to 10:50 am

SESSION 2

Room: Osceola Breakout 1-2..... Thurs. 10:50 am to 12:10 pm

Modelling Laser Propagation through the Earth's Atmosphere

- 10:50 am: **Intensity fluctuations of stochastic electromagnetic beams propagating through the atmosphere**, O. Korotkova, College of Optics and Photonics/Univ. of Central Florida [6215-07]
- 11:10 am: **Modeling the PDF for the irradiance of an uplink beam**, L. C. Andrews, Univ. of Central Florida; R. R. Parenti, R. J. Sasiela, Massachusetts Institute of Technology; R. L. Phillips, Univ. of Central Florida [6215-08]
- 11:30 am: **Low-order turbulence effects in Gaussian beam weak scintillation and fade probability**, G. J. Baker, Lockheed Martin Corp. [6215-10]
- 11:50 am: **PDF models of the irradiance fluctuations in Gaussian beam waves**, F. E. Strömquist Vetelino, C. Y. Young, L. C. Andrews, Univ. of Central Florida; J. Recolons, Univ. Politècnica de Catalunya (Spain); K. J. Grant, K. A. Corbett, B. A. Clare, Defence Science and Technology Organisation (Australia) [6215-11]
- Lunch/Exhibition Break 12:10 to 2:00 pm

SESSION 3

Room: Osceola Breakout 1-2..... Thurs. 2:00 to 5:30 pm

Challenges in Atmospheric Propagation: Performance and Mitigation Techniques

- 2:00 pm: **Current challenges in atmospheric propagation Research** (*Invited Paper*), J. C. Ricklin, Defense Advanced Research Projects Agency; P. G. Tomlinson, Solers, Inc. [6215-12]
- 2:40 pm: **Coordinated multiwavelength laser system propagation experiments**, O. K. Steinvall, L. J. Sjöqvist, P. Andersson, G. Bolander, M. Elmquist, F. Kullander, O. K. Gustafsson, P. Sakari, Swedish Defence Research Agency (Sweden) [6215-13]
- 3:00 pm: **Turbulence-induced scintillation studies at near and mid-infrared wavelengths**, M. T. Batdorf, J. D. Strasburg, Pacific Northwest National Lab. [6215-14]
- Coffee Break 3:20 to 3:50 pm
- 3:50 pm: **Conformal beam steering apparatus for simultaneous manipulation of optical and radio frequency signals**, R. S. Winsor, M. Braunstein, ITT Industries [6215-23]
- 4:10 pm: **Mid-infrared laser beam scintillation study**, J. Lepage, D. Vincent, Defence R&D Canada/Valcartier (Canada) [6215-15]
- 4:30 pm: **Fast holographic wavefront sensor**, G. P. Andersen, P. Dyrud, U.S. Air Force Academy [6215-16]
- 4:50 pm: **Optical phase conjugation for atmosphere turbulence assessment**, V. B. Markov, A. I. Khizhnyak, D. Woll, J. D. Trolinger, MetroLaser, Inc.; F. D. Eaton, Air Force Research Lab. [6215-17]
- 5:10 pm: **Studies of a mesospheric sodium guidestar pumped by continuous-wave sum-frequency mixing of two Nd:YAG laser lines in lithium triborate**, J. M. Telle, J. D. Drummond, C. A. Denman, P. D. Hillman, G. T. Moore, S. Novotny, R. Q. Fugate, Air Force Research Lab. [6215-18]

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

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- ✓ **The propagation of flattened Gaussian beams in the atmosphere: a comparison of theory with a computer simulation model**, D. Cowan, Univ. of Central Florida; J. Recolons, Univ. Politècnica de Catalunya (Spain); L. C. Andrews, C. Y. Young, Univ. of Central Florida [6215-09]
- ✓ **Modeling of laser beam propagation through the whirlwind**, E. N. Terentiev, F. V. Shugaev, L. S. Shtemenko, O. I. Dokukina, O. A. Ignateva, M.V. Lomonosov Moscow State Univ. (Russia) [6215-19]

Related Courses

- SC160 **Precision Stabilization and Laser Pointing Systems** (*Stockum, Masten*) Monday 8:30 am to 5:30 pm
- SC167 **Introduction to Laser Radar** (*Kammerman*) Monday 8:30 am to 12:30 pm
- SC168 **Advanced Coherent Laser Radars Design and Applications** (*Kammerman, Molebny*) Tuesday 8:30 am to 5:30 pm
- SC188 **Laser Beam Propagation for Applications in Laser Communications, Laser Radar, and Active Imaging** (*Phillips, Andrews*) Wednesday 8:30 am to 5:30 pm
- SC338 **Limitations to Imaging and Laser Propagation in the Atmosphere** (*Farmer*) Tuesday 8:30 am to 5:30 pm
- SC649 **Optical Phased Array Design & Implementation** (*McManamon*) Tuesday 1:30 pm to 5:30 pm

Laser Source and System Technology for Defense and Security II

Conference Chairs: **Gary L. Wood**, Army Research Lab.; **Mark A. Dubinskii**, Army Research Lab.

Program Committee: **Michael A. Bass**, College of Optics and Photonics/Univ. of Central Florida; **Denton Marrs**, Naval Air Systems Command; **Stephen G. Post**, Missile Defense Agency; **Quentin E. Saulter**, Naval Sea Systems Command; **C. Martin Stickley**, Defense Advanced Research Projects Agency

Monday 17 April

SESSION 1

Room: Naples 1-2 Mon. 8:30 to 10:20 am

Spectral Control in High Power Laser Technology

Chair: **Michael A. Bass**,

College of Optics and Photonics/Univ. of Central Florida

8:30 am: **High-brightness laser design based on volume Bragg gratings divergence**, G. B. Venus, L. B. Glebov, V. K. Rotar, College of Optics and Photonics/Univ. of Central Florida [6216-01]

9:00 am: **Volume Bragg semiconductor lasers with near diffraction limited mirrors**, T. Chung, A. Rapaport, V. I. Smirnov, M. Hemmer, L. B. Glebov, M. C. Richardson, M. A. Bass, College of Optics and Photonics/Univ. of Central Florida [6216-02]

9:20 am: **Spectral narrowing of solid state lasers by narrow-band PTR Bragg gratings**, T. Chung, A. Rapaport, V. I. Smirnov, M. Hemmer, L. B. Glebov, M. C. Richardson, M. A. Bass, College of Optics and Photonics/Univ. of Central Florida [6216-03]

9:40 am: **Power electronics for improving performance and lifetime in high-power laser diodes**, R. A. Petr, R. Pierce, J. Jacob, Science Research Lab., Inc. [6216-04]

10:00 am: **Compact white-light continuum source ranging from 1.1 μm to 2.5 μm for optical sensing and monitoring applications**, T. Okuno, M. Hirano, M. Onishi, Sumitomo Electric Industries, Ltd. (Japan); G. J. Spuehler, L. Krainer, U. Keller, ETH Zürich (Switzerland) [6216-05]

Coffee Break 10:20 to 10:50 am

SESSION 2

Room: Naples 1-2 Mon. 10:50 am to 12:10 pm

High Power Lasers and Laser Systems

Chair: **Denton Marrs**, Naval Air Systems Command

10:50 am: **High-power phase-locked MOPA laser array** (*Invited Paper*), H. Injeyan, Northrop Grumman Corp. [6216-06]

11:20 am: **High-power edge pumped Yb:YAG single crystal/YAG ceramics hybrid microchip laser** (*Invited Paper*), T. Taira, M. Tsunekane, Institute for Molecular Science (Japan) [6216-08]

11:50 am: **Multifunctional laser transmitter**, P. S. Banks, J. H. Zarrabi, G. Gates, P. Thompson, R. T. Snider, M. Ritter, General Atomics [6216-09]

Lunch Break 12:10 to 1:30 pm

SESSION 3

Room: Naples 1-2 Mon. 1:30 to 3:20 pm

High Brightness Laser Diodes, Beam Shaping, and Spectral Control

Chair: **Gary L. Wood**, Army Research Lab.

1:30 pm: **Efficient beam shaping for high-power laser applications** (*Invited Paper*), O. Homburg, L. Aschke, D. Hauschild, V. Lissotschenko, LIMO-Lissotschenko Mikrooptik GmbH (Germany) [6216-10]

2:00 pm: **High-power conversion efficiency and wavelength stabilized narrow bandwidth diode laser pumps**, M. Kanskar, J. Cai, Y. He, E. Stiers, S. R. Tatavarti-Bharatam, Alfalight, Inc.; D. Botez, L. J. Mawst, Univ. of Wisconsin/Madison [6216-11]

2:20 pm: **High-brightness high-efficiency high-reliability diode lasers**, S. Patterson, P. A. Crump, J. Wang, J. Farmer, M. A. DeVito, S. R. Karlens, D. E. Schulte, R. Martinsen, D. Wise, S. Das, M. Grimshaw, W. Dong, nLight Photonics, Inc. [6216-12]

2:40 pm: **Advances in high-brightness high-power semiconductor lasers**, P. Rudy, R. M. Lammert, M. L. Osowski, C. Panja, T. S. Stakelon, J. E. Ungar, Quintessence Photonics Corp. [6216-13]

3:00 pm: **High-power and ultranarrow DFB laser: the effect of linewidth reduction systems on coherence length and interferometer noise**, J. Cliche, M. Allard, M. Têtu, TeraXion Inc. (Canada) [6216-14]

Coffee Break 3:20 to 3:50 pm

SESSION 4

Room: Naples 1-2 Mon. 3:50 to 5:30 pm

Thermal Issues and Advanced Thermal Management

Chair: **Stephen G. Post**, Missile Defense Agency

3:50 pm: **Processes of heat generation in Nd+3 doped lasing materials during pump-lase cycle** (*Invited Paper*), S. Goldring, R. Lavi, Soreq Nuclear Research Ctr. (Israel) [6216-15]

4:20 pm: **Thermomechanical and optical analysis and modeling for a diamond-cooled solid state Nd:YAG laser**, H. P. Chou, I. Sadovnik, E. J. Tammaro, Y. Wang, Textron Systems Corp. [6216-16]

4:40 pm: **Good beam quality from a diamond-cooled ErYAG laser**, D. O. Hogenboom, M. Nguyen, H. P. Chou, Textron Systems Corp. [6216-17]

5:00 pm: **Thermal management of solid state lasers using optical quality silicon carbide** (*Invited Paper*), M. A. Dubinskii, A. Newburgh, Army Research Lab. [6216-18]

Tuesday 18 April

SESSION 5

Room: Naples 1-2 Tues. 8:30 to 10:20 am

New Lasers and Laser Materials

Chair: C. Martin Stickley,
Defense Advanced Research Projects Agency

8:30 am: **Continuous-wave and mode-locked lasers based on cubic sesquioxide crystalline hosts** (*Invited Paper*), V. P. Petrov, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany); K. Petermann, Univ. Hamburg (Germany); U. Griebner, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany); V. Peters, Univ. Hamburg (Germany); J. Liu, M. Rico, P. Klopp, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany); G. Huber, Univ. Hamburg (Germany) . [6216-19]

9:00 am: **High-power diode-pumped laser based on Yb3+:Y2O3 ceramic**, M. A. Dubinskii, J. A. Simmons, A. Michael, A. Newburgh, Army Research Lab.; V. K. Castillo, G. J. Quarles, VLOC Inc. [6216-20]

9:20 am: **Spectroscopic properties and laser operation of RE3+-ion doped garnet materials**, T. Taira, Y. Sato, J. Saikawa, Institute for Molecular Science (Japan); A. Ikesue, Poly-Techno Co., Ltd. (Japan) [6216-21]

9:40 am: **Efficient diode-pumped cw Tm:KLu(WO4)2 laser**, V. P. Petrov, J. Liu, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany); M. Galan, G. Viera, Monocrom S.L. (Spain); C. Pujol, Univ. Rovira i Virgili (Spain); U. Griebner, Max-Born-Institut für Nichtlineare Optik und Kurzzeitspektroskopie (Germany); M. Aguilo, F. Diaz, Univ. Rovira i Virgili (Spain) [6216-22]

10:00 am: **Recent advances in onshore produced ceramic laser gain materials**, R. L. Gentilman, J. Huie, T. S. Stefanik, D. Rockosi, Raytheon Co. [6216-23]

Coffee Break 10:20 to 10:50 am

SESSION 6

Room: Naples 1-2 Tues. 10:50 am to 12:50 pm

Diffusion Bonding, Mid-Infrared and Ultraviolet Materials/Lasers

Chair: Mark A. Dubinskii, Army Research Lab.

10:50 am: **Middle-infrared luminescence of rare-earth ions in silver halide crystals**, G. Brodetzki, O. Gayer, I. Lyakhovskiy, L. Nagli, A. Katzir, Tel Aviv Univ. (Israel) [6216-24]

11:10 am: **Advances in bonded YAG composite laser gain media**, J. E. Sundeen, Northrop Grumman Corp. [6216-25]

11:30 am: **Adhesive-free bond (AFB(r)) CVD diamond/sapphire and CVD diamond/YAG crystal composites**, H. Lee, H. E. Meissner, O. R. Meissner, Onyx Optics Inc. [6216-26]

11:50 am: **Monolithic semiconductor mid-IR optical parametric oscillators with modal phase matching**, P. Rudy, J. E. Ungar, R. M. Lammert, M. L. Osowski, S. W. Oh, Quintessence Photonics Corp. [6216-27]

12:10 pm: **Efficient intracavity doubled OPO UV light source for PLIF imaging of radicals in combustion environment**, S. Wu, California Institute of Technology; S. L. Palm, Aerofluidics, LLC [6216-28]

12:30 pm: **All solid state 193-nm source for commercial industrial application**, S. Wu, California Institute of Technology; Y. Wu, Chinese Academy of Sciences (China) [6216-29]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Accurate timing of passive Q-switch lasers**, S. Wu, California Institute of Technology [6216-30]
- ✓ **High-peak-power intracavity OPO transmitter at 1572 nm**, W. Zendzian, J. K. Jabczynski, J. Kwiatkowski, Wojskowa Akademia Techniczna (Poland) [6216-31]
- ✓ **InP-based QCL for defense and security applications**, M. Garcia, F. Vermersch, X. Marcadet, S. Bansropun, M. M. Krakowski, Thales Research & Technology (France); C. Sirtori, Univ. Paris VII (France); A. Wilk, C. Chaix, RIBER (France) [6216-32]
- ✓ **Spectral beam combining with volume Bragg gratings: cross-talk analysis and optimization schemes**, A. Sevian, O. Andrusyak, I. Ciapurin, G. B. Venus, L. B. Glebov, College of Optics and Photonics/Univ. of Central Florida [6216-33]
- ✓ **Spectral control of laser diode pumping sources by volume Bragg gratings**, G. B. Venus, A. Sevian, V. K. Rotar, L. B. Glebov, College of Optics and Photonics/Univ. of Central Florida [6216-34]
- ✓ **Robust diffractive elements in PTR glass for laser applications**, V. I. Smirnov, E. V. Rotari, OptiGrate; L. Glebova, J. Lumeau, V. K. Rotar, A. Sevian, A. S. Sinitskii, E. Zanutto, L. B. Glebov, College of Optics and Photonics/Univ. of Central Florida [6216-35]
- ✓ **Large aperture diffractive elements in PTR glass**, M. Demenikov, V. K. Rotar, A. Sevian, V. I. Smirnov, L. B. Glebov, College of Optics and Photonics/Univ. of Central Florida [6216-36]

Related Courses

- SC160 **Precision Stabilization and Laser Pointing Systems** (*Stockum, Masten*) Monday 8:30 am to 5:30 pm
- SC167 **Introduction to Laser Radar** (*Kammerman*) Monday 8:30 am to 12:30 pm
- SC168 **Advanced Coherent Laser Radars Design and Applications** (*Kammerman, Molebny*) Tuesday 8:30 am to 5:30 pm
- SC188 **Laser Beam Propagation for Applications in Laser Communications, Laser Radar, and Active Imaging** (*Phillips, Andrews*) Wednesday 8:30 am to 5:30 pm
- SC649 **Optical Phased Array Design & Implementation** (*McManamon*) Tuesday 1:30 pm to 5:30 pm
- SC725 **Optical & Laser Scanning Technology: Devices, Systems & Applications** (*Marshall*) Wednesday 8:30 am to 5:30 pm
- SC784 **Fiber Lasers for Defense Applications: Fibers, Components and System Design Considerations** (*Samson, Torruellas*) Wednesday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Detection and Remediation Technologies for Mines and Minelike Targets XI

Conference Chairs: **J. Thomas Broach**, U.S. Army RDECOM CERDEC NVESD; **Russell S. Harmon**, U.S. Army Research Office; **John H. Holloway, Jr.**, Naval Surface Warfare Ctr. Panama City

Program Committee: **Jerrell R. Ballard, Jr.**, U.S. Army Corps of Engineers; **Leslie M. Collins**, Duke Univ.; **Yogadhis Das**, Defence R&D Canada/Suffield (Canada); **Gerald J. Dobeck**, Naval Surface Warfare Ctr. Panama City; **Paul D. Gader**, Univ. of Florida; **John E. McFee**, Defence R&D Canada/Suffield (Canada); **Kevin A. O'Neill**, U.S. Army Corps of Engineers; **James M. Ralston**, Institute for Defense Analyses; **James M. Sabatier**, Univ. of Mississippi; **Hichem Sahli**, Vrije Univ. Brussel (Belgium); **H. M. Schleijsen**, TNO (Netherlands); **Waymond R. Scott, Jr.**, Georgia Institute of Technology; **Richard C. Weaver**, U.S. Army RDECOM CERDEC NVESD

Monday 17 April

SESSION 1

Room: Sanibel 1-2 Mon. 9:30 to 11:40 am

Electromagnetic Induction I

Chairs: **Yogadhis Das**, Defence Research and Development Canada (Canada); **Kevin A. O'Neill**, U.S. Army Engineer Research and Development Ctr.

9:30 am: **Time-domain response of a metal detector to a target buried in soil with frequency-dependent magnetic susceptibility**, Y. Das, Defence Research and Development Canada (Canada) [6217-01]

9:50 am: **Spectral representation: a core aspect of modeling the response characteristics of time-domain EMI mine detectors**, G. F. West, R. C. Bailey, Univ. of Toronto (Canada) [6217-03]

10:10 am: **Evaluation of SVM classification of metallic objects based on a magnetic dipole representation**, J. P. Fernández, Dartmouth College; B. E. Barrowes, K. Jones, K. A. O'Neill, U.S. Army Engineer Research and Development Ctr.; I. Shamatava, F. Shubitidze, K. Sun, Dartmouth College [6217-04]

Coffee Break 10:30 to 11:00 am

11:00 am: **Testing of a locating discriminating metal detector for landmine detection**, N. Davidson, M. Hawkins, R. J. Beech, Defence Science and Technology Lab. (United Kingdom) [6217-05]

11:20 am: **Moving belt metal detector (MBMD)**, C. V. Nelson, D. P. Mendat, T. B. Huynh, Johns Hopkins Univ. [6217-06]

Lunch Break 11:40 am to 1:30 pm

SESSION 2

Room: Sanibel 1-2 Mon. 1:30 to 2:50 pm

Electromagnetic Induction II

Chairs: **Carl Nelson**, U.S. Army Night Vision & Electronic Sensors Directorate; **Juan P. Fernández**, Dartmouth College

1:30 pm: **Dumbbell dipole model and its application in UXO discrimination**, K. Sun, Dartmouth College; K. A. O'Neill, B. E. Barrowes, U.S. Army Engineer Research and Development Ctr.; J. P. Fernández, F. Shubitidze, I. Shamatava, K. D. Paulsen, Dartmouth College [6217-07]

1:50 pm: **Application of SEA to UXO discrimination in geophysical environments producing EMI response**, F. Shubitidze, Dartmouth College; K. A. O'Neill, B. E. Barrowes, U.S. Army Engineer Research and Development Ctr.; I. Shamatava, K. Sun, J. P. Fernández, K. D. Paulsen, Dartmouth College [6217-08]

2:10 pm: **Use of EMI response coefficients from spheroidal excitation and scattering modes to classify objects via SVM**, B. Zhang, Massachusetts Institute of Technology; K. A. O'Neill, U.S. Army Engineer Research and Development Ctr. and Massachusetts Institute of Technology; T. M. Grzegorzczak, J. A. Kong, Massachusetts Institute of Technology [6217-09]

2:30 pm: **Electromagnetic induction sensor that uses a toroidal bucking transformer**, W. R. Scott, Jr., M. Malluck, Georgia Institute of Technology [6217-10]

Coffee Break 2:50 to 3:30 pm

SESSION 3

Room: Sanibel 1-2 Mon. 3:30 to 5:10 pm

Spectral Sensing I

Chairs: **Russell S. Harmon**, U.S. Army Research Office; **Nicola A. Playle**, Defence Science and Technology Lab. (United Kingdom)

3:30 pm: **Detection of landmines using hyperspectral imaging**, N. A. Playle, Defence Science and Technology Lab. (United Kingdom) [6217-11]

3:50 pm: **Remote detection of buried mines**, C. A. Hibbitts, Johns Hopkins Univ.; J. Bauer, Jet Propulsion Lab. [6217-12]

4:10 pm: **Laser polarization and reflectance characterization of selected target and background material**, H. H. Bennett, Jr., U.S. Army Engineer Research and Development Ctr.; Z. I. Derzko, U.S. Army Night Vision & Electronic Sensors Directorate; M. Fields, U.S. Army Engineer Research and Development Ctr. [6217-13]

4:30 pm: **Multi-optical mine detection: results from a field trial**, D. Letalick, S. K. Sjökvist, A. Linderhed, S. Nyberg, C. A. Grönwall, M. S. G. Uppsäll, H. Larsson, Swedish Defence Research Agency (Sweden) [6217-14]

4:50 pm: **Models for spectral properties of soil backgrounds**, J. M. Cathcart, Georgia Institute of Technology [6217-15]

Tuesday 18 April

Sessions 4-5 run concurrently with Sessions 8-9

SESSION 4

Room: Sanibel 3 **Tues. 8:00 to 10:00 am**

Spectral Sensing II

Chairs: **Gary Koh**, U.S. Army Engineer Research and Development Ctr.;
Miranda A. Schatten, U.S. Army Night Vision &
Electronic Sensors Directorate

8:00 am: **Surface and buried mine detection using MWIR images**, B. Ling, Migra Systems, Inc. [6217-16]

8:20 am: **Rainfall degradation of LWIR disturbed soil signature**, G. Koh, U.S. Army Engineer Research and Development Ctr.; E. M. Winter, Technical Research Associates, Inc.; M. A. Schatten, U.S. Army Night Vision & Electronic Sensors Directorate [6217-17]

8:40 am: **Spectral analysis of terrain infrared signatures**, J. M. Cathcart, B. Remesch, Georgia Institute of Technology [6217-18]

9:00 am: **Landmine casings discriminated using man-portable LIBS**, R. S. Harmon, U.S. Army Research Office; F. DeLucia, Jr., A. W. Miziolek, Army Research Lab.; A. La Pointe, U.S. Army Night Vision & Electronic Sensors Directorate [6217-19]

9:20 am: **MOMS: a multi-optical approach for landmine and UXO detection**, S. K. Sjökvist, Swedish Defence Research Agency (Sweden) [6217-20]

9:40 am: **Multispectral imaging and mine detection**, G. C. Mooradian, Apogon Technologies [6217-21]

Coffee Break 10:00 to 10:30 am

SESSION 5

Room: Sanibel 3 **Tues. 10:30 am to 12:10 pm**

Environmental Effects I

Chairs: **Yogadhis Das**, Defence Research and Development Canada (Canada); **Gary Koh**, U.S. Army Engineer Research and Development Ctr.

10:30 am: **Effect of magnetite on GPR detection of buried landmines: modeling and experiments**, R. L. Van Dam, B. Borchers, J. M. Hendrickx, New Mexico Institute of Mining and Technology [6217-22]

10:50 am: **Modeling soil magnetic susceptibility and frequency-dependent susceptibility to aid landmine clearance**, J. Hannam, Cranfield Univ. (United Kingdom); J. W. Dearing, The Univ. of Liverpool (United Kingdom) [6217-23]

11:10 am: **Physical model of soil and its implications for landmine detection interference**, J. Katsube, Natural Resources Canada (Canada); Y. Das, Defence Research and Development Canada (Canada); R. DiLabio, Natural Resources Canada (Canada); V. Singhroy, Canada Ctr. for Remote Sensing (Canada); P. Keating, J. Hunter, S. Connell-Madore, N. Scromeda, Natural Resources Canada (Canada) [6217-24]

11:30 am: **Electromagnetic response of soil samples: time and frequency domain**, A. M. Lewis, P. Ripka, M. A. Pike, European Commission (Italy) [6217-25]

11:50 am: **Magnetic soil properties at two arid to semi-arid sites in the Western United States**, R. L. Van Dam, J. B. J. Harrison, C. M. Rittel, J. M. Hendrickx, B. Borchers, New Mexico Institute of Mining and Technology [6217-26]

Lunch/Exhibition Break 12:10 to 1:10 pm

SESSION 8

Room: Sanibel 1-2 **Tues. 8:00 to 9:40 am**

Acoustics I

Chairs: **Steven S. Bishop**, U.S. Army Night Vision & Electronic Sensors Directorate; **Bradley W. Libbey**, U.S. Army Night Vision & Electronic Sensors Directorate

8:00 am: **High-frequency modulation approach for the nonlinear seismo-acoustic detection of buried landmines**, D. M. Donskoy, Stevens Institute of Technology; D. J. Fenneman, U.S. Army Engineer Research and Development Ctr.; A. N. Zagrai, M. Tsionskiy, N. Sedunov, Stevens Institute of Technology [6217-37]

8:20 am: **Nonlinear acoustic landmine detection: comparison of off-target soil background and on-target soil-mine nonlinear effects**, M. S. Korman, U.S. Naval Academy; J. M. Sabatier, The Univ. of Mississippi [6217-38]

8:40 am: **A study of the acoustic behavior of a plastic blast-hardened anti-tank landmine**, W. C. K. Alberts II, R. M. Waxler, J. M. Sabatier, The Univ. of Mississippi [6217-39]

9:00 am: **Influence of particle size on the vibration of plates loaded with granular material**, J. A. Turner, W. Kang, K. Rattanadit, L. Yang, F. Bobaru, Univ. of Nebraska/Lincoln [6217-40]

9:20 am: **Ground-contacting sensors for seismic landmine detection**, G. D. Larson, J. S. Martin, W. R. Scott, Jr., Georgia Institute of Technology [6217-42]

Coffee Break 9:40 to 10:30 am

SESSION 9

Room: Sanibel 1-2 **Tues. 10:30 am to 12:10 pm**

Acoustics II

Chairs: **James M. Sabatier**, The Univ. of Mississippi; **Douglas J. Fenneman**, U.S. Army Night Vision & Electronic Sensors Directorate

10:30 am: **Large vibrometer arrays for seismic landmine detection**, W. R. Scott, Jr., J. O. Hamblen, J. S. Martin, G. D. Larson, Georgia Institute of Technology [6217-43]

10:50 am: **Optimal experiments with seismic sensors for the localization of buried landmines**, M. Alam, G. D. Larson, J. H. McClellan, W. R. Scott, Jr., Georgia Institute of Technology [6217-44]

11:10 am: **Ultrasound displacement sensing in the presence of random surface roughness**, P. Ratilal, C. M. Rappaport, Northeastern Univ.; D. J. Fenneman, U.S. Army Night Vision & Electronic Sensors Directorate [6217-45]

11:30 am: **Advanced LDV instruments for buried landmine detection**, A. K. Lal, V. Aranchuk, C. F. Hess, V. V. Doushkina, J. M. Kilpatrick, MetroLaser, Inc.; J. M. Sabatier, The Univ. of Mississippi [6217-46]

11:50 am: **Speckle noise in a continuously scanning multibeam laser Doppler vibrometer for acoustic landmine detection**, A. K. Lal, C. F. Hess, V. Aranchuk, Metrolaser, Inc.; J. M. Sabatier, The Univ. of Mississippi; R. D. Burgett, Planning Systems Inc.; I. Aranchuk, The Univ. of Mississippi; W. T. Mayo, Jr., Extended Vision, Inc [6217-47]

Lunch/Exhibition Break 12:10 to 1:30 pm

Sessions 6-7 run concurrently with Session 10

SESSION 6

Room: Sanibel 3 **Tues. 1:10 to 3:10 pm**

Environmental Effects II

Chairs: **Adam M. Lewis**, European Commission Joint Research Ctr. (Italy); **Remke L. Van Dam**, New Mexico Institute of Mining and Technology

- 1:10 pm: **Soil compensation techniques for the detection of buried metallic objects**, L. R. Pasion, The Univ. of British Columbia (Canada); S. D. Billings, Sky Research Inc. (Canada); D. W. Oldenburg, The Univ. of British Columbia (Canada); Y. Li, Colorado School of Mines [6217-27]
- 1:30 pm: **Characterizing mine detector performance over difficult soils**, R. C. Bailey, G. F. West, Univ. of Toronto (Canada) [6217-28]
- 1:50 pm: **Effect of the soil on the metal detector signature of a buried mine**, P. M. P. Druyts, Royal Military Academy (Belgium); Y. Das, Defence Research and Development Canada (Canada); C. Craeye, Univ. Catholique de Louvain (Belgium); M. Acheroy, Royal Military Academy (Belgium) [6217-29]
- 2:10 pm: **Investigation of electromagnetic induction scattering from magnetically susceptible rough surfaces**, I. Shamatava, Dartmouth College; K. A. O'Neill, U.S. Army Engineer Research and Development Ctr.; F. Shubitidze, Dartmouth College; B. E. Barrowes, U.S. Army Engineer Research and Development Ctr.; J. P. Fernández, K. Sun, K. D. Paulsen, Dartmouth College [6217-30]
- 2:30 pm: **Electromagnetic soil properties variability in a minefield trial site in Cambodia and its effect on the detection of mine-like targets with the MINEHOUND dual-sensor system**, A. Ranada Shaw, A. Gorriti, Technische Univ. Delft (Netherlands); A. J. Schoolderman, J. B. Rhebergen, TNO-FEL (Netherlands); E. C. Slob, Technische Univ. Delft (Netherlands) [6217-31]
- 2:50 pm: **Electromagnetic soil properties variability in a minefield trial site in Cambodia**, A. Gorriti, A. Ranada Shaw, Technische Univ. Delft (Netherlands); A. J. Schoolderman, J. B. Rhebergen, TNO-FEL (Netherlands); E. C. Slob, Technische Univ. Delft (Netherlands) [6217-32]
- Coffee Break 3:10 to 3:40 pm

SESSION 7

Room: Sanibel 3 **Tues. 3:40 to 5:00 pm**

Environmental Effects III

Chairs: **Christopher J. Black**, U.S. Army Night Vision & Electronic Sensors Directorate; **Larry N. Lynch**, U.S. Army Corps of Engineers

- 3:40 pm: **Comparison of two new portable magnetic susceptibility measurement systems**, R. E. North, U.S. Army Engineer Research and Development Ctr. [6217-33]
- 4:00 pm: **Empirical study of the effect of soil magnetic properties on a range of current-model metal detectors**, A. M. Lewis, M. A. Pike, D. M. Guelle, P. Ripka, European Commission (Italy); C. Craill, Consultant Defencetek CSIR (South Africa) [6217-34]
- 4:20 pm: **A controlled outdoor test site for evaluation of soil effects on landmine detection sensors: measurements under real field conditions**, J. M. H. Hendrickx, R. L. Van Dam, B. Borchers, J. Kleissl, H. Shannon, S. Hong, N. Alkov, New Mexico Institute of Mining and Technology [6217-35]
- 4:40 pm: **A new integrated approach for characterizing in real time the soil electromagnetic properties and detecting landmines using a hand-held vector network analyzer**, O. L. Lopera, Royal Military Academy (Belgium) and Univ. de Los Andes (Colombia); E. C. Slob, Technische Univ. Delft (Netherlands); M. Vanclooster, Univ. Catholique de Louvain (Belgium); S. Lambot, Technische Univ. Delft (Netherlands) [6217-36]

SESSION 10

Room: Sanibel 1-2 **Tues. 1:30 to 3:30 pm**

Acoustics III

Chairs: **Waymond R. Scott**, Jr., Georgia Institute of Technology; **Steven S. Bishop**, U.S. Army Night Vision & Electronic Sensors Directorate

- 1:30 pm: **Field testing of a small seismo/acoustic landmine confirmation sensor**, J. M. Sabatier, The Univ. of Mississippi [6217-48]
- 1:50 pm: **Dynamic analysis of mass loaded highway guardrails**, S. S. Bishop, U.S. Army Night Vision & Electronic Sensors Directorate; P. Tsopelas, T. Chen, Catholic Univ. of America; J. A. Judge, The Catholic Univ. of America .. [6217-49]
- 2:10 pm: **Compressional wave gradients within one meter of the ground surface**, C. J. Hickey, J. M. Sabatier, W. B. Howard, The Univ. of Mississippi [6217-50]
- 2:30 pm: **The study of climate and seasonal effects on soil properties by a nonlinear acoustic technique: the phase-shift method**, Z. Lu, J. M. Sabatier, Univ. of Mississippi [6217-51]
- 2:50 pm: **Contact-probe based excitation method for mine detection: application on a VS1.6 Italian landmine**, S. S. Bishop, U.S. Army Night Vision & Electronic Sensors Directorate; T. Chen, P. Tsopelas, J. A. Judge, The Catholic Univ. of America [6217-52]
- 3:10 pm: **Nonlinear detection of land mines using wide-bandwidth time-reversal technique**, A. M. Sutin, Artann Labs., Inc. and Stevens Institute of Technology; B. W. Libbey, U.S. Army Night Vision & Electronic Sensors Directorate; V. Kurtenoks, Artann Labs., Inc.; D. J. Fenneman, U.S. Army Night Vision & Electronic Sensors Directorate; A. Sarvazyan, Artann Labs., Inc. [6217-53]

Wednesday 19 April

Sessions 11-13 run concurrently with Sessions 15-16

SESSION 11

Room: Sanibel 3 **Wed. 8:20 to 10:20 am**

Littoral Studies I

Chairs: **Gerald J. Dobeck**, Naval Surface Warfare Ctr. Panama City;
Jason R. Stack, Naval Surface Warfare Ctr. Panama City

- 8:20 am: **Detailed investigation of cascaded Volterra fusion of processing strings for automated sea mine classification in very shallow water**, T. Aridgides, M. F. Fernandez, Lockheed Martin Corp. [6217-54]
- 8:40 am: **Application of fusion algorithms for computer-aided detection and classification of bottom mines to synthetic aperture sonar test data**, C. M. Ciany, W. C. Zurawski, Raytheon Co. [6217-55]
- 9:00 am: **Automated sea-mine detection and classification in high-resolution sonar imagery**, G. J. Dobeck, Naval Surface Warfare Ctr. [6217-56]
- 9:20 am: **Classification of buried underwater objects using the new BOSS and multichannel canonical correlation feature extraction**, M. R. Azimi-Sadjadi, J. Cartmill, B. Thompson, Colorado State Univ. [6217-57]
- 9:40 am: **Clutter reduction in low-resolution multifrequency sonar imagery**, J. R. Stack, R. T. Arrieta, Naval Surface Warfare Ctr. [6217-58]
- 10:00 am: **Advanced minefield detection algorithm development**, V. T. Holmes, B. Cadle, R. J. Hilton, Areté Associates; J. H. Holloway, Jr., Naval Surface Warfare Ctr. [6217-59]
- Extended Lunch/Exhibition Break 10:20 am to 1:30 pm

SESSION 13

Room: Sanibel 3 **Wed. 1:30 to 2:30 pm**

Littoral Studies III

Chairs: **Michael P. Strand**, Naval Surface Warfare Ctr. Panama City;
Gerald J. Dobeck, Naval Surface Warfare Ctr. Panama City

- 1:30 pm: **Broadband signal processing for detection, classification, and identification of underwater, bottomed, and buried targets in natural noise background of shallow waters, littoral regions, and ocean environments**, G. Goo, MicroTechnologies, Inc. [6217-63]
- 1:50 pm: **Acoustic seabed classification using fractional Fourier transform**, M. Barbu, E. J. Kaminsky, R. E. Trahan, Univ. of New Orleans [6217-65]
- 2:10 pm: **Phase coherence adaptive processor for automatic signal detection**, R. A. Wagstaff, The Univ. of Mississippi [6217-67]
- Coffee Break 2:30 to 3:30 pm

SESSION 15

Room: Sanibel 1-2 **Wed. 8:20 to 11:30 am**

Environmental Effects IV

Chairs: **Russell S. Harmon**, U.S. Army Research Office;
Rae A. Melloh, U.S. Army Engineer Research and Development Ctr.

- 8:20 am: **Thermal modeling for landmine detection: efficient numerical methods and soil parameters estimation**, T. T. Nguyen, H. Dinh Nho, H. Sahli, Vrije Univ. Brussel (Belgium) [6217-73]
- 8:40 am: **Statistical analysis of spectral data for vegetation detection**, J. M. Cathcart, R. Love, Georgia Institute of Technology [6217-74]
- 9:00 am: **Water flow and distribution around buried landmines**, G. Koh, M. Ginsberg, S. Howington, U.S. Army Engineer Research and Development Ctr. [6217-75]
- 9:20 am: **Field measurement and model representation of soil property spatial variation**, R. A. Melloh, S. Howington, J. F. Peters, G. L. Mason, J. R. Ballard, Jr., U.S. Army Engineer Research and Development Ctr. ... [6217-76]
- 9:40 am: **Development of a multiscale packing methodology for evaluating fate and transport processes of explosive-related chemicals in soil physical models**, S. Rodriguez, V. Vargas, C. Torres, I. Y. Padilla, I. Santiago, Univ. de Puerto Rico Mayagüez [6217-77]
- Coffee Break 10:00 to 10:30 am
- 10:30 am: **Effects of flow reversal on two-dimensional transport of explosive chemicals near soil-atmospheric interfaces subjected to advection processes**, I. Y. Padilla, J. P. Gutierrez Marin, I. Santiago, S. Rodriguez, Univ. de Puerto Rico Mayagüez [6217-78]
- 10:50 am: **Transport of explosives from buried mines: 3D numerical approach**, M. Irrazábal-Aguilera, V. Florian, S. P. Hernández-Rivera, M. E. Castro-Rosario, J. G. Briano, Univ. de Puerto Rico Mayagüez [6217-79]
- 11:10 am: **Adsorption studies of TNT on clay minerals using HPLC**, N. Mina, R. Rivera, M. A. Muñoz, Univ. de Puerto Rico Mayagüez [6217-80]
- Lunch/Exhibition Break 11:30 am to 1:30 pm

SESSION 16

Room: Sanibel 1-2 **Wed. 1:30 to 3:10 pm**

Radar I

Chairs: **James M. Ralston**, Institute for Defense Analyses;
David J. Daniels, ERA Technology Ltd. (United Kingdom)

- 1:30 pm: **Ground-penetrating radar field evaluation in Angola**, R. Walls, U.S. Army Night Vision & Electronic Sensors Directorate; J. F. Clodfelter, M. Price, S. Lauziere, S. Laudato, NIITEK, Inc. [6217-81]
- 1:50 pm: **An experimental site with a complex of polarimetric combined active-passive sensors of of S-, C-, Ku-, and Ka-band of frequencies for soil and snow remote sensing and surveillance**, A. K. Arakelyan, ECOSERV Remote Observation Ctr. Co. Ltd. (Armenia) and Institute of Radiophysics & Electronics (Armenia) [6217-82]
- 2:10 pm: **Numerical parametric study of buried target ground-penetrating radar signature**, I. C. van den Bosch, P. M. P. Druyts, M. Acheroy, Royal Military Academy (Belgium); I. Huynen, Univ. Catholique de Louvain (Belgium) .. [6217-83]
- 2:30 pm: **Wideband radar for airborne minefield detection**, W. W. Clark, B. P. Burns, U.S. Army Night Vision & Electronic Sensors Directorate; G. J. Moussally, Mirage Systems, Inc.; M. Soumekh, U.S. Army Night Vision & Electronic Sensors Directorate [6217-84]
- 2:50 pm: **Neutralization and detection of buried landmines using a low-power microwave neutralization (LPMN) device**, H. G. Mende, Defence Research and Development Canada (Canada) [6217-86]
- Coffee Break 3:10 to 3:30 pm

Session 14 runs concurrently with Session 17

SESSION 14

Room: Sanibel 3 **Wed. 3:30 to 5:10 pm**

Explosives Detection I

Chair: Scott L. Grossman, U.S. Army Night Vision & Electronic Sensors Directorate

- 3:30 pm: **Interactions of α -RDX with siloxane site surface: a computational modeling approach**, N. Mina-Camilde, N. M. Hernández, Y. M. Colón-Lopez, L. F. Alzate, Univ. de Puerto Rico Mayagüez [6217-68]
- 3:50 pm: **An optical fiber based microsensor for explosives detection**, G. Walsh, C. Sun, H. Xiao, N. Liu, J. Dong, V. Romero, New Mexico Institute of Mining and Technology [6217-69]
- 4:10 pm: **Detection of chemical signatures from TNT buried in sand at various ambient conditions: phase II**, S. P. Hernández-Rivera, B. Baez, V. Florian, A. C. Cabanzo Olarte, J. G. Briano, M. E. Castro-Rosario, Univ. de Puerto Rico Mayagüez [6217-70]
- 4:30 pm: **Detection of TNT at a distance from analysis of backscattered radiation between 395 and 405 nm**, M. E. Castro-Rosario, C. A. Peroza, C. M. Osorio-Cantillo, M. Morales, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez [6217-71]
- 4:50 pm: **Ultrafast dynamics in TNT: kinetic energy distribution of NO_x fragments generated from TNT photolysis**, M. E. Castro-Rosario, C. M. Osorio-Cantillo, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez [6217-72]

SESSION 17

Room: Sanibel 1-2 **Wed. 3:30 to 5:10 pm**

Radar II

Chairs: Brian P. Burns, U.S. Army Night Vision & Electronic Sensors Directorate; William W. Clark, U.S. Army Night Vision & Electronic Sensors Directorate

- 3:30 pm: **Millimeter-wave imaging system for the detection of non-metallic buried objects**, T. W. Du Bosq, J. M. Lopez-Alonso, D. E. Mullally, Jr., G. Boreman, College of Optics and Photonics/Univ. of Central Florida; D. Dillery, J. W. Grantham, D. R. Muh, Northrop Grumman Corp. [6217-87]
- 3:50 pm: **Application of multistatic inversion algorithms to landmine detection**, A. C. Gurbuz, T. Counts, K. Kim, J. H. McClellan, W. R. Scott, Jr., Georgia Institute of Technology [6217-88]
- 4:10 pm: **Application of pre-stack depth migration to SAR-GPR for landmine detection in rough ground area**, X. Feng, T. Kobayashi, M. Sato, Tohoku Univ. (Japan) [6217-89]
- 4:30 pm: **The results of spatio-temporally combined microwave active-passive measurements of bare and vegetated soil at 37 GHz**, A. Arakelyan, ECOSERV Remote Observation Ctr. Co. Ltd. (Azerbaijan) [6217-90]
- 4:50 pm: **Ray analysis and mine imaging**, G. P. Tricoles, Consultant .. [6217-91]

Thursday 20 April

Session 18 runs concurrently with Session 20

SESSION 18

Room: Sanibel 3 **Thurs. 8:30 to 10:10 am**

Explosives Detection II

Chairs: Samuel P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez; Aaron La Pointe, U.S. Army Night Vision & Electronic Sensors Directorate

- 8:30 am: **Nitro explosive detection: from basic science to detection at a distance**, M. E. Castro-Rosario, C. M. Osorio-Cantillo, C. A. Peroza, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez [6217-92]
- 8:50 am: **Investigation of the fragmentation of explosives by femtosecond laser mass spectroscopy**, C. McEnnis, Y. Dikmelik, T. J. Cornish, M. D. Antoine, P. Demirev, J. B. Spicer, Johns Hopkins Univ. [6217-93]
- 9:10 am: **Femtosecond laser-induced breakdown spectroscopy of explosives**, Y. Dikmelik, C. McEnnis, J. B. Spicer, Johns Hopkins Univ. [6217-94]
- 9:30 am: **Feasibility of landmine detection using transgenic plants**, M. Deyholos, Univ. of Alberta (Canada); A. A. Faust, Defence Research and Development Canada (Canada); M. Miao, D. A. Donahue, R. Montoya, Univ. of Alberta (Canada) [6217-95]
- 9:50 am: **Feasibility of fast neutron analysis for detection of buried landmines**, A. A. Faust, J. E. McFee, Defence Research and Development Canada (Canada); H. R. Andrews, H. Ing, Bubble Technologies Industries, Inc. (Canada) [6217-96]
- Coffee Break 10:10 to 10:40 am

SESSION 20

Room: Sanibel 1-2 **Thurs. 8:00 to 10:00 am**

Multisensor I

Chairs: John E. McFee, Defence Research and Development Canada (Canada); David J. Daniels, ERA Technology Ltd. (United Kingdom)

- 8:00 am: **Sensor fusion for airborne landmine detection**, M. A. Schatten, U.S. Army Night Vision & Electronic Sensors Directorate; P. D. Gader, J. Bolton, Univ. of Florida [6217-102]
- 8:20 am: **Canadian Forces ILDS: a militarily fielded multisensor vehicle-mounted teleoperated landmine detection system**, J. E. McFee, K. L. Russell, R. H. Chesney, A. A. Faust, Y. Das, Defence Research and Development Canada (Canada) [6217-104]
- 8:40 am: **Vehicle-mounted SAR-GPR and its evaluation**, M. Sato, T. Kobayashi, K. Takahashi, Tohoku Univ. (Japan); J. Fujiwara, Tokyo Gas Co., Ltd. (Japan); X. Feng, Tohoku Univ. (Japan) [6217-105]
- 9:20 am: **Autonomous mine detection sensors (AMDS)**, F. Navish III, U.S. Army Night Vision & Electronic Sensors Directorate [6217-106]
- 9:20 am: **An optimal technology for detection of vegetation-obscured tripwires**, C. L. Liao, L. Carter, Univ. of Auckland (New Zealand) [6217-107]
- Coffee Break 9:40 to 10:30 am

Session 19 runs concurrently with Session 21

SESSION 19

Room: Sanibel 3 **Thurs. 10:40 am to 12:20 pm**

Explosives Detection III

Chairs: Pablo J. Prado, GE Security; Stephen F. Schaedel, U.S. Army Night Vision & Electronic Sensors Directorate

- 10:40 am: **Evaluation of PELAN as a landmine confirmation sensor**, G. Vourvopoulos, Science Applications International Corp. [6217-97]
- 11:00 am: **Identification of obscured IEDs by the detection of gamma rays produced by fast neutrons**, T. R. Witten, U.S. Army Night Vision & Electronic Sensors Directorate; A. Vaucher, M. Muniruzzaman, B. Maglich, HiEnergy Technologies, Inc. [6217-98]
- 11:20 am: **Frequency selective detection of nuclear quadrupole resonance spin echoes**, S. D. Somasundaram, King's College London (United Kingdom); A. Jakobsson, Karlstad Univ. (Sweden); J. A. S. Smith, K. Althoefer, King's College London (United Kingdom) [6217-99]
- 11:40 am: **Theoretical and experimental investigations into landmine detection using nuclear quadrupole resonance (NQR)**, S. F. Schaedel, U.S. Army Night Vision & Electronic Sensors Directorate and Defence Science and Technology Lab. (United Kingdom) [6217-100]
- 12:00 pm: **False alarm reduction during landmine detection**, P. J. Prado, J. Chepin, G. A. Barrall, H. Robert, P. J. Turner, GE Security [6217-101]

SESSION 21

Room: Sanibel 1-2 **Thurs. 10:30 am to 12:00 pm**

Multisensor II

Chairs: Francis Navish III, U.S. Army Night Vision & Electronic Sensors Directorate; Richard Walls, U.S. Army Night Vision & Electronic Sensors Directorate

- 10:30 am: **Handheld standoff mine detection system (HSTAMIDS) field evaluation in Namibia (Invited Paper)**, R. Walls, S. P. Burke, R. Cresci, P. Ngan, U.S. Army Night Vision & Electronic Sensors Directorate; R. C. Doherty, Office of Assistant Secretary of Defense [6217-110]
- 11:00 am: **Development of handheld dual-sensor ALIS and its evaluation**, M. Sato, Tohoku Univ. (Japan); J. Fujiwara, Tokyo Gas Co., Ltd. (Japan); X. Feng, K. Takahashi, T. Kobayashi, Tohoku Univ. (Japan) [6217-108]
- 11:20 am: **Migration interpolation for the handheld GPR MD sensor system (ALIS)**, X. Feng, T. Kobayashi, T. Kazunori, Tohoku Univ. (Japan); J. Fujiwara, Tokyo Gas Co. Ltd. (Japan); M. A. Hafez, National Research Institute of Astronomy and Geophysics (Egypt); M. Sato, Tohoku Univ. (Japan) ... [6217-109]
- 11:40 am: **Minehound trials in Cambodia, Bosnia, and Angola**, D. J. Daniels, P. Curtis, ERA Technology Ltd. (United Kingdom) [6217-111]
- Lunch/Exhibition Break 12:00 to 1:10 pm

SESSION 22

Room: Sanibel 1-2 **Thurs. 1:10 to 2:50 pm**

Signal Processing I

Chairs: Paul D. Gader, Univ. of Florida; Peter Howard, U.S. Army Night Vision & Electronic Sensors Directorate

- 1:10 pm: **Improving spectral features from GPR by exploring the depth information**, D. K. C. Ho, Univ. of Missouri/Columbia; P. D. Gader, J. N. Wilson, Univ. of Florida [6217-112]
- 1:30 pm: **Statistical methods for detection of antipersonnel landmines with multistatic full-polarimetric ground-penetrating radar**, V. Kovalenko, Technische Univ. Delft (Netherlands) [6217-113]
- 1:50 pm: **A waveform-based algorithm for landmine detection using GPR**, V. Kovalenko, Technische Univ. Delft (Netherlands) [6217-114]
- 2:10 pm: **Image processing of ground-penetrating radar for landmine detection**, K. Long, Defence Science and Technology Lab. (United Kingdom); P. Liatsis, City Univ. (United Kingdom) [6217-115]
- 2:30 pm: **Comparison of pattern recognition approaches for multisensor detection and discrimination of anti-personnel and anti-tank landmines**, P. A. Torrione, L. M. Collins, Duke Univ. [6217-117]
- Coffee Break 2:50 to 3:30 pm

SESSION 23

Room: Sanibel 1-2 **Thurs. 3:30 to 5:10 pm**

Signal Processing II

Chairs: Richard C. Weaver, U.S. Army Night Vision & Electronic Sensors Directorate; Peter A. Torrione, Duke Univ.

- 3:30 pm: **On the confidence level fusion of IR and forward-looking GPR**, T. Wang, J. M. Keller, M. Busch, Univ. of Missouri/Columbia; P. D. Gader, C. E. Hawkins, J. McElroy, Univ. of Florida; D. K. C. Ho, Univ. of Missouri/Columbia [6217-118]
- 3:50 pm: **The effects of uncertainty and uncertainty modeling on information-based sensor management performance**, M. P. Kolba, L. M. Collins, Duke Univ. [6217-119]
- 4:10 pm: **Confirmation sensor scheduling using a reinforcement learning approach**, J. A. Marble, D. Blatt, A. O. Hero III, Univ. of Michigan [6217-120]
- 4:30 pm: **An analysis of sweep patterns for a handheld demining system**, J. N. Wilson, Univ. of Florida; D. K. C. Ho, Univ. of Missouri/Columbia; P. D. Gader, Univ. of Florida [6217-121]
- 4:50 pm: **Constrained filter optimization for subsurface landmine detection**, P. A. Torrione, L. M. Collins, Duke Univ. [6217-122]

✓ **Posters-Thursday**

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **X-band radar cross-section model and analysis of a typical 155 munition mounted behind a highway guardrail**, S. S. Bishop, U.S. Army Night Vision & Electronic Sensors Directorate [6217-131]
- ✓ **Macro-sorption of explosives related chemicals in soil under variable environmental conditions**, M. D. Hernandez, Univ. de Puerto Rico Mayagüez [6217-132]
- ✓ **UV Raman detection of 2,4-DNT in contact with sand particles**, S. P. Hernández-Rivera, A. Blanco, J. I. Jerez-Rozo, N. Mina-Camilde, M. E. Castro-Rosario, Univ. de Puerto Rico Mayagüez [6217-134]
- ✓ **Transport of explosive-related chemicals in 3D lab-scale soil tank under variable environmental conditions**, P. J. Tarafa, I. Y. Padilla, Univ. de Puerto Rico Mayagüez [6217-135]
- ✓ **Spatial distribution of TNT on soil determined from electron microscopy measurements**, M. E. Castro-Rosario, A. C. Cabanzo Olarte, O. L. Rizo Vivas, T. Luna Pineda, S. P. Hernández-Rivera, Univ. de Puerto Rico Mayagüez [6217-136]
- ✓ **Field study of the fate and transport of explosive chemicals in soil lysimeters subject to variable environmental conditions**, D. D. Pérez-Ruiz, I. Y. Padilla, Univ. de Puerto Rico Mayagüez [6217-137]
- ✓ **FT-IR signatures of TNT on montmorillonite-clay particles**, S. P. Hernández-Rivera, G. M. Herrera-Sandoval, L. M. Ballesteros-Rueda, N. Mina-Camilde, J. G. Briano, Univ. de Puerto Rico Mayagüez [6217-138]
- ✓ **Sampling of explosives in unsaturated soils using porous cup samplers and multiphase extraction techniques**, A. C. Padilla Jiménez, I. Y. Padilla, Univ. de Puerto Rico Mayagüez [6217-139]
- ✓ **Spectroscopic signatures of PETN part II: detection in clay**, S. P. Hernández-Rivera, L. M. Ballesteros-Rueda, G. M. Herrera-Sandoval, N. Mina-Camilde, Univ. de Puerto Rico Mayagüez [6217-140]
- ✓ **Design tradeoffs for a UAV-based minefield detection system**, S. Agarwal, S. Agarwal, Univ. of Missouri/Rolla; A. H. Trang, U.S. Army Night Vision & Electronic Sensors Directorate [6217-142]
- ✓ **Change detection for route reconnaissance and IED detection**, T. J. Woodard, S. Agarwal, Univ. of Missouri/Rolla; A. H. Trang, U.S. Army Night Vision & Electronic Sensors Directorate [6217-143]

Friday 21 April

SESSION 24

Room: Sanibel 1-2 Fri. 8:20 to 11:30 am

Signal Processing III

Chairs: **Paul D. Gader**, Univ. of Florida;
Hichem Frigui, Univ. of Louisville

- 8:20 am: **Multiband anomaly detection using signal subspace processing**, K. I. Ranney, H. Kwon, Army Research Lab.; M. Soumekh, SUNY/Univ. at Buffalo [6217-123]
- 8:40 am: **An EM-IMM based abrupt change detector for landmine detection**, V. Venkatasubramanian, H. Leung, Univ. of Calgary (Canada) [6217-124]
- 9:00 am: **A scale space approach to detect a class of side-attack landmines from SWIR video sequences**, M. Busch, J. M. Keller, Univ. of Missouri/Columbia; P. D. Gader, Univ. of Florida [6217-125]
- 9:20 am: **Predicting GPR target locations using time-delay differences**, A. C. Gurbuz, J. H. McClellan, W. R. Scott, Jr., Georgia Institute of Technology [6217-126]
- 9:40 am: **Region processing algorithm for HSTAMIDS**, P. Ngan, S. P. Burke, R. Cresci, U.S. Army Engineer Research and Development Ctr.; J. N. Wilson, Univ. of Florida; D. K. C. Ho, Univ. of Missouri/Columbia [6217-127]
- Coffee Break 10:00 to 10:30 am
- 10:30 am: **Detection and discrimination of landmines in ground-penetrating radar based on edge histogram descriptors**, H. Frigui, Univ. of Louisville; P. D. Gader, Univ. of Florida [6217-128]
- 10:50 am: **Using the adjoint method for solving the nonlinear GPR inverse problem**, L. M. van Kempen, H. Dinh Nho, H. Sahli, Vrije Univ. Brussel (Belgium) [6217-129]
- 11:10 am: **Visual detection, recognition, and classification of surface-buried UXO based on soft-computing decision fusion**, A. H. Shirkhodaie, H. Rababaah V, Tennessee State Univ. [6217-130]

Chemical and Biological Sensing VII

Conference Chairs: **Patrick J. Gardner**, General Dynamics Armament and Technical Products; **Augustus W. Fountain III**, U.S. Military Academy

Program Committee: **Jerome J. Braun**, MIT Lincoln Lab.; **John C. Carrano**, Luminex Corp.; **Christopher C. Carter**, Johns Hopkins Univ.; **Matthew T. Griffin**, General Dynamics Armament and Technical Products; **Debra M. Niemeyer**, Air Force Institute for Operational Health; **Paul M. Pellegrino**, Army Research Lab.; **Cynthia R. Swim**, U.S. Army Edgewood Chemical Biological Ctr.

Wednesday 19 April

Opening Remarks

Room: Tallahassee 2-3 Wed. 8:00 to 8:10 am

Chair: **Patrick J. Gardner**,
General Dynamics Armament and Technical Products

SESSION 1

Room: Tallahassee 2-3 Wed. 8:10 am to 12:10 pm

Chemical Agent Detection

Chair: **Augustus W. Fountain III**, U.S. Military Academy

8:10 am: **Markers and methods for biodetection (Invited Paper)**, A. Fox, Univ. of South Carolina [6218-01]

8:40 am: **Overview of Chem-Bio Detection (Invited Paper)**, C. R. Swim, U.S. Army Edgewood Chemical Biological Ctr. [6218-02]

9:10 am: **Characterizing the spectral reproducibility of quartz-bound Au nanoparticle substrates for surface-enhanced Raman spectroscopy**, W. N. Radicic, E. V. Ni, C. Tombrello, A. W. Fountain III, U.S. Military Academy [6218-03]

9:30 am: **Multilayer enhanced SERS active materials: fabrication, characterization, and application to trace chemical detection**, H. Li, C. E. Baum, M. E. Hankus, B. M. Cullum, Univ. of Maryland/Baltimore... [6218-04]

9:50 am: **Examination of quantum cascade laser source for a MEMS-scale photo-acoustic chemical sensor**, D. A. Heaps, P. M. Pellegrino, Army Research Lab. [6218-05]

Coffee Break 10:10 to 10:40 am

10:40 am: **Differential mobility spectroscopy for chemical agent detection (Invited Paper)**, M. T. Griffin, General Dynamics Armament and Technical Products [6218-06]

11:10 am: **Measurements of scene spectral radiance variability**, J. A. Seeley, E. C. Wack, M. Muldoon, S. Shey, C. A. Upham, MIT Lincoln Lab.; J. M. Harvey, Boston Univ.; R. N. Czerwinski, M. Jordan, MIT Lincoln Lab.; M. Chamberland, TELOPS Inc. (Canada) [6218-07]

11:30 am: **Background data collection suite for atmospheric remote sensing applications**, A. K. Lazarevich, D. A. Oursler, K. C. Baldwin, Johns Hopkins Univ. [6218-08]

11:50 am: **UV Raman spectra and cross sections of chemical agents: analysis of relative detectability**, S. D. Christesen, J. M. Lochner, A. Hyre, U.S. Army Edgewood Chemical Biological Ctr.; J. P. Jones, ITT Industries; D. K. Emge, U.S. Army Edgewood Chemical Biological Ctr. [6218-09]

Lunch/Exhibition Break 12:10 to 1:30 pm

SESSION 2

Room: Tallahassee 2-3 Wed. 1:30 to 5:40 pm

Biological Agent Detection

Chair: **Matthew T. Griffin**,

General Dynamics Armament and Technical Products

1:30 pm: **Characterization of ambient aerosols at the San Francisco International Airport using bio-aerosol mass spectrometry**, P. T. Steele, K. R. Coffee, E. L. McJimpsey, D. P. Fergenson, V. J. Riot, H. J. Tobias, B. W. Woods, E. E. Gard, M. Frank, Lawrence Livermore National Lab. . . [6218-10]

1:50 pm: **Detection of biological particles in ambient air using bio-aerosol mass spectrometry (BAMS)**, E. L. McJimpsey, Univ. of California/Davis and Lawrence Livermore National Lab.; P. T. Steele, K. R. Coffee, D. P. Fergenson, V. J. Riot, B. W. Woods, E. E. Gard, M. Frank, H. J. Tobias, Lawrence Livermore National Lab.; C. B. Lebrilla, Univ. of California/Davis [6218-11]

2:10 pm: **Bio-Briefcase: advantages of fiber-coupled lasers for bio-aerosol detection**, S. M. Sickafoose, Sandia National Labs.; J. Kulakofsky, Blue Sky Research, Inc. [6218-12]

2:30 pm: **Deep-UV solid state light sources in the tactical biological sensor (TAC-Bio)**, J. B. Cabalo, M. De Lucia, F. Narayanan, A. Poldmae, D. W. Sickenberger, U.S. Army Research, Development and Engineering Command [6218-13]

2:50 pm: **Biological aerosol warner and analyser**, H. Schlemmer, G. Kürbitz, Carl Zeiss Optronics GmbH (Germany); P. Mielthe, Senova Immunoassay Systems (Germany); M. Spieweck, Carl Zeiss Optronics GmbH (Germany) [6218-14]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **A real-time early warning system for pathogens in water**, J. A. Adams, JMAR Technologies, Inc. [6218-15]

4:00 pm: **Surface-enhanced Raman of bacterial simulants**, J. A. Guicheteau, S. D. Christesen, U.S. Army Edgewood Chemical Biological Ctr. [6218-16]

4:20 pm: **Assessment of scan-only operations of lidar for the detection and discrimination of biological clouds**, K. H. Kwon, Johns Hopkins Univ. [6218-17]

4:40 pm: **Detection and discrimination of bio-aerosols with a LWIR lidar**, R. G. Vanderbeek, U.S. Army Edgewood Chemical Biological Ctr.; R. E. Warren, EO-Stat, Inc. [6218-18]

5:00 pm: **Biochemical detection and identification false alarm rate dependence on wavelength using laser induced native fluorescence**, R. Bhartia, Jet Propulsion Lab.; W. F. Hug, Photon Systems; A. L. Lane, A. Tsapin, Jet Propulsion Lab.; R. D. Reid, Photon Systems; P. G. Conrad, Jet Propulsion Lab. [6218-19]

5:20 pm: **Optically tunable hydrogel biosensor material**, T. C. Ayi, M. M. Tong, V. S. Lee, DSO National Labs. (Singapore) [6218-20]

Thursday 20 April

Opening Remarks

Room: Tallahassee 2-3 Thurs. 8:00 to 8:10 am

Chair: Patrick J. Gardner,
General Dynamics Armament and Technical Products

SESSION 3

Room: Tallahassee 2-3 Thurs. 8:10 to 11:40 am

Modeling and Simulation for Chem-Bio Detection

Chair: Jerome J. Braun, MIT Lincoln Lab.

- 8:10 am: **Biological agent detection based on principal component analysis**, N. R. Mudigonda, R. Kacelenga, General Dynamics Canada Ltd. (Canada) [6218-21]
- 8:30 am: **A fractal analysis of pathogen detection**, A. Sadana, A. M. Doke, B. Morris, The Univ. of Mississippi [6218-22]
- 8:50 am: **Multisensor data analysis and aerosol background characterization**, Y. Glina, J. J. Braun, P. N. Skomoroch, K. D. Transue, MIT Lincoln Lab. . [6218-24]
- 9:10 am: **Remote detection of airborne biological species**, M. B. Airola, D. D. Duncan, Johns Hopkins Univ.; J. C. Ramella-Roman, The Catholic Univ. of America [6218-25]
- 9:30 am: **Backscatter and extinction cross-sections of biologically significant material from laboratory measurements and recent field tests**, M. B. Airola, M. E. Thomas, N. T. Boggs, J. E. Steinberg, J. Jackman, Johns Hopkins Univ. [6218-26]
- 9:50 am: **Radiation transfer of emitting clouds that can scatter within the atmosphere for near-horizontal paths**, R. I. Joseph, M. E. Thomas, Johns Hopkins Univ. [6218-27]
- Coffee Break 10:10 to 10:40 am
- 10:40 am: **Verification and validation of an atmospheric boundary layer passive remote sensing technique using mid-wave infrared downwelling radiance**, M. E. Thomas, D. H. Terry, T. S. Han, J. Woznicki, Johns Hopkins Univ. [6218-28]
- 11:00 am: **Analyzing the performance of a sensor network using CT-Analyst**, K. S. Obenschain, A. Moses, T. Young, Jr., Naval Research Lab. [6218-29]
- 11:20 am: **Implementation of algorithms to discriminate chemical/biological airbursts from high-explosive airbursts utilizing acoustic signatures**, M. E. Hohil, S. V. Desai, U.S. Army Research, Development and Engineering Command [6218-30]
- Lunch/Exhibition Break 11:40 am to 1:30 pm

SESSION 4

Room: Tallahassee 2-3 Thurs. 1:30 to 4:20 pm

Novel Approaches to Chemical and Biological Detection

Chair: Paul M. Pellegrino, Army Research Lab.

- 1:30 pm: **A radically new approach to rapidly detect biological threat agents**, Z. Cheng, B. A. Chin, Auburn Univ. [6218-31]
- 1:50 pm: **Detection of salmonella typhimurium using phage-based magnetostrictive sensor**, R. S. Lakshmanan, J. Hu, R. Guntupalli, J. Wan, S. Huang, H. Yang, V. A. Petrenko, J. M. Barbaree, B. A. Chin, Auburn Univ. [6218-32]
- 2:10 pm: **Novel grating-based optical waveguide device for sensor applications**, S. Grego, A. M. Patel, B. R. Stoner, RTI International; Y. Cao, T. J. Suleski, Univ. of North Carolina/Charlotte [6218-33]
- 2:30 pm: **Nanoporous zeolite-fiber integrated microsensors for highly sensitive point detection of chemical agents**, H. Xiao, N. Liu, J. Dong, J. Hui, New Mexico Institute of Mining and Technology [6218-34]
- Coffee Break 2:50 to 3:20 pm
- 3:20 pm: **Biological and chemical sensing devices based on porous polymer photonic structures**, T. J. Huang, V. K. Hsiao, The Pennsylvania State Univ.; T. J. Bunning, Air Force Research Lab. [6218-35]
- 3:40 pm: **Active microcantilever device for biological agent detection**, D. E. Dausch, K. Gilchrist, RTI International; C. Harris, R. L. Clark, Duke Univ. [6218-36]
- 4:00 pm: **Laser patterning of neurons and myoblasts on MEAs: a prospective tool for practical and efficient biosensor fabrication**, R. K. Pirlo, Clemson Univ.; W. Ma, Naval Research Lab.; M. S. Kindy, Medical Univ. of South Carolina; B. Z. Gao, Clemson Univ. [6218-38]

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Monitoring apoptosis of TK-GFP-expressing ACC-M cells induced by ACV using FRET technique**, T. Xiong, China Univ. of Geosciences (China) [6218-49]
- ✓ **An acoustic wave biosensor for probing the viscoelastic properties of living cells**, F. Li, J. H. Wang, Q. Wang, Univ. of Pittsburgh [6218-51]
- ✓ **Raman and surface enhanced Raman of amino acids and nucleotide bases for target bacterial vibrational mode identification**, J. A. Guicheteau, L. Argue, S. D. Christesen, A. Hyre, M. L. Jacobson, U.S. Army Edgewood Chemical Biological Ctr. [6218-52]

Friday 21 April

Opening Remarks

Room: Tallahassee 2-3 Fri. 8:00 to 8:10 am

Chair: Patrick J. Gardner,
General Dynamics Armament and Technical Products

SESSION 5

Room: Tallahassee 2-3 Fri. 8:10 to 11:20 am

Biosensors and Biomonitoring Technologies

Chair: Patrick J. Gardner,
General Dynamics Armament and Technical Products

- 8:10 am: **Fractal binding and dissociation kinetics of heart-related compounds on biosensor surfaces**, A. M. Doke, A. Sadana, The Univ. of Mississippi [6218-39]
- 8:30 am: **Determining the resolution of a real-time arousal gauge**, S. R. Fishel, E. R. Muth, A. W. Hoover, L. J. Gugerty, Clemson Univ. [6218-41]
- 8:50 am: **Autonomous hemorrhage monitoring**, R. Leca, Sixtum, Inc. (Canada) [6218-42]
- 9:10 am: **Estimation of confidence level for physiological variables measured by a vital sign detection system**, J. Liu, T. McKenna, U.S. Army Medical Research and Materiel Command; B. Beidleman, W. Tharion, U.S. Army Research Institute of Environmental Medicine; J. Reifman, U.S. Army Medical Research and Materiel Command [6218-43]
- 9:30 am: **Neurotechnology for intelligence analysts**, A. A. Kruse, DARPA; K. C. Boyd, J. Schulman, Strategic Analysis, Inc. [6218-45]
- Coffee Break 9:50 to 10:20 am
- 10:20 am: **Enabling human HUMS with data modeling**, H. M. Jaenisch, dttech Systems Inc.; J. W. Handley, SPARTA, Inc.; M. Barnett, Computer Sciences Corp.; D. A. Grover, Washington Square Associates, Inc. [6218-46]
- 10:40 am: **The enhanced psychomotor vigilance task (EPVT): time-on-task effects as reflected in behavioral and physiological measures**, E. J. Sirevaag, Washington Univ. in St. Louis; J. A. Stern, Bio-Behavioral Analysis Systems, LLC [6218-47]
- 11:00 am: **An embedded real-time advisory system (ERTAS) for crew-automation reliability**, L. J. Trejo, NASA Ames Research Ctr. and Pacific Development & Technology, LLC; A. Raj, Florida Institute for Human and Machine Cognition; B. Matthews, NASA Ames Research Ctr.; J. Higgins, Florida Institute for Human and Machine Cognition; R. Kochavi, NASA Ames Research Ctr. [6218-48]

Related Courses

SC719 **Chemical & Biological Detection: Overview of Point and Standoff Sensing Technologies** (Gardner) Tuesday 1:30 pm to 5:30 pm

See SPIE Cashier to Register.

Enabling Technologies and Design of Nonlethal Weapons

Conference Chairs: **Glenn T. Shwaery**, Univ. of New Hampshire; **John G. Blitch**, Blitz Solutions Inc.; **Carlton Land**, Joint Non-Lethal Weapons Directorate

Program Committee: **Stephen Allen**, U.S. Coast Guard R&D Ctr; **Joseph J. Cecconi**, National Institute of Justice; **A. Trent DePersia**, Homeland Security Advanced Research Projects Agency; **Thomas E. Johnson**, Colorado State Univ.; **Patrick Mason**, Air Force Research Lab.; **Nasser N. Peyghambarian**, College of Optical Sciences/The Univ. of Arizona; **A-Lan V. Reynolds**, Raytheon Missile Systems; **Martin C. Richardson**, Univ. of Central Florida; **Ashley J. Welch**, The Univ. of Texas at Austin; **Mark Wrobel**, Air Force Medical Support Agency

Tuesday 18 April

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Vessel marking**, R. D. Sedat, U.S. Coast Guard [6219-22]
- ✓ **Virtual targeting in three-dimensional space with sound and light interference**, F. B. Chua, R. M. DeMarco, M. T. Bergen, Veterans Affairs Medical Ctr. [6219-24]
- ✓ **Ambulatory monitoring of physiology and behavior utilizing the PDA platform**, M. T. Bergen, Veterans Affairs Medical Ctr.; P. Shah, Veterans Affairs Medical Ctr. and New Jersey Institute of Technology [6219-23]

Wednesday 19 April

Introduction and Overview

Room: Osceola Breakout 1-2..... Wed. 8:00 to 10:10 am

Chairs: **Glenn T. Shwaery**, Univ. of New Hampshire;
John G. Blitch, Blitz Solutions Inc.;
Carlton Land, Joint Non-Lethal Weapons Directorate

SESSION 1

Room: Osceola Breakout 1-2..... Wed. 8:10 to 10:10 am

Emerging Nonlethal Technologies

Chair: **Carlton Land**, Joint Non-Lethal Weapons Directorate

- 8:10 am: **Nonlethal combined flash and sound pulse projector for counter-personnel and crowd control**, R. B. Schaefer, Phoenix Science & Technology, Inc [6219-01]
- 8:30 am: **Multiwavelength optical dazzler for personnel and sensor incapacitation**, J. P. Hauck, Scientific Applications and Research Associates, Inc. and Univ. of San Diego; A. Donne, Scientific Applications and Research Associates, Inc.; J. E. Ludman, Northeast Photosciences, Inc.; R. L. Moldow, Veterans Affairs Medical Ctr. and Seton Hall Univ. [6219-02]
- 8:50 am: **Neuromuscular disruption with ultrashort electrical pulses**, K. H. Schoenbach, R. P. Joshi, J. F. Kolb, Old Dominion Univ.; J. Comeaux, C. Beason, J. Ashmore, Air Force Research Lab. [6219-03]
- 9:10 am: **Nociceptor activation and damage by pulsed E-fields**, B. Y. Cooper, Univ. of Florida [6219-04]
- 9:30 am: **Synthetic fog as a nonlethal obscurant**, N. S. Cherniack, K. R. Short, Veterans Affairs Medical Ctr. [6219-05]
- 9:50 am: **Compact highly efficient 2-micron fiber laser**, S. Jiang, NP Photonics, Inc. [6219-25]
- Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Osceola Breakout 1-2..... Wed. 10:40 am to 12:20 pm

Laser-induced Plasma: Characterization and Applications

Chair: **Nasser N. Peyghambarian**,
College of Optical Sciences/The Univ. of Arizona

- 10:40 am: **Features of femtosecond laser filamentation in the atmosphere for standoff defense**, M. Fisher, R. Bernath, M. C. Richardson, College of Optics and Photonics/Univ. of Central Florida; A. L. Gaeta, T. Grow, Cornell Univ. ... [6219-07]
- 11:00 am: **Detection and analysis of laser-generated electromagnetic pulses**, N. Barbieri, J. Aspiotis, C. G. Brown, R. Bernath, M. Fisher, M. C. Richardson, College of Optics and Photonics/Univ. of Central Florida [6219-08]
- 11:20 am: **Laser light strings for atmospheric propagation (Presentation Only)**, E. M. Wright, College of Optical Sciences/The Univ. of Arizona; J. V. Moloney, M. Kolesik, The Univ. of Arizona [6219-09]
- 11:40 am: **Shock-wave generation in transparent media from ultrafast lasers**, R. Bernath, C. G. Brown, J. Aspiotis, M. Fisher, M. C. Richardson, College of Optics and Photonics/Univ. of Central Florida [6219-10]
- 12:00 pm: **Remote femtosecond laser induced breakdown spectroscopy (LIBS) in a standoff detection regime**, C. G. Brown, R. Bernath, M. Fisher, M. C. Richardson, M. Sigman, College of Optics and Photonics/Univ. of Central Florida; R. A. Walters, Ocean Optics, Inc. [6219-11]
- Lunch/Exhibition Break 12:20 to 1:50 pm

SESSION 3

Room: Osceola Breakout 1-2..... Wed. 1:50 to 3:10 pm

Remote Detection Platforms and Technologies

Chair: **A-Lan V. Reynolds**, Raytheon Missile Systems

- 1:50 pm: **Wireless power technology for application scenarios of high-altitude airships**, S. H. Choi, J. R. Elliott, G. C. King, Y. Park, J. Kim, S. Chu, NASA Langley Research Ctr.; K. D. Song, Norfolk State Univ. [6219-12]
- 2:10 pm: **Long-range propagation effects observed during acoustic counter battery system (ACBS) tests**, M. A. Cardinale, D. Velea, K. Torvik, A. LaRow, Planning Systems Inc. [6219-13]
- 2:30 pm: **Two-band infrared thermographer for standoff temperature measurements**, J. R. Dupuis, D. J. Mansur, R. M. Vaillancourt, D. L. Carlson, E. Schundler, G. J. Genetti, Optra, Inc. [6219-14]
- 2:50 pm: **Dielectric ultra-wideband optical E-field sensors**, W. C. Wang, H. Lotem, D. Zang, R. Forber, IPITEK, Inc.; S. M. Schultz, R. H. Selfridge, Brigham Young Univ. [6219-15]
- Coffee Break 3:10 to 3:40 pm

SESSION 4

Room: Osceola Breakout 1-2..... Wed. 3:40 to 5:40 pm

Evaluating Physiological Stress and Behavioral Consequences Resulting from Nonlethal Weapon Application

Chair: Richard J. Servatius, Veterans Affairs Medical Ctr.

3:40 pm: **Nonlethal suppression: from basic science to operationally relevant experimentation**, R. J. Servatius, Veterans Affairs Medical Ctr. [6219-16]

4:00 pm: **Blunt impact as deterrent: human approach-avoidance behaviors and other stress responses studied within a paintball gaming context**, K. R. Short, Veterans Affairs Medical Ctr. [6219-17]

4:20 pm: **Suppression through acoustics**, K. D. Beck, Veterans Affairs Medical Ctr. [6219-18]

4:40 pm: **Suppression: sound and light interference with targeting**, K. M. VanMeenen, K. R. Short, Veterans Affairs Medical Ctr. [6219-19]

5:00 pm: **Developing psychophysiological profiles for monitoring stress**, R. L. Moldow, Seton Hall Univ. and Veterans Affairs Medical Ctr.; M. T. Bergen, Veterans Affairs Medical Ctr. [6219-20]

5:20 pm: **Simulation training tools for nonlethal weapons using gaming environments**, A. Donne, Scientific Applications and Research Associates, Inc. [6219-21]

Spaceborne Sensors III

Conference Chairs: **Richard T. Howard**, NASA Marshall Space Flight Ctr.; **Robert D. Richards**, Optech, Inc. (Canada)

Program Committee: **John P. Croce**, Space Dynamics Lab./Utah State Univ.; **Michael E. Dobbs**, ITT Industries, Inc.; **Stephen R. Granade**, Advanced Optical Systems; **Shahid Habib**, NASA Goddard Space Flight Ctr.; **Brian Holz**, Ball Aerospace & Technologies Corp.; **Floyd E. Hovis**, Fibertek, Inc.; **Daniel L. Lau**, Univ. of Kentucky; **Vladimir B. Markov**, MetroLaser, Inc.; **Patricia K. Murphy**, Johns Hopkins Univ.; **Peter Tchoryk, Jr.**, Michigan Aerospace Corp.

Tuesday 18 April

Track Keynote Presentation

Room: **Osceola Ballroom D** Tues. 8:00 to 8:35 am

8:00 am: **Opening Remarks and Introduction**

Chairs: **Richard T. Howard**, NASA Marshall Space Flight Ctr.; **Robert D. Richards**, Optech, Inc. (Canada)

8:05 am: **Should we enhance the observing systems or improve coordination among the operating agencies: what is needed the most for security: a philosophical discussion (Invited Paper, Presentation Only)**

S. Habib, NASA Goddard Space Flight Ctr.

Break 8:35 to 8:45 am

SESSION 1

Room: **Destin 1-2** Tues. 8:45 to 10:30 am

8:45 am: **Image smear noise in CCDs**, D. M. Down, Ball Aerospace & Technologies Corp. [6220-02]

9:00 am: **Rad-hard ultrafast InGaAs photodiodes for space applications**, A. M. Joshi, Discovery Semiconductors, Inc.; F. Heine, T. Feifel, Tesat-Spacecom GmbH & Co. KG (Germany) [6220-03]

9:15 am: **High-performance microchannel plate imaging photon counters for spaceborne sensing**, O. H. Siegmund, Univ. of California/Berkeley ... [6220-04]

9:30 am: **Vibration testing for spaceflight qualification of a lightweight tunable Fabry-Perot interferometer**, S. K. Lindemann, Michigan Aerospace Corp. [6220-05]

9:45 am: **MEMS programmable spectral imaging system for remote sensing**, J. D. Newman, A. D. Cropper, P. P. Lee, ITT Industries; M. W. Kowarz, J. G. Phalen, Eastman Kodak Co. [6220-06]

10:00 am: **Spectral and imaging characteristics of tunable ultranarrow photonic-crystal interferometer for space-based application**, A. I. Khizhnyak, V. B. Markov, D. Woll, MetroLaser, Inc.; W. B. Cook, NASA Langley Research Ctr. [6220-07]

10:15 am: **Probabilistic analysis of the comparative performance of proportion-mode and Geiger-mode APD arrays for strategic LADAR systems**, G. M. Williams, A. S. Huntington, Voxel, Inc. [6220-08]

Coffee Break 10:30 to 10:50 am

SESSION 2

Room: **Destin 1-2** Tues. 10:50 am to 12:35 pm

10:50 am: **Real-time 3D vision solution for on-orbit autonomous rendezvous and docking**, S. Ruel, C. E. English, M. Anctil, J. Daly, C. Smith, S. Zhu, Neptec Design Group Ltd. (Canada) [6220-09]

11:05 am: **Fusion of composite pattern structured-light illumination with stereovision for high-resolution real-time range-sensing video**, A. M. A. Tan, D. L. Lau, L. G. Hassebrook, Univ. of Kentucky [6220-10]

11:20 am: **DART AVGS performance**, R. T. Howard, T. C. Bryan, NASA Marshall Space Flight Ctr. [6220-11]

11:35 am: **Effects of optical artifacts in a laser-based spacecraft navigation sensor**, J. E. LeCroy, D. S. Hallmark, The Boeing Co.; R. T. Howard, NASA Marshall Space Flight Ctr. [6220-12]

11:50 am: **3D sensor algorithms for pose determination and other Moon/Mars space operations**, J. M. Trenkle, Nonlinear Dynamics, Inc.; A. S. Hickerson, G. A. Ritter, J. C. Pavlich, P. Tchoryk, Jr., Michigan Aerospace Corp. ... [6220-13]

12:05 pm: **A relative navigation application of ULTOR technology for automated rendezvous and docking**, J. S. Hannah, Advanced Optical Systems [6220-14]

12:20 pm: **Composite pattern demodulation by means of optical correlators**, D. L. Lau, L. G. Hassebrook, Univ. of Kentucky; T. T. Lu, Jet Propulsion Lab. [6220-15]

Lunch Break 12:35 to 2:00 pm

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Conference 6220 • Room: Destin 1-2/
 Concurrent Session in Sun Ballroom C

Sessions 3-4 runs concurrently with Session 5

SESSION 3

Room: Destin 1-2 **Tues. 2:00 to 3:00 pm**
 2:00 pm: **3D scannerless LADAR for Orbiter inspection**, R. D. Habbit, Jr., Sandia National Labs. [6220-16]
 2:15 pm: **3D inspection for the shuttle return to flight**, A. M. Deslauriers, D. Beach, Neptec Design Group Ltd. (Canada); A. Montpool, R. Taylor, Neptec; I. Christie, Neptec Design Group Ltd. (Canada) [6220-17]
 2:30 pm: **Expanding range of pulsed range sensors with active projection from spatial light modulators**, X. Xun, Univ. of Louisville; W. Su, Univ. of Kentucky; R. W. Cohn, Univ. of Louisville; L. G. Hassebrook, Univ. of Kentucky [6220-18]
 2:45 pm: **Wide-angle LADAR for direction and distance (WALDD)**, S. R. Granade, Advanced Optical Systems [6220-19]
 Coffee Break 3:00 to 3:35 pm

SESSION 4

Room: Destin 1-2 **Tues. 3:35 to 4:35 pm**
 3:35 pm: **A software architecture for autonomous orbital robotics**, C. G. Henshaw, K. Akins, J. Johnson, C. M. Bielmeier, Naval Research Lab. [6220-22]
 3:50 pm: **Overview of the XNAV program: x-ray navigation using celestial sources**, D. Beckett, Ball Aerospace & Technologies Corp. [6220-23]
 4:05 pm: **The imaging sensor and electronics assembly for the Roadrunner (JWS-D1) Space Experiment: updated performance data**, M. A. Massie, E. J. Woodbury, Nova Sensors; P. D. LeVan, Air Force Research Lab. . . [6220-20]
 4:20 pm: **A Keplerian approach to angles-only orbit determination**, P. J. Vitarius, D. Hahs, Freel Innovations, Inc; D. A. Gregory, The Univ. of Alabama in Huntsville. [6220-30]

SESSION 5

Room: Sun Ballroom C **Tues. 1:00 to 3:20 pm**

Joint Session with conference 6249

Chairs: Raja Suresh, General Dynamics Advanced Information Systems; **Peter Tchoryk, Jr.**, Michigan Aerospace Corp.
 1:00 pm: **Near space: a new frontier (Invited Paper)**, J. R. Guerci, Defense Advanced Research Projects Agency [6249-14]
 1:30 pm: **A network-centric approach to space situational awareness (Invited Paper)**, D. A. Whelan, A. Galasso, A. Adler, The Boeing Co. [6249-15]
 2:00 pm: **High-altitude balloon-based wind LIDAR demonstration: from near space to space**, M. T. Dehring, P. Tchoryk, Jr., Michigan Aerospace Corp. [6220-25]
 2:20 pm: **Test and operations: one tool, one team**, C. J. Finley, Air Force Research Lab. [6220-26]
 2:40 pm: **How autonomy is taking the people out of TacSat-2**, C. J. Finley, Air Force Research Lab. [6220-27]
 3:00 pm: **Modular architectures for responsive Space missions: examples from TacSat-2 and TacSat-3**, S. D. Straight, B. Stargardt, Air Force Research Lab. [6220-29]
 Coffee Break 3:20 to 4:00 pm

Panel Discussion

Room: Sun Ballroom C **Tues. 4:00 to 5:00 pm**

Responsive Space

Chairs: Raja Suresh, General Dynamics Advanced Information Systems; **Peter Tchoryk, Jr.**, Michigan Aerospace Corp.; **Joseph R. Guerci**, Defense Advanced Research Projects Agency; **David A. Whelan**, The Boeing Co.; **Jeffrey J. Puschell**, Raytheon Space and Airborne Systems, **Ronald Graves**, General Dynamics C4 Systems

Related Courses

SC549 **Incorporating GPS Technology into Commercial and Military Applications (Uijt de Haag)** Tuesday 8:30 am to 12:30 pm

See SPIE Cashier to Register.

Modeling, Simulation, and Verification of Space-based Systems III

Conference Chair: **Pejmun Motaghedi**, The Boeing Co.

Cochair: **T. S. Kelso**, Ctr. for Space Standards and Innovation

Program Committee: **Marco Bacaloni**, Aerospace Corp.; **Steven C. Gordon**, Georgia Tech Research Institute; **Richard T. Howard**, NASA Marshall Space Flight Ctr.; **Patrick J. McNally**, MSC Software, Inc.; **Khanh Pham**, Air Force Research Lab.; **Fred Tasker**, Naval Research Lab.; **Patrick A. Tobbe**, Dynamic Concepts, Inc.; **Andrew D. Williams**, Air Force Research Lab.

Monday 17 April

SESSION 1

Room: Sarasota 3 Mon. 8:30 to 9:00 am

Plenary Presentation

8:30 am: **Satellite orbital conjunction reports assessing threatening encounters in Space (SOCRATES)** (*Invited Paper*), T. S. Kelso, S. Alfano, Ctr. for Space Standards & Innovation [6221-01]

SESSION 2

Room: Sarasota 3 Mon. 9:00 to 10:40 am

Contact and Dynamics

9:00 am: **A robotics-based testbed for testing a systematic method of identifying contact dynamics model parameters**, O. Ma, New Mexico State Univ. [6221-02]

9:20 am: **Contact dynamics simulations for robotic servicing of Hubble Space Telescope**, J. Wang, R. Mukherji, M. Ficocelli, A. Ogilvie, C. Rice, MacDonald, Dettwiler and Associates Ltd. (Canada) [6221-03]

9:40 am: **Robotics-based hardware-in-the-loop dynamic simulation for verifying microgravity contact dynamics**, O. Ma, New Mexico State Univ.; M. Liu, MacDonald, Dettwiler and Associates Ltd. (Canada) [6221-04]

10:00 am: **Simulation and deployment of the lenticular jointed MARSIS antenna booms**, D. S. Adams, Jet Propulsion Lab. [6221-05]

10:20 am: **Joint time-frequency domain identification of nonlinearly controlled structures**, G. Jin, Ford Motor Co.; M. K. Sain, Univ. of Notre Dame; B. F. Spencer, Jr., Univ. of Illinois at Urbana-Champaign; K. Pham, Air Force Research Lab. [6221-06]

Coffee Break 10:40 to 11:00 am

SESSION 3

Room: Sarasota 3 Mon. 11:00 am to 12:20 pm

Thermal Issues

11:00 am: **Effects and sensing of thermal radiation on basic on-orbit truss geometries**, S. E. Franke, Air Force Research Lab.; F. Roybal, The Univ. of New Mexico [6221-07]

11:20 am: **Modeling and analysis of a robust thermal control system based on forced convection thermal switches**, A. D. Williams, Air Force Research Lab. [6221-08]

11:40 am: **Small satellite thermal design, test and analysis**, M. F. Diaz-Aguado, J. Greenbaum, W. Fowler, G. Lightsey, The Univ. of Texas at Austin [6221-09]

12:00 pm: **University Nanosat System thermal design, analysis and testing**, C. M. Gerhart, Air Force Research Lab. [6221-10]

Lunch Break 12:20 to 1:30 pm

SESSION 4

Room: Sarasota 3 Mon. 1:30 to 3:10 pm

Rendezvous, Capture, Docking and Berthing

1:30 pm: **On the integrated requirements definition and performance of autonomous rendezvous and capture subsystems**, C. F. Enriquez, Jr., The Boeing Co.; P. A. Tobbe, Dynamic Concepts, Inc. [6221-11]

1:50 pm: **Automated rendezvous and docking operations evaluations**, R. T. Howard, L. Brewster, M. Williamson, D. P. Hall, K. Chavis, N. S. Johnston, J. Gaines, NASA Marshall Space Flight Ctr. [6221-12]

2:10 pm: **Modeling and testing of docking and berthing mechanisms**, D. P. Hall, M. M. Slone, NASA Marshall Space Flight Ctr.; P. A. Tobbe, Dynamic Concepts, Inc. [6221-13]

2:30 pm: **Development of the miniature video docking sensor**, L. P. Rodgers, S. P. Nolet, E. M. Kong, D. W. Miller, Massachusetts Institute of Technology [6221-14]

2:50 pm: **The guidance method of differential game for space vehicle rendezvous under target maneuvering based on orbital elements**, Q. Zhang, M. Huang, Y. Sun, Harbin Institute of Technology (China) [6221-15]

Coffee Break 3:10 to 3:30 pm

SESSION 5

Room: Sarasota 3 Mon. 3:30 to 4:50 pm

Intelligent Architectures and Systems

3:30 pm: **Comparison of simulation and measurement results of a high-speed intersatellite optical communication system**, D. Mohr, C. Wree, D. Becker, Discovery Semiconductors, Inc. [6221-17]

3:50 pm: **Data modeling for analytical equivalence and consistency proofing of simulation data with flight data**, H. M. Jaenisch, dtech Systems Inc.; M. Barnett, Computer Sciences Corp.; J. W. Handley, SPARTA, Inc.; D. A. Grover, Washington Square Associates, Inc. [6221-18]

4:10 pm: **Advances in modeling of launch and range operations**, J. E. Bardina, NASA Ames Research Ctr. [6221-19]

4:30 pm: **Behavioral modeling and simulation for the design process of aerospace microinstrumentation based on MEMS**, C. Ferrer, Univ. Autònoma de Barcelona (Spain) and CNM-IMB-CSIC (Spain); B. Lorente, Univ. Autònoma de Barcelona (Spain); L. Barrachina, Univ. Autònoma de Barcelona (Spain) and CNM-IMB-CSIC (Spain) [6221-20]

Sensors for Propulsion Measurement Applications

Conference Chair: **Valentin Korman**, Madison Research Corp.

Program Committee: **Edmund C. Baroth**, Jet Propulsion Lab.; **Richard Cohn**, Air Force Research Lab.; **Michael D. Cornelius**, ATK Thiokol; **Dawn M. Davis**, NASA Stennis Space Ctr.; **Rebecca A. Farr**, NASA Marshall Space Flight Ctr.; **Fernando Figueroa**, NASA Stennis Space Ctr.; **Sivaram P. Gogineni**, Innovative Scientific Solutions, Inc.; **Mark S. Hughes**, NASA SSC VA30E; **Gary W. Hunter**, NASA Glenn Research Ctr.; **Scott Hyde**, ATK; **Lon M. Stevens**, ATK Thiokol; **Michael D. Watson**, NASA Marshall Space Flight Ctr.; **John T. Wiley**, NASA Marshall Space Flight Ctr.

Thursday 20 April

SESSION 1

Room: Osceola Breakout 3-4 Thurs. 8:00 to 11:50 am

Space Propulsion Sensors

Chairs: **John T. Wiley, Jr.**, NASA Marshall Space Flight Ctr.;
Valentin Korman, Madison Research Corp.

- 8:00 am: **Application of Intelligent Sensors in the Integrated Systems Health Monitoring of a Rocket Test Stand**, A. M. Mahajan, S. Chitikeshi, L. Utterback, P. Bandhil, Southern Illinois Univ. Carbondale; F. Figueroa, NASA John C. Stennis Space Ctr. [6222-01]
- 8:20 am: **Instrumentation of UALR lab-scale hybrid rocket motor**, A. B. Wright, Univ. of Arkansas/Little Rock; W. Teague, A. Wright, Hendrix College; P. Foley, Univ. of Arkansas/Little Rock [6222-02]
- 8:40 am: **Unique thermocouple measures the temperatures of squibs, igniters, and propellants**, J. Nanigian, Nanmac Corp. [6222-03]
- 9:00 am: **Embeddable structural sensors for SHM of solid rocket grains**, J. Buswell, Micron Instruments [6222-04]
- 9:20 am: **Techniques for embedding instrumentation in pressure vessel test articles**, M. D. Cornelius, ATK Thiokol [6222-05]
- 9:40 am: **Cryo-Tracker(r) mass gauging system testing in a large-scale Atlas launch vehicle LOX tank simulator**, D. J. Schieb, M. S. Haberbusch, A. J. Yeckley, Sierra Lobo, Inc. [6222-06]
- Coffee Break 10:00 to 10:30 am
- 10:30 am: **Comparative analysis of volumetric flow meters used for mass flow estimation in multiphase and multidensity environments**, J. T. Wiley, Jr., NASA Marshall Space Flight Ctr.; V. Korman, Madison Research Corp. [6222-07]
- 10:50 am: **Optical determination of mass flow in a cryogenic fluid**, V. Korman, Madison Research Corp.; J. T. Wiley, NASA Marshall Space Flight Ctr.; D. A. Gregory, The Univ. of Alabama in Huntsville [6222-08]
- 11:10 am: **Development and application of high-temperature sensors and electronics for propulsion applications**, G. W. Hunter, NASA Glenn Research Ctr. [6222-09]
- 11:30 am: **Data compensation for fiber optic and foil strain gages for use at cryogenic temperatures**, S. L. Jensen, R. Field, G. Drouant, R. Drackett, NASA John C. Stennis Space Ctr. [6222-10]
- Lunch/Exhibition Break 11:50 am to 1:10 pm

SESSION 2

Room: Osceola Breakout 3-4 Thurs. 1:10 to 4:20 pm

Space Vehicle Sensors

Chairs: **Michael D. Cornelius**, ATK Thiokol;
Rebecca A. Farr, NASA Marshall Space Flight Ctr.

- 1:10 pm: **Status in developing a phosphor-based spacecraft health monitoring sensor suite**, W. A. Hollerman, Univ. of Louisiana at Lafayette; S. M. Goedeke, Oak Ridge National Lab.; N. P. Bergeron, Univ. of Louisiana at Lafayette; S. W. Allison, Oak Ridge National Lab.; R. J. Moore, Univ. of Louisiana at Lafayette [6222-11]
- 1:30 pm: **Chromochromic hydrogen detection**, J. Captain, B. Peterson, M. Whitten, C. Berger, NASA Kennedy Space Ctr.; G. Bokerman, J. McPherson, N. Mohajeri, N. Muradov, A. T-Raissi, Univ. of Central Florida [6222-12]
- 1:50 pm: **Orthogonal frequency coded surface acoustic wave passive remote sensing**, D. C. Malocha, D. Puccio, N. Saldanha, College of Optics and Photonics/Univ. of Central Florida [6222-13]
- 2:10 pm: **Optical slip ring for sensor interface applications**, D. A. Gregory, E. Hong, The Univ. of Alabama in Huntsville [6222-14]
- 2:30 pm: **Valve health monitoring system utilizing smart instrumentation**, S. L. Jensen, G. Drouant, NASA John C. Stennis Space Ctr. [6222-15]
- 2:50 pm: **Impact detection and analysis/health monitoring system for composites**, J. E. Child, ATK Thiokol; A. Kumar, S. J. Beard, X. Qing, Acellent Technologies, Inc.; D. G. Paslay, ATK Thiokol [6222-16]
- Coffee Break 3:10 to 3:40 pm
- 3:40 pm: **Wireless sensors network**, J. M. Perotti, A. Lucena, P. A. Mullenix, NASA Kennedy Space Ctr.; C. T. Mata, ASRC Aerospace Corp. [6222-17]
- 4:00 pm: **Development of bonded joint technology for a rigidizable-inflatable deployable truss**, S. S. Smeltzer III, NASA Langley Research Ctr. [6222-18]

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Detect nozzle deformation by JTFA pattern of jet noise: assessment of the procedure**, Q. Xu, Nanjing Univ. of Science & Technology (China) . . . [6222-25]
- ✓ **Rocket plume temperature measurement by wire-welded thermocouples**, Q. Xu, Nanjing Univ. of Science & Technology (China) [6222-26]
- ✓ **Detection of chemical and biological compounds through fluorescent emission in a hollow core optical fiber**, A. G. Duffell, The Univ. of Alabama in Huntsville and NASA Marshall Space Flight Ctr. [6222-27]
- ✓ **Hydrazine leak detection using poly (3-hexylthiophene) thin-film microsensor**, H. Yang, J. Wan, Auburn Univ.; H. Shu, Auburn Univ.; X. Liu, R. S. Lakshmanan, R. Guntupalli, J. Hu, W. Howard, B. A. Chin, Auburn Univ. [6222-28]
- ✓ **Correcting distortion in acoustic sense lines**, D. A. Gregory, The Univ. of Alabama in Huntsville [6222-29]
- ✓ **The optical transmission through the optical side-window**, Y. Zhang, Z. Fan, Harbin Institute of Technology (China) [6222-30]

- ✓ **Space robot for Mars and compatible with spacecraft**, V. K. Chittlangi,
Poornima College of Engineering (India) [6222-31]
- ✓ **Laser power beaming infrastructure for space power and propulsion**,
J. T. Kare, JT Kare Technical Consulting [6222-32]

Friday 21 April

SESSION 3

Room: Osceola Breakout 3-4 Fri. 8:30 to 10:30 am

Vehicle Health and Systems Architecture

Chair: Charles J. Finley, Air Force Research Lab.

- 8:30 am: **Highly reliable multi-sensor array (MSA) smart transducers**,
J. M. Perotti, A. Lucena, NASA Kennedy Space Ctr.; C. T. Mata, C. D. Immer,
ASRC Aerospace Corp. [6222-19]
- 8:50 am: **NASA Stennis Space Center integrated system health management
test bed and development capabilities**, J. F. Figueroa, R. Holland, D. Coote,
NASA John C. Stennis Space Ctr. [6222-20]
- 9:10 am: **Ethernet based smart networked elements (sensors and actuators)**,
J. M. Perotti, A. Lucena, P. A. Mullenix, NASA Kennedy Space Ctr.; C. T. Mata,
R. L. Oostdyk, ASRC Aerospace Corp. [6222-21]
- 9:30 am: **Smart actuators: valve health monitor (VHM) system**, J. M. Perotti,
A. Lucena, NASA Kennedy Space Ctr.; B. M. Burns, ASRC Aerospace
Corp. [6222-22]
- 9:50 am: **A Kennedy Space Center implementation of IEEE 1451**,
R. L. Oostdyk, ASRC Aerospace Corp.; J. M. Perotti, A. Lucena, P. A. Mullenix,
NASA Kennedy Space Ctr.; C. T. Mata, ASRC Aerospace Corp. [6222-23]
- 10:10 am: **Absolute autonomous inertial stationkeeping using microcosm's
orbit control kit (OCK)**, Y. Plam, L. J. Hansen, R. Van Allen, Microcosm,
Inc. [6222-24]



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Related Courses

- SC549 **Incorporating GPS Technology into Commercial and Military
Applications** (*Uijt de Haag*) Tuesday 8:30 am to 12:30 pm
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Micro (MEMS) and Nanotechnologies for Space Applications

Conference Chairs: **Thomas George**, ViaLogy Corp.; **Zhongyang Cheng**, Auburn Univ.

Program Committee: **Linan An**, Univ. of Central Florida; **Debjyoti Banerjee**, Texas A&M Univ.; **Scott D. Collins**, Univ. of Maine; **Ann G. Darrin**, Johns Hopkins Univ.; **Faheem F. Faheem**, Univ. of Colorado at Boulder; **Ernest J. Garcia**, Sandia National Labs.; **Robert D. Habbit, Jr.**, Sandia National Labs.; **Nils Hoivick**, IBM T.J. Watson Research Ctr.; **Mary J. Li**, NASA Goddard Space Flight Ctr.; **Yu-Chen Lin**, SpringSoft Inc. (Taiwan); **Jason Lohn**, NASA Ames Research Ctr.; **Zhichun Ma**, Michigan Aerospace Corp.; **Laurent Marchand**, European Space Agency/ESTEC (Netherlands); **Peter Nilsson Zandkarimi**, Uppsala Univ. (Sweden); **Robert S. Okojie**, NASA Glenn Research Ctr.; **Joseph Tringe**, Lawrence Livermore National Lab.; **David V. Wick**, Sandia National Labs.

Wednesday 19 April

Opening Remarks

Room: Naples 2 Wed. 8:05 to 8:10 am

Chairs: **Thomas George**, ViaLogy Corp.;
Zhongyang Cheng, Auburn Univ.

SESSION 1

Room: Naples 2 Wed. 8:10 to 10:10 am

MEMS for Space Applications

Chairs: **Fredrik C. Bruhn**, Ångström Aerospace Corp. (Sweden);
Choonsup Lee, Jet Propulsion Lab.

8:10 am: **Enabling responsive Space applications using multifunctional MEMS miniaturization** (*Invited Paper*), F. C. Bruhn, Ångström Aerospace Corp. (Sweden); T. George, ViaLogy Corp. and Angstrom Aerospace Corporation (Sweden); L. Stenmark, Ångström Aerospace Corp. (Sweden) [6223-01]

8:50 am: **MEMS-based force-detected nuclear magnetic resonance (FDNMR) spectrometer**, C. Lee, Jet Propulsion Lab.; M. C. Butler, California Institute of Technology; T. George, ViaLogy Corp.; D. P. Weitekamp, California Institute of Technology [6223-02]

9:10 am: **Integration of MEMS phase shifters with CMOS control circuitry**, A. M. Darwish, Army Research Lab.; T. Farmer, The George Washington Univ.; K. Ali, Jackson State Univ.; M. E. Zaghoul, The George Washington Univ.; A. Hung, E. A. Viveiros, Army Research Lab. [6223-03]

9:30 am: **Diffraction optics for Moon topography mapping**, J. G. Smith, MEMS Optical, Inc.; L. A. Ramos-Izquierdo, NASA Goddard Space Flight Ctr.; A. Stockham, MEMS Optical, Inc.; S. Scott, NASA Goddard Space Flight Ctr. [6223-04]

9:50 am: **Segmented MEMS deformable-mirror technology for Space applications**, M. A. Helmbrecht, T. N. Juneau, N. Doble, Iris AO, Inc. . . [6223-05]

Coffee Break 10:10 to 10:30 am

SESSION 2

Room: Naples 2 Wed. 10:30 am to 12:50 pm

MEMS Chemical Sensors

Chairs: **Richard W. Cernosek**, Sandia National Labs.;
Haifeng Ji, Louisiana Tech Univ.

10:30 am: **Micro-analytical systems for national security applications** (*Invited Paper*), R. W. Cernosek, A. M. Robinson, D. Cruz, Sandia National Labs. [6223-06]

11:10 am: **Molecular recognition of chem/biowarfare agents using micromechanical sensors** (*Invited Paper*), H. Ji, Louisiana Tech Univ.; T. G. Thundat, Oak Ridge National Lab. [6223-07]

11:50 am: **Conducting polymer color microsensors for detecting chemical vapors**, X. Liu, F. Meng, C. Luo, Louisiana Tech Univ. [6223-08]

12:10 pm: **Electronic nose for detecting multiple chemical vapors**, A. Chakraborty, R. Poddar, X. Liu, C. Luo, Louisiana Tech Univ. [6223-09]

12:30 pm: **A hybrid flagellar motor/MEMS-based TNT detection system**, J. Kim, S. Tung, Univ. of Arkansas [6223-10]

Lunch/Exhibition Break 12:50 to 2:00 pm

SESSION 3

Room: Naples 2 Wed. 2:00 to 4:50 pm

MEMS and Nano-Biological Sensors

Chairs: **Sonia E. Letant**, Lawrence Livermore National Lab.;
Scott D. Collins, Univ. of Maine

2:00 pm: **Functional nanostructured platforms for biological and chemical sensing** (*Invited Paper*), S. E. Letant, Lawrence Livermore National Lab. [6223-11]

2:40 pm: **Microdevices in medicine and biology** (*Invited Paper*), S. D. Collins, Univ. of Maine [6223-12]

Coffee Break 3:20 to 3:50 pm

3:50 pm: **Magnetostrictive microcantilever as micro-biosensor platform**, S. Li, L. Orona, Z. Cheng, Auburn Univ. [6223-13]

4:10 pm: **Phage-based magnetostrictive-acoustic microbiosensors for detecting bacillus anthracis spores**, J. Wan, Auburn Univ. and Consultant; H. Yang, R. S. Lakshmanan, R. Guntupalli, S. Huang, J. Hu, V. A. Petrenko, B. A. Chin, Auburn Univ. [6223-14]

4:30 pm: **Bio/chemical sensors based on liquid core optical ring resonator**, I. M. White, H. Oveys, X. Fan, Univ. of Missouri/Columbia [6223-30]

Thursday 20 April

SESSION 4

Room: Naples 2 Thurs. 8:40 to 10:00 am

Nano Materials and Acoustic MEMS

Chairs: **Zhongyang Cheng**, Auburn Univ.;
Qing-Ming Wang, Univ. of Pittsburgh

8:40 am: **High-frequency piezoelectric micromachined ultrasonic transducers for imaging applications** (*Invited Paper*), Q. Zhou, K. K. Shung, Univ. of Southern California; Q. Zhang, F. T. Djuth, Geospace Research Inc. [6223-16]

9:20 am: **On-chip thin-film bulk acoustic wave resonators for RF and microwave frequency control applications**, Q. Wang, Q. Chen, F. Li, Univ. of Pittsburgh [6223-17]

9:40 am: **Self-lubricating films for rotating and sliding MEMS**, C. Liang, B. Prorok, Auburn Univ.; P. Gupta, M. Tlustochowicz, R. Zhu, M. McNallan, Univ. of Illinois at Chicago [6223-19]

Coffee Break 10:00 to 10:40 am

SESSION 5

Room: Naples 2 **Thurs. 10:40 am to 12:40 pm**

Dip Pen Nanolithography

Chairs: **Debjyoti Banerjee**, Texas A&M Univ.;
William P. King, Georgia Institute of Technology

- 10:40 am: **Microfluidic ink delivery systems for dip pen nanolithography (DPN™)** (*Invited Paper*), D. Banerjee, A. Rivas-Cordona, V. Sathyamurthi, Texas A&M Univ. [6223-20]
- 11:20 am: **Direct writing, inspection, and repair of nanoelectronics using thermal dip pen nanolithography**, W. P. King, Georgia Institute of Technology [6223-21]
- 11:40 am: **SPM patterning of nanoscale metallic junctions**, J. D. Batteas, Texas A&M Univ. [6223-22]
- 12:00 pm: **Development of two-dimensional scanning probe arrays for dip pen nanolithography (DPN™)**, J. Zou, Texas A&M Univ.; D. A. Bullen, Bettis Atomic Power Lab.; X. Wang, GE Global Reserch Ctr.; C. Liu, Univ. of Illinois at Urbana-Champaign; C. A. Mirkin, Northwestern Univ. [6223-23]
- 12:20 pm: **Detection of explosives using microcantilever-based sensors functionalized by dip pen nanolithography (DPN™)**, M. S. Mannan, W. J. Rogers, D. Banerjee, Texas A&M Univ. [6223-24]
- Lunch/Exhibition Break 12:40 to 2:00 pm

SESSION 6

Room: Naples 2 **Thurs. 2:00 to 5:00 pm**

High Performance MEMS/Nano-Sensors

Chairs: **Cheng Luo**, Louisiana Tech Univ.;
Tian-Bing Xu, National Institute of Aerospace

- 2:00 pm: **Optical MEMS sensor development: a case study** (*Invited Paper*), E. A. Johnson, Ion Optics Inc. [6223-32]
- 2:40 pm: **Suspended silicon nanowire-based static sensors**, C. Luo, A. Chakraborty, R. Poddar, A. Francis, X. Liu, H. Li, H. Yu, Louisiana Tech Univ. [6223-25]
- 3:00 pm: **Theoretical modeling for electroactive polymer-based microactuators**, T. Xu, National Institute of Aerospace; J. Su, NASA Langley Research Ctr. [6223-26]
- Coffee Break 3:20 to 3:40 pm
- 3:40 pm: **Enhancing the sensitivity of microcantilever-based sensors via geometry modification**, B. Prorok, S. Morshed, Auburn Univ. [6223-27]
- 4:00 pm: **Fabrication of magnetostrictive nanobars**, S. Li, Z. Cheng, Auburn Univ. [6223-28]
- 4:20 pm: **Piezoelectric diaphragm as a high-performance sensor platform**, X. Yang, L. Odum, Z. Li, Z. Cheng, Auburn Univ. [6223-29]
- 4:40 pm: **Laser patterning of neurons and myoblasts on MEAs: a prospective tool for practical and efficient biosensor fabrication**, R. K. Pirlo, W. Ma, Clemson Univ.; M. S. Kindy, Medical Univ. of South Carolina; B. Z. Gao, Clemson Univ. [6223-31]

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Magnesium phthalocyanine(MgPc) thin films as nanomaterials**, M. Puri, GND Univ. (India) [6223-18]

Helmet- and Head-Mounted Displays XI: Technologies and Applications

Conference Chairs: **Randall W. Brown**, Air Force Research Lab.; **Peter L. Marasco**, Air Force Research Lab.; **Clarence E. Rash**, U.S. Army Aeromedical Research Lab; **Colin E. Reese**, U.S. Army Night Vision & Electronic Sensors Directorate

Monday 17 April

SESSION 1

Room: Osceola Breakout 1-2..... Mon. 1:30 to 3:20 pm

Human Factors

Chairs: **Clarence E. Rash**, U.S. Army Aeromedical Research Lab.;
Colin E. Reese, U.S. Army Night Vision & Electronic Sensors Directorate

1:30 pm: **Dichoptic image fusion in human vision system** (*Invited Paper*), D. G. Curry, D. G. Hopper, L. K. Harrington, Air Force Research Lab. . . . [6224-01]

2:00 pm: **Visual suppression of monocularly presented symbology against a fused background in simulation and training environments**, M. D. Winterbottom, Air Force Research Lab.; R. Patterson, Washington State Univ.; B. J. Pierce, Air Force Research Lab. [6224-02]

2:20 pm: **Binocular depth acuity using the modular multi-spectrum stereoscopic night vision goggle**, J. O. Merritt, The Merritt Group; V. G. CuQlock-Knopp, P. S. Paicopolis, J. Smoot, Army Research Lab. . [6224-03]

2:40 pm: **The response dynamics of pilots' head azimuth, pitch, and tilt**, L. A. Temme, A. Houtsma, U.S. Army Aeromedical Research Lab.; D. L. Still, UES, Inc. [6224-04]

3:00 pm: **A strategy for the evaluation of physiological stress effects on operational performance with HMDs**, D. L. Still, UES, Inc.; L. A. Temme, J. M. Cleland, U.S. Army Aeromedical Research Lab. [6224-05]

Coffee Break 3:20 to 3:50 pm

SESSION 2

Room: Osceola Breakout 1-2..... Mon. 3:50 to 5:20 pm

HMD Testing

Chairs: **Randall W. Brown**, **Alan R. Pinkus**, Air Force Research Lab.

3:50 pm: **A unified taxonomic approach to the laboratory assessment of visionic devices** (*Invited Paper*), A. R. Pinkus, Air Force Research Lab.; C. E. Rash, U.S. Army Aeromedical Research Lab. [6224-06]

4:20 pm: **Effects on task performance due to placement and type of monocular HMD**, P. R. Havig, Air Force Research Lab.; J. P. McIntire, Consortium Research Fellows Program [6224-07]

4:40 pm: **New vision-performance indicators of biocular head-mounted display image misalignment**, M. E. Kalich, L. M. Lont, U.S. Army Aeromedical Research Lab. [6224-08]

5:00 pm: **Performance effects of mounting a helmet-mounted display on the ANVIS mount of the HGU-56P helmet**, T. H. Harding, J. S. Martin, UES, Inc.; C. E. Rash, U.S. Army Aeromedical Research Lab. [6224-09]

Tuesday 18 April

SESSION 3

Room: Osceola Breakout 1-2..... Tues. 8:30 to 10:10 am

Head Tracker Technologies and Issues

Chairs: **Randall W. Brown**, **Alan R. Pinkus**, Air Force Research Lab.

8:30 am: **Chasing the sun: the inflight evaluation of an optical head tracker**, M. R. Sedillo, Ball Aerospace & Technologies Corp.; D. W. Harris, General Dynamics Corp.; D. L. Franck, Air Force Research Lab. [6224-10]

8:50 am: **Dynamic tracker test apparatus**, J. L. M. Shattuck III, V. M. Parisi, Air Force Research Lab. [6224-11]

9:10 am: **Next-generation, high-accuracy optical tracker for target acquisition and cueing**, D. S. Odell, V. Kogan, J. T. Scully, Ascension Technology Corp. [6224-12]

9:30 am: **Determining tracker accuracy in flight**, C. G. Koepke, U.S. Air Force Academy; V. M. Parisi, Air Force Research Lab. [6224-13]

Coffee Break 10:10 to 10:40 am

SESSION 4

Room: Osceola Breakout 1-2..... Tues. 10:40 am to 12:00 pm

NVG Use/Testing

Chairs: **Randall W. Brown**, **Alan R. Pinkus**, Air Force Research Lab.

10:40 am: **Spatial navigation performance using night vision goggles**, M. S. Gauthier, A. Parush, Carleton Univ. (Canada); T. J. Macuda, National Research Council Canada (Canada); D. Tang, Canadian Dept. of National Defence (Canada); G. Craig, S. A. Jennings, National Research Council Canada (Canada) [6224-15]

11:00 am: **Assessing the impact unique NVG filters have on human visual performance under simulated compatible cockpit lighting conditions**, S. A. Dixon, P. L. Marasco, Air Force Research Lab. [6224-16]

11:20 am: **Statistical assessment of NVG noise**, J. G. Wales, P. L. Marasco, Air Force Research Lab. [6224-17]

11:40 am: **NVG adjustment methods, eyepiece focus settings, and vision**, R. E. VanArsdel, B. Baldwin, L. K. Harrington, J. L. Craig, Air Force Research Lab. [6224-18]

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 5

Room: Osceola Breakout 1-2..... Tues. 1:30 to 3:10 pm

HMD Applications

Chairs: Clarence E. Rash, U.S. Army Aeromedical Research Lab.;
Colin E. Reese, U.S. Army Night Vision & Electronic
 Sensors Directorate

1:30 pm: **Compact non-occluded monocular HMD**, B. E. Catanzaro, CFE Services; J. W. Porter, A. Barton, W. B. Maffucci, Rockwell Collins, Inc. . [6224-19]

1:50 pm: **IHADSS-21: maintaining and enhancing the Apache HMD capability for the 21st century**, M. J. Parise, J. Kline, EFW Inc. [6224-20]

2:10 pm: **Symbology display unit: night vision symbology for the AH-64 increasing mission effectiveness and safety**, M. J. Parise, D. McIntire, EFW Inc. [6224-21]

2:30 pm: **Hyperstereopsis in night vision devices: basic mechanisms and impact for training requirements**, A. Priot, S. Hourlier, l'Institut de Médecine Aéropatiale (France); G. Giraudet, Essilor International (France); A. Leger, Thales Avionics (France); C. Roumes, Institut de Médecine Aéropatiale (France) [6224-22]

2:50 pm: **Advanced helmet-mounted display (AHMD) for simulator applications**, A. P. Riser, Zygo Corp.; A. Sisodia, L-3 Communications Corp.; M. Bayer, Zygo Corp. [6224-23]

Coffee Break 3:10 to 3:40 pm

SESSION 6

Room: Osceola Breakout 1-2..... Tues. 3:40 to 5:20 pm

Image Sources for HMD's

Chairs: Clarence E. Rash, U.S. Army Aeromedical Research Lab.;
Colin E. Reese, U.S. Army Night Vision & Electronic
 Sensors Directorate

3:40 pm: **SVGA AMOLED (active matrix OLED) with world's smallest pixel pitch**, O. F. Prache, eMagin Corp. [6224-25]

4:00 pm: **A spatial color SXGA, normally black, high-contrast wide symmetrical viewing angle AMLCD for military head-mounted displays (HMDs) and other viewer applications**, O. C. Woodard, Sr., H. L. Ong, Kopin Corp.; C. E. Reese, Kopin Corp. and U.S. Army Night Vision & Electronic Sensors Directorate [6224-26]

4:20 pm: **Evaluation of microvision color scanning laser display**, T. H. Harding, UES, Inc.; C. E. Rash, U.S. Army Aeromedical Research Lab.; S. Dennis, C. D. Wright, U.S. Army Aviation and Missile Command [6224-27]

4:40 pm: **Ultrabright head-mounted displays using LED-illuminated LCOS**, M. A. Handschy, J. R. McNeil, Displaytech, Inc.; P. Weissman, Optical Resolutions, Inc. [6224-28]

5:00 pm: **Immersive input display device (I2D2)**, D. Tremper, K. Burnett, A. Malloy, R. Wert, Naval Research Lab. [6224-29]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

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✓ **Digital development in modeling and assembling of helmet system for the air unit of the Army**, H. Liu, Z. Li, L. Zheng, Tsinghua Univ. (China) . . [6224-30]

✓ **Immersive viewing engine**, W. J. Schonlau, Modular Motion Systems [6224-31]

✓ **Wireless link for helmet mounted display/tracker**, G. S. Saini, Air Force Research Lab. [6224-32]

Related Courses

SC159 **Head-Mounted Displays: Design and Applications Including Night Vision (Melzer,Browne)** Wednesday 8:30 am to 5:30 pm

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Defense, Security, and Cockpit Displays III

Conference Chairs: **James C. Byrd**, Aeronautical Systems Ctr./U.S. Air Force; **Daniel D. Desjardins**, U.S. Air Force

Program Committee: **Eric Butter**, Air Force Research Lab.; **John J. Doyle, Jr.**, ADS Transicoil; **Gregory J. Hardy**, The Boeing Co.; **Robert P. Herman**, Astronautics Corp. of America; **David C. Huffman**, L-3 Communications Display Systems; **Asad A. Khan**, Kent Displays, Inc.; **Andrew Malloy**, Naval Research Lab.; **James Niemczyk**, American Panel Corp.; **James Phillips**, Royal Air Force (United Kingdom); **Kalluri R. Sarma**, Honeywell International, Inc.; **Lawrence E. Tannas, Jr.**, Tannas Electronic Displays, Inc.; **John T. Thomas**, General Dynamics Canada (Canada); **Manfred Vormbaum**, Luxell Technologies, Inc. (Canada); **Paul L. Wisely**, BAE Systems plc (United Kingdom)

Wednesday 19 April

SESSION 1

Room: Naples 1 Wed. 1:20 to 3:00 pm

Keynote Presentations

Chair: **Kalluri R. Sarma**, Honeywell International, Inc.

- 1:20 pm: **Overview of flexible displays and electronics technology: why, what, and when** (*Invited Paper, Presentation Only*), M. R. Pinnel, U.S. Display Consortium (USDC) [6225A-01]
- 1:50 pm: **Overview of aircraft displays EXCOMM and Naval Enterprise Display working group (NEDWG)** (*Invited Paper*), A. Malloy, Naval Research Lab.; G. P. Daelemans, Naval Air Systems Command; K. Burnett, Naval Research Lab. [6225A-02]
- 2:20 pm: **Navy common enterprise display system (CEDS)**, J. Morse, Naval Sea Systems Command; K. Burnett, Naval Research Lab. [6225A-32]
- 2:40 pm: **Military display market: fourth comprehensive edition**, D. D. Desjardins, U.S. Air Force; D. G. Hopper, Air Force Research Lab. [6225A-03]
- Coffee Break 3:00 to 3:30 pm

SESSION 2

Room: Naples 1 Wed. 3:30 to 5:10 pm

Cockpit Applications

Chair: **John J. Doyle, Jr.**, Aerospace Display Systems LLC.

- 3:30 pm: **Using the cockpit displays to improve on-aircraft maintenance**, R. P. Herman, R. D. Seinfeld, Astronautics Corp. of America [6225A-05]
- 3:50 pm: **F18 E/F MPCD and UFCD displays**, A. Miscovitch, E. Amarilio, L. Roisman, Elbit Systems Ltd. (Israel); R. E. Warden, The Boeing Co. [6225A-35]
- 4:10 pm: **Readability evaluation of an active matrix electrophoric ink display**, F. M. Meyer, Air Force Research Lab.; T. L. Trissell, General Dynamics Corp.; D. L. Aleva, D. G. Hopper, Air Force Research Lab.; S. J. Longo, L3/Link Simulation and Training [6225A-07]
- 4:30 pm: **The 3ATI instrument: the first of a new breed of common display systems?**, J. Wright, Luxell Technologies Inc. (Canada); J. T. Thomas, General Dynamics Canada Ltd. (Canada) [6225A-27]
- 4:50 pm: **Boeing electronic flight bag**, S. D. Ellersick, E. J. Trujillo, The Boeing Co. [6225A-16]

Thursday 20 April

SESSION 3

Room: Naples 1 Thurs. 8:30 to 10:20 am

LED, Organic, and Flexible Displays

Chair: **Kevin Burnett**, Naval Research Lab.

- 8:30 am: **Organic light emitting diode microdisplays: an essential technology with compelling advantages** (*Invited Paper*), G. W. Jones, eMagin Corp. [6225A-09]
- 9:00 am: **Improved LED backlight with unique color and intensity control and NVIS capability**, R. P. Herman, P. Zagar, T. Ulijasz, H. C. Hansen, F. Ellner, Astronautics Corp. of America [6225A-10]
- 9:20 am: **Expeditionary fighting vehicle (EFV) advanced display integration**, K. Burnett, A. Malloy, Naval Research Lab. [6225A-11]
- 9:40 am: **Common relevant operational picture enabling capability**, K. Burnett, A. Malloy, Naval Research Lab.; W. E. Bond, Office of Naval Research [6225A-12]
- 10:00 am: **All-organic active matrix OLED flexible display**, L. Zhou, A. Wanga, J. Sun, S. Wu, S. Park, T. N. Jackson, The Pennsylvania State Univ. . [6225A-13]
- Coffee Break 10:20 to 10:40 am

SESSION 4

Room: Naples 1 Thurs. 10:40 am to 12:20 pm

AMLCDs

Chair: **James Phillips**, Royal Air Force (United Kingdom)

- 10:40 am: **Resized 4ATI AMLCD glass for cockpit applications**, H. Woo, Luxell Technologies Inc. (Canada) [6225A-14]
- 11:00 am: **Large resized AMLCD glass for airborne applications**, M. Vormbaum, Aktelux (Canada) [6225A-15]
- 11:20 am: **Large screen 17" avionics display for the military E-2 AHE all-glass cockpit**, P. Paolillo, Naval Air Systems Command; R. Saxena, Northrop Grumman Corp.; R. D. Blanchard, L-3 Communications Corp. [6225A-36]
- 11:40 am: **Fast switching flexoelectric cholesteric liquid crystal displays** (*Invited Paper*), L. Chien, S. H. Kim, L. Shi, Kent State Univ. [6225A-17]
- 12:00 pm: **Fringe field switching AMLCD technology in military and consumer applications**, J. Niemczyk, American Panel Corp. [6225A-18]
- Lunch/Exhibition Break 12:20 to 1:20 pm

SESSION 5

Room: Naples 1 **Thurs. 1:20 to 3:00 pm**
HUDs, HMDs and Projection

Chair: Asad A. Khan, Kent Displays, Inc.

- 1:20 pm: **Head-up display system considerations for enhanced situational awareness through the integration of weather penetrating sensors**, P. L. Wisely, BAE Systems plc (United Kingdom) [6225A-31]
- 1:40 pm: **Digital HUDs for tactical aircraft**, M. H. Kalmanash, Rockwell Collins, Inc. [6225A-20]
- 2:00 pm: **Arc segment attitude reference helmet-mounted display symbology as a primary flight reference**, J. C. Jenkins, Air Force Flight Test Ctr. [6225A-21]
- 2:20 pm: **All digital technology as a viable alternative to cathode ray tube technology in head up display applications**, P. L. Wisely, BAE Systems plc (United Kingdom) [6225A-22]
- 2:40 pm: **Enhanced interactive datawall: display architecture for data fusion and collaboration in C2 environments**, R. C. Alvarez, P. A. Jedrysik, Air Force Research Lab. [6225A-34]
- Coffee Break 3:00 to 3:30 pm

SESSION 6

Room: Naples 1 **Thurs. 3:30 to 5:10 pm**
Human Factors

Chair: Lawrence E. Tannas, Jr., Tannas Electronic Displays, Inc.

- 3:30 pm: **Issues in defense training system immersive displays**, P. G. Gaylord, Naval Air Systems Command [6225A-24]
- 3:50 pm: **Human factors evaluation of OLED displays in the cockpit environment**, I. Glick, Luxell Technologies Inc. (Canada) [6225A-25]
- 4:10 pm: **A new display bezel technology with self diagnostic and self reconfiguring capability**, R. P. Herman, Astronautics Corp. of America; S. Peters, Scientific Research Corp.; C. Bremigan, Texzec Inc.; R. D. Seinfeld, Astronautics Corp. of America [6225A-26]
- 4:30 pm: **Scalable interfaces for mounted and dismounted unmanned systems control**, T. M. Tierney, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. [6225A-08]
- 4:50 pm: **Joint strike fighter displays**, H. C. Benjamin IV, Naval Air Systems Command [6225A-28]

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Recent advances in temporally multiplexed and point aspect autostereoscopic displays**, V. B. Markov, S. A. Kupiec, MetroLaser, Inc.; A. R. Travis, Univ. of Cambridge (United Kingdom) [6225A-56]
- ✓ **A low-cost, lightweight, head-mounted display for dismounted war-fighter applications**, P. L. Wisely, BAE Systems plc (United Kingdom) ... [6225A-23]

Displays Workshop

Display Technology and Issues

Thurs. 8:00 to 10:00 pm

*Facilitator: James Byrd,
 U.S. Air Force Aeronautical Systems Ctr.*

Agenda

- 8:00 pm: **Welcome and solicitation of topics.**
 - 8:05 pm: **Demonstrations** (announcements of setups in back of ballroom)
 - Flexible Plasma Display (Ms. Carol Wedding)
 - Metrolaser 3D Display
 - Display Symbology Language (Mike Gilger)
 - 8:10 pm: **Initial discussion topics include:**
 - Structure of Displays Track at SPIE Orlando and Other SPIE Venues
 - Need for Standardized Interfaces
 - Emerging Defense and Security Display Requirements
 - Revolutionary Display Advances: Ultraresolution, True3D, Rollable Active Screens, etc.
 - Industry/Academia View of New Technologies DoD & DHS Should Be Considering (but are not)
 - 9:00 pm: **Impromptu topics and demonstrations**
 - 10:00 pm: **Adjourn**
- Displays workshops are free to all registered attendees at SPIE Defense and Security Symposium.

Friday 21 April

SESSION 7

Room: Naples 1 **Fri. 8:30 to 10:20 am**
Cut Glass and Cornucopia

Chair: David C. Huffman, L-3 Communications Corp.

- 8:30 am: **Concept validation for a resized AMLCD used in a land-mobile environment**, J. T. Thomas, General Dynamics Canada Ltd. (Canada) [6225A-29]
- 8:50 am: **Supporting COTS-based displays in long-term military programs**, J. T. Thomas, General Dynamics Canada Ltd. (Canada) [6225A-30]
- 9:10 am: **Variable transmission visors** (*Invited Paper*), B. Taheri, AlphaMicron, Inc. [6225A-19]
- 9:40 am: **Multipurpose display group upgrade program: implementation of risk management in the avionics integrated product team environment**, W. Grimsbo, The Boeing Co.; C. Prince, L-3 Communications Corp. (Canada) [6225A-06]
- 10:00 am: **Multi-carrier waveform communication in MIL-STD-1553B notice 5**, D. L. Anderson, Edgewater Computer Systems Inc (Canada) [6225A-57]

Related Courses

SC159 **Head-Mounted Displays: Design and Applications Including Night Vision** (*Melzer,Browne*) Wednesday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Future Display Technologies II

Conference Chairs: **Eric W. Forsythe**, Army Research Lab.; **Henry J. Girolamo**, U.S. Army Soldier Systems Ctr.

Program Committee: **Denise L. Aleva**, Air Force Research Lab.; **Charles E. Bradford**, U.S. Army Night Vision & Electronic Sensors Directorate; **David Chiu**, Army Research Lab.; **Anna B. Chwang**, Universal Display Corp.; **Gary P. Daelemans**, Naval Air Systems Command; **Michael G. Hack**, Universal Display Corp.; **Dennis S. Magnifico**, U.S. Army Soldier Systems Ctr.; **Andrew Malloy**, Naval Research Lab.; **David C. Morton**, Army Research Lab.; **Gregory B. Raupp**, Arizona State Univ.; **Kalluri R. Sarma**, Honeywell International, Inc.; **Raymond Schulze**, CERDEC/U.S. Army

Thursday 20 April

SESSION 9

Room: Osceola Ballroom A Thurs. 1:20 to 3:40 pm

Display Users Overview

Chair: **Kalluri R. Sarma**, Honeywell International, Inc.

- 1:20 pm: **Information displays for future force warrior** (*Invited Paper*), A. Taylor, U.S. Army Soldier Systems Ctr. [6225B-37]
- 1:50 pm: **Application of novel display technologies to defense applications** (*Invited Paper*), M. J. Steffensmeier, Rockwell Collins, Inc. [6225B-38]
- 2:20 pm: **Flexible displays: concept interfaces for future force warrior** (*Invited Paper*), J. B. Sampson, U.S. Army [6225B-39]
- 2:50 pm: **OLED military characterization for rugged PDA application**, A. Malloy, K. Burnett, Naval Research Lab.; K. R. Sarma, Honeywell International, Inc. [6225B-40]
- 3:10 pm: **Information display - the weak link for NCW**, M. Gilger, FYI Corp. [6225B-55]
- Coffee Break 3:40 to 4:10 pm

SESSION 10

Room: Osceola Ballroom A Thurs. 4:10 to 5:50 pm

Flexible Displays

Chair: **Andrew Malloy**, Naval Research Lab.

- 4:10 pm: **Micro-encapsulated electrophoretic displays for military applications** (*Invited Paper*), M. D. McCreary, E Ink Corp. [6225B-41]
- 4:40 pm: **Recent advances in flexible low-power cholesteric LCDs** (*Invited Paper*), A. A. Khan, I. Shiyankovskaya, E. N. Montbach, T. L. Schneider, F. Nicholson, N. Miller, D. W. Marhefka, T. Ernst, J. W. Doane, Kent Displays, Inc. [6225B-42]
- 5:10 pm: **White-phosphorescent organic light-emitting devices for display applications**, B. W. D'Andrade, Y. Tung, M. S. Weaver, M. G. Hack, J. J. Brown, Universal Display Corp. [6225B-43]
- 5:30 pm: **Flexible thin-film transistor backplane process development and scale-up for flexible display integration and manufacturing**, G. B. Raupp, N. Colaneri, S. M. O'Rourke, Arizona State Univ. [6225B-44]

Friday 21 April

SESSION 11

Room: Osceola Ballroom A Fri. 8:30 to 10:30 am

Enabling Technologies for Future Displays

Chair: **Gregory B. Raupp**, Arizona State Univ.

- 8:30 am: **Organic semiconductors: the silicon technology of the 21st century?** (*Invited Paper, Presentation Only*), F. So, Univ. of Florida ... [6225B-45]
- 9:00 am: **Perspectives on printed electronics and display materials in a capped out world** (*Invited Paper*), P. A. Smith, Honeywell International, Inc. [6225B-46]
- 9:30 am: **White-light-emitting OLED display based on partially conjugated Si-PPV copolymer**, S. Song, New Span Opto-Technology Inc.; M. R. Wang, Univ. of Miami [6225B-47]
- 9:50 am: **Innovative transparent electrode for flexible displays**, H. Demiryont, K. Shannon, R. Storm, Eclipse Energy Systems, Inc. [6225B-48]
- 10:10 am: **NVIS filters for defense enhancement of flexible and emissive display technologies: (USDC program RFP04-110)**, A. N. Stuppi, J. D. Sampica, T. J. Barnidge, Rockwell Collins, Inc. [6225B-49]
- Coffee Break 10:30 to 11:00 am

SESSION 12

Room: Osceola Ballroom A Fri. 11:00 am to 12:40 pm

Future Displays Technologies

Chair: **Dennis S. Magnifico**, U.S. Army Soldier Systems Ctr.

- 11:00 am: **Time-multiplexed optical shutter technology for avionics platforms**, M. G. Selbrede, Uni-Pixel Displays, Inc. [6225B-50]
- 11:20 am: **Enabling smarter smart displays with solid state flash disks**, O. Tsur, M-Systems, Inc. (Israel) [6225B-51]
- 11:40 am: **Computer-generated holograms of a real 3D object using depth-data extracted from integral imaging technique**, E. Kim, D. Lee, S. Kim, Kwangwoon Univ. (South Korea) [6225B-52]
- 12:00 pm: **Performance metrics for integrated lighting systems**, T. P. Jansson, E. B. Arik, M. J. Bennahmias, N. Vaidyanathan, S. Z. Wang, K. Lee, Physical Optics Corp. [6225B-53]
- 12:20 pm: **Hardened image and M-video frames in RF-wireless communication**, T. P. Jansson, A. A. Kostrzewski, Physical Optics Corp. [6225B-54]

Enhanced and Synthetic Vision 2006

Conference Chairs: **Jacques G. Verly**, Univ. de Liège (Belgium); **Jeff J. Guell**, The Boeing Co.

Cochair: **Dan G. Baize**, NASA Kennedy Space Ctr.

Program Committee: **Gloria L. Calhoun**, **Guy A. French**, Air Force Research Lab.; **Peter Hecker**, **Bernd R. Korn**, DLR (Germany); **Michael C. Lightfoot**, NASA Langley Research Ctr.; **Jens Schiefele**, Jeppesen GmbH (Germany)

Monday 17 April

SESSION 1

Room: Destin 1-2 Mon. 8:30 to 10:10 am

Chairs: **Jens Schiefele**, Jeppesen GmbH (Germany);
Guy A. French, Air Force Research Lab.;
Jacques G. Verly, Univ. de Liège (Belgium)

8:30 am: **3D volumetric radar using 94-GHz millimeter waves**, B. Takacs, L. S. Sadovnik, V. A. Manasson, WaveBand Corp. [6226-01]

8:50 am: **Synthetic vision helicopter flights using high-resolution LIDAR terrain data**, A. Sindlinger, Technische Univ. Darmstadt (Germany); J. Schiefele, Jeppesen GmbH (Germany); M. Meuter, N. Barraci, M. Guettler, U. Klingauf, Technische Univ. Darmstadt (Germany); D. Howland, Jeppesen; C. Pschierer, Jeppesen GmbH (Germany) [6226-02]

9:10 am: **Implementing a shadow detection algorithm for synthetic vision systems in reconfigurable hardware**, J. O. Ladeji-Osias, A. Theobalds, O. Nare, K. T. Wandji, C. J. Scott, K. A. Nyarko, Morgan State Univ. [6226-03]

9:30 am: **A worldwide SRTM terrain database suitable for aviation use**, J. Schiefele, M. Launer, Jeppesen GmbH (Germany); D. Howland, B. Dorrell, Jeppesen; C. Pschierer, Jeppesen GmbH (Germany) [6226-04]

9:50 am: **On-the-sphere block-based 3D terrain rendering using a wavelet-encoded terrain database for SVS**, G. A. Baxes, T. Linger, TerraMetrics Inc [6226-05]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Destin 1-2 Mon. 10:40 am to 12:20 pm

Chairs: **Jeff J. Guell**, The Boeing Co.;
Bernd R. Korn, DLR (Germany);
Jacques G. Verly, Univ. de Liège (Belgium)

10:40 am: **Visual performance-based image enhancement methodology: an investigation of contrast enhancement algorithms**, K. E. Neriani, T. J. Herbranson, A. R. Pinkus, Air Force Research Lab.; C. D. Goodyear, General Dynamics Advanced Information Systems [6226-06]

11:00 am: **Real-time implementation of image alignment and fusion on a police helicopter**, D. J. Dwyer, Octec Ltd. (United Kingdom); M. I. Smith, J. P. Heather, T. Riley, D. L. Hickman, Waterfall Solutions Ltd. (United Kingdom); D. A. Scott, S. Hogg, Octec Ltd. (United Kingdom) [6226-07]

11:20 am: **Performance of obstacle detection and collision warning system for civil helicopters**, N. Yonemoto, K. Yamamoto, K. Yamada, Electronic Navigation Research Institute (Japan); H. Yasui, IHI Aerospace (Japan); C. Migliaccio, J. Dauvignac, C. Pichot, Univ. de Nice Sophia Antipolis (France) [6226-08]

11:40 am: **Real-time enhancement, registration, and fusion for an enhanced vision system**, G. D. Hines, NASA Langley Research Ctr.; Z. Rahman, College of William & Mary; D. J. Jobson, G. A. Woodell, NASA Langley Research Ctr. [6226-09]

12:00 pm: **Flight simulator with IR and MMW radar image generation capabilities**, M. E. Bonjean, J. G. Verly, Univ. de Liège (Belgium) [6226-11]

Lunch Break 12:20 to 1:20 pm

SESSION 3

Room: Destin 1-2 Mon. 1:20 to 3:00 pm

Chairs: **Gloria L. Calhoun**, Air Force Research Lab.;
Jeff J. Guell, The Boeing Co.;
Jacques G. Verly, Univ. de Liège (Belgium)

1:20 pm: **Integrating critical interface elements for intuitive single-display aviation control of UAVs**, J. L. Cooper, M. A. Goodrich, Brigham Young Univ. [6226-12]

1:40 pm: **Calibration and display of distributed aperture sensor (DAS) systems**, J. L. Dale, D. J. Dwyer, J. R. Thornton, L. D. Wren, Octec Ltd. (United Kingdom) [6226-13]

2:00 pm: **Synthetic vision to augment sensor-based vision for remotely piloted vehicle and payload control**, E. Theunissen, J. Koeners, Technische Univ. Delft (Netherlands); J. Tadema, Koninklijk Instituut voor de Marine (Netherlands) [6226-14]

2:20 pm: **Simulation assessment of synthetic vision system concepts for UAV operations**, M. H. Draper, G. L. Calhoun, Air Force Research Lab.; H. Ruff, General Dynamics Corp.; J. Nelson, A. Lefebvre, Air Force Research Lab. [6226-15]

2:40 pm: **Situation awareness for teams of dismounted warfighters and unmanned vehicles**, M. A. Livingston, S. J. Julier, D. Brown, Naval Research Lab. [6226-16]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Destin 1-2 Mon. 3:30 to 6:30 pm

Chairs: **Michael C. Lightfoot**, NASA Langley Research Ctr.;
Peter Hecker, DLR (Germany);
Jacques G. Verly, Univ. de Liège (Belgium)

3:30 pm: **Crew and display concepts evaluation for synthetic/enhanced vision systems**, R. E. Bailey, L. J. Kramer, NASA Langley Research Ctr. [6226-25]

3:50 pm: **Adaptive synthetic vision**, S. J. Julier, ITT Industries - AES Division and Naval Research Lab.; B. MacIntyre, Georgia Institute of Technology; J. Thomas, Reallaer, LLC [6226-17]

4:10 pm: **Synthetic vision enhanced surface operations and flight procedure rehearsal**, J. J. Arthur III, L. J. Prinzel III, S. P. Williams, NASA Langley Research Ctr. [6226-18]

4:30 pm: **A fresh look at runway incursions: onboard surface movement alerting system based on SVS**, C. Vernaleken, L. Mihalic, U. Klingauf, Technische Univ. Darmstadt (Germany) [6226-19]

4:50 pm: **Flight tests of a hybrid-centered integrated 3D perspective view primary flight display**, G. He, T. Feyereisen, B. Wilson, S. Wyatt, J. Engels, Honeywell International, Inc. [6226-20]

5:10 pm: **Flare cue symbology and EVS for zero-zero landings**, G. A. French, Air Force Research Lab.; D. M. Murphy, W. R. Ercoline, General Dynamics Corp. [6226-21]

5:30 pm: **Imaging sensor fusion and enhanced vision for helicopter landing operations**, M. Hebel, K. Bers, K. M. Jäger, FGAN-FOM (Germany) ... [6226-22]

5:50 pm: **Synthetic vision for rotorcraft: the altitude and ground track predicting flight path marker**, Z. P. Szoboszlai, NASA Ames Research Ctr. [6226-23]

6:10 pm: **Out the window scene characteristics required for PC-based helicopter flight simulators**, Y. C. Yardimci, C. Karaahmetoglu, E. Yilmaz, Middle East Technical Univ. (Turkey) [6226-10]

Tuesday 18 April

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Psychometric correlates of the effects of image-enhancing algorithms on visual performance**, G. A. Reis, A. R. Pinkus, K. E. Neriani, Air Force Research Lab. [6226-24]
- ✓ **Investigating the benefits of 'scene linking' for a pathway HMD: from laboratory flight experiments to flight tests**, S. Schmerwitz, H. H. Többen, B. Lorenz, DLR (Germany); A. Kuritz-Kaiser, Technische Univ. Berlin (Germany); T. Iijima, Japan Aerospace Exploration Agency (Japan) [6226-26]
- ✓ **Infrared based enhanced flight vision sensor development**, G. Connor, Opgal Ltd. (Israel) [6226-27]

Related Courses

SC159 **Head-Mounted Displays: Design and Applications Including Night Vision** (Melzer,Browne) Wednesday 8:30 am to 5:30 pm

See SPIE Cashier to Register.



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Enabling Technologies for Simulation Science X

Conference Chair: Dawn A. Trevisani, Air Force Research Lab.

Program Committee: Timothy E. Busch, Air Force Research Lab.; Steven C. Gordon, Georgia Tech Research Institute; Robert M. McGraw, RAM Labs.; William K. McQuay, Air Force Research Lab.

Monday 17 April

Welcome Remarks

Room: Tampa 3 Mon. 1:00 to 1:10 pm

Chair: Alex F. Sisti, Air Force Research Lab.

SESSION 1

Room: Tampa 3 Mon. 1:10 to 2:10 pm

Technologies for Training

Chair: Alex F. Sisti, Air Force Research Lab.

1:10 pm: **Using GPU-generated virtual video stream for multisensor system training**, D. Liao, Univ. of Central Florida; B. Hennessey, Adacel Systems, Inc. [6227-01]

1:30 pm: **Increasing combat realism: the effectiveness of stun belt use on soldiers for the enhancement of live training and testing exercises**, B. C. Schricker, AT&T Government Solutions, Inc.; C. Antalek, General Dynamics Corp. [6227-02]

1:50 pm: **Tag-n-Track system for situation awareness for MOUTs**, R. Kumar, M. Aggarwal, Sarnoff Corp. [6227-03]

SESSION 2

Room: Tampa 3 Mon. 2:10 to 5:00 pm

M&S Frameworks and Architectures

Chair: Robert M. McGraw, RAM Labs.

2:10 pm: **A framework for adaptive modeling and ontology-driven simulation (FAMOS)**, P. C. Benjamin, M. H. Graul, Knowledge Based Systems, Inc. [6227-04]

2:30 pm: **A framework for modeling and simulation at multiple levels of abstraction**, P. C. Benjamin, M. Erraguntla, M. H. Graul, Knowledge Based Systems, Inc. [6227-05]

2:50 pm: **Integrating architecture and simulation tools for modeling and evaluating combat missions**, J. Woodring, Expand Inc. [6227-06]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Security simulation for vulnerability assessment**, B. Hennessey, R. B. Wesson, Adacel Systems Inc.; L. A. Cano, Sandia National Labs. . [6227-07]

4:00 pm: **Transitioning the DSAP infrastructure to a web-service environment**, R. M. McGraw, C. N. Lammers, RAM Labs. [6227-08]

4:20 pm: **Effectiveness measurements and state-estimation for DSAP**, R. M. McGraw, C. N. Lammers, RAM Labs.; D. A. Trevisani, Air Force Research Lab. [6227-09]

4:40 pm: **Polymorphic collaboration in the global grid**, W. K. McQuay, Air Force Research Lab. [6227-10]

Tuesday 18 April

SESSION 3

Room: Tampa 3 Tues. 8:10 to 9:10 am

M&S S&T Requirements

Chair: Steven C. Gordon, Georgia Tech Research Institute

8:10 am: **High-priority areas for army battle command (BC)-related modeling and simulation (M&S) science and technology (S&T)**, W. S. Murphy, Jr., Alion Science and Technology Corp.; J. Foreman, U. S. Army; D. S. Hartley III, Hartley Consulting; A. A. Sciarretta, CNS Technologies, Inc.; S. H. Starr, Barcroft Research Institute [6227-11]

8:30 am: **Metrics to access command, control, and communications (C3) performance within a network-centric warfare simulation**, S. B. Banks, Calculated Insight; M. R. Stytyz, Institute for Defense Analyses [6227-12]

8:50 am: **Federated executable architecture technology as an enabling technology for simulation of large systems**, G. A. Harrison, Lockheed Martin Corp.; A. Herrigel, Up-Great AG (Switzerland); R. Hutt, U.S. Air Force; H. S. Kern, Lockheed Martin Information Technologies; S. Saidi, C. A. Young, Lockheed Martin Simulation, Training & Support [6227-13]

SESSION 4

Room: Tampa 3 Tues. 9:10 to 10:10 am

High-Level Decision Making: Issues and Answers

Keynote Presentation

9:10 am: **Theory and methods for supporting high-level decision making (Invited Paper)**, P. K. Davis, Rand Corp. [6227-14]

Coffee Break 10:10 to 10:40 am

SESSION 5

Room: Tampa 3 Tues. 10:40 am to 12:05 pm

Tools and Techniques for Societal and Human Behavior Modeling

Chair: Paul K. Davis, Rand Corp.

10:40 am: **Multiresolution qualitative system modeling for counter terrorism**, P. K. Davis, Rand Corp. [6227-15]

11:00 am: **An agent-based simulated force generator with an adaptive command structure**, J. Hanes, Applied Research Associates, Inc. [6227-16]

11:20 am: **Using GOMS and Bayesian plan recognition to develop recognition models of operator behavior**, J. D. Zaiantz, E. A. M. DeKoven, N. Piedgon, Soar Technology, Inc.; M. J. Huber, Intelligent Reasoning Systems, Inc. [6227-18]

11:40 am: **Structuring analysis to support effects-based operations**, P. K. Davis, Rand Corp. [6227-24]

Lunch/Exhibition Break 12:05 to 1:30 pm

SESSION 6

Room: Tampa 3 Tues. 1:30 to 3:10 pm

Dealing with System Complexity

Chair: Michael L. Talbert, Air Force Research Lab.

1:30 pm: **Visual unified modeling language for the composition of scenarios in modeling and simulation systems**, M. L. Talbert, Air Force Research Lab.; D. E. Swayne, Air Force Institute of Technology [6227-19]

1:50 pm: **Data modeling predictive control theory for deriving hyper-real-time war game models from real-time models**, H. M. Jaenisch, dtech Systems Inc.; M. Barnett, Computer Sciences Corp.; J. W. Handley, SPARTA, Inc.; D. A. Grover, Washington Square Associates, Inc. [6227-20]

2:10 pm: **Verifying end-to-end system performance with a transformational information extraction model**, A. W. Mauck, G. Roszyk, G. Fuller, Booz Allen Hamilton Inc. [6227-21]

2:30 pm: **Migrating modeling and simulation applications on to high-performance computers**, M. D. Barnell, B. J. Rahn, Air Force Research Lab. [6227-22]

2:50 pm: **Accelerated modeling and simulation with a desktop supercomputer**, E. J. Kelmelis, J. R. Humphrey, J. Durbano, F. Ortiz, EM Photonics, Inc. [6227-23]

Coffee Break 3:10 to 3:40 pm

Modeling and Simulation for Military Applications

Conference Chair: **Kevin Schum**, Air Force Research Lab.

Cochair: **Alex F. Sisti**, Air Force Research Lab.

Program Committee: **Misty Blowers**, Air Force Research Lab.; **Christina M. Doolittle**, Air Force Research Lab.; **David J. Gorsich**, U.S. Army Tank-automotive and Armament Command; **Michael D. Letherwood**, U.S. Army Tank-automotive and Armaments Command; **Dawn A. Trevisani**, Air Force Research Lab.; **Jingzhou Yang**, The Univ. of Iowa

Tuesday 18 April

SESSION 1

Room: Tampa 3 Tues. 3:40 to 4:55 pm

Satellite/Space Systems Modeling

Chair: **Bruce Preiss**, Air Force Research Lab.

3:40 pm: **AFRL space technology planning: strategic investment model analysis for warfighter capabilities**, B. Preiss, L. Greene, J. Kriebel, Air Force Research Lab.; A. R. Wasson, B. R. Wilkinson, Toffler Associates [6228-01]

4:05 pm: **Modeling, simulation, and analysis of satellite communications in nuclear disturbed environments with OPNET**, M. A. Johnson, The Aerospace Corp. [6228-03]

4:30 pm: **Modeling and simulation of satellite subsystems for end-to-end spacecraft modeling**, K. Schum, C. M. Doolittle, G. Boyarko, Air Force Research Lab. [6228-04]

Wednesday 19 April

SESSION 2

Room: Tampa 3 Wed. 8:10 to 10:10 am

Ground Vehicle Technologies

Chair: **David J. Gorsich**,
U.S. Army Tank-automotive and Armaments Command

8:10 am: **Development of a terrain severity measurement system utilizing optical lasers**, N. Dembski, G. Rizzoni, A. A. Soliman, The Ohio State Univ. [6228-05]

8:30 am: **Preliminary results using Markov chain characterizations of 2D topographic mappings of roads**, J. B. Ferris, J. V. Kern, Virginia Polytechnic Institute and State Univ. [6228-06]

8:50 am: **Reconstructing 3D CAD models for simulation using imaging-based reverse engineering**, D. L. Page, A. F. Koschan, M. A. Abidi, The Univ. of Tennessee [6228-07]

9:10 am: **Automated proper modeling: theoretical developments and applications in ground vehicle modeling and simulation**, L. S. Louca, Univ. of Cyprus (Cyprus); J. L. Stein, H. K. Fathy, Univ. of Michigan [6228-08]

9:30 am: **Developing a scalable modeling architecture for studying survivability technologies**, S. Mohammad, P. Bounker, U.S. Army RDEC/TARDEC [6228-09]

9:50 am: **A clothing modeling framework for uniform and armor system design**, X. Man, C. C. Swan, S. Rahmatalla, The Univ. of Iowa [6228-10]
Coffee Break 10:10 to 10:40 am

SESSION 3

Room: Tampa 3 Wed. 10:40 am to 12:00 pm

Advanced Power Trains

Chair: **Mehdi Ahmadian**, Virginia Polytechnic Institute and State Univ.

10:40 am: **Evaluation of logistic and economic impacts of hybrid vehicle propulsion/microgrid concepts: demonstration of LOCSS applied to HE HMMMV in future unit of action**, M. Farrell, L. Tiberi, J. W. Burns, Altarum Institute; T. B. Udvardy, U.S. Army Tank-automotive and Armaments Command [6228-11]

11:00 am: **Supervisory control of hybrid electric vehicles**, H. Peng, Univ. of Michigan [6228-12]

11:20 am: **Evaluation of powertrain solutions for future tactical truck system vehicles**, P. Pisu, C. Cantemir, N. Dembski, C. Hubert, G. Rizzoni, L. Serrao, A. A. Soliman, J. Li, The Ohio State Univ.; M. Carroll, Aetion Technologies, LLC; J. R. Josephson, Aetion Technologies, LLC and The Ohio State Univ.; J. Russell, Aetion Technologies, LLC [6228-13]

11:40 am: **Integrating high-fidelity simulations and real hardware for design and evaluation of advanced powertrains**, Z. Filipi, H. K. Fathy, J. L. Stein, Univ. of Michigan [6228-14]

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 4

Room: Tampa 3 Wed. 1:30 to 2:50 pm

Reliability/Uncertainty

Chair: **Zach Rowland**, Mississippi State Univ.

1:30 pm: **Model building for simulation and testing under uncertain conditions**, B. Grinstead, A. F. Koschan, D. L. Page, M. A. Abidi, The Univ. of Tennessee [6228-15]

1:50 pm: **Fleet management using system reliability prediction**, A. Dey, R. Tryon, L. Nasser, VEXTEC [6228-16]

2:10 pm: **Modeling 3D damage progression of laser deposited materials**, P. T. Wang, Mississippi State Univ. [6228-17]

2:30 pm: **Optimization technology in design: trends, direction, gaps**, U. Schramm, M. Arold, Altair Engineering, Inc. [6228-18]

Coffee Break 3:00 to 3:20 pm

SESSION 5

Room: Tampa 3 Wed. 3:20 to 5:20 pm

Applications

Chair: **Teik C. Lim**, Univ. of Cincinnati

3:20 pm: **Analytical modeling and simulation of an AUV with five control surfaces**, J. Tomasi, K. Ro, Western Michigan Univ. [6228-19]

3:40 pm: **Multibody dynamic simulation of military vehicles for stability, safety, mobility, and load prediction**, D. R. Kading, LMS International. [6228-20]

4:00 pm: **Flight dynamic investigations of flying wing with winglet-configured unmanned aerial vehicle**, K. Ro, Western Michigan Univ. [6228-21]

4:20 pm: **SimUGV: a general purpose simulator for analyzing energy dynamics and locomotion for unmanned ground vehicle (UGV)**, A. K. Sinha, PercepTek, Inc.; J. Vashishtha, Colorado School of Mines [6228-22]

4:40 pm: **Interaction force-field modeling of mini-UAV swarm**, W. Liou, K. Ro, Western Michigan Univ.; H. H. Szu, George Washington Univ. [6228-23]

5:00 pm: **Vehicle-network development on a communications-network test bed**, J. L. Rapanotti, Defence R&D Canada/Valcartier (Canada) [6228-24]

Thursday 20 April

SESSION 6

Room: Tampa 3 Thurs. 8:30 to 9:30 am

Evolutionary Computation Theory

Chair: Misty Blowers, Air Force Research Lab.

Keynote Presentation

8:30 am: **Foundations of evolutionary computation** (*Invited Paper*), D. B. Fogel, Natural Selection, Inc. [6228-25]

SESSION 7

Room: Tampa 3 Thurs. 9:30 am to 12:25 pm

Evolutionary Computation for Improved Machine Learning

Chair: Misty Blowers, Air Force Research Lab.

9:30 am: **Genetic learning classifier systems: fundamentals and recent advances** (*Invited Paper*), J. C. Oh, Syracuse Univ. [6228-26]

9:55 am: **Evolutionary algorithms for training neural networks** (*Invited Paper*), C. K. Mohan, Syracuse Univ. [6228-27]

Coffee Break 10:20 to 10:50 am

10:50 am: **Developing a robust integrated learning system** (*Invited Paper*), R. E. Smith, RESystems Consulting; B. Ravichandran, A. Gandhe, R. K. Mehra, Scientific Systems Co., Inc. [6228-28]

11:15 am: **Adaptation of a multiresolution adversarial model for asymmetric warfare** (*Invited Paper*), P. G. Gonsalves, B. Rosenberg, Charles River Analytics, Inc. [6228-29]

11:40 am: **Evolved multiresolution analysis transforms for improved image compression and reconstruction under quantization** (*Invited Paper*), F. W. Moore, Univ. of Alaska Anchorage [6228-30]

12:05 pm: **Multidisciplinary design optimization through use of stochastic mutation algorithm**, S. M. Hong, Air Force Research Lab.; G. A. Thiele, Univ. of Dayton [6228-49]

Lunch/Exhibition Break 12:25 to 1:15 pm

SESSION 8

Room: Tampa 3 Thurs. 1:15 to 3:20 pm

Evolutionary Computation for System Assessment and Exploitation

Chair: Juan R. Vasquez, Air Force Institute of Technology

1:15 pm: **Bio-inspired odor-based navigation** (*Invited Paper*), J. R. Vasquez, Air Force Institute of Technology; M. J. Porter III, Consultant [6228-31]

1:40 pm: **Genetic design and optimization of military antennas** (*Invited Paper*), T. H. O'Donnell, Air Force Research Lab. and ARCON Corp.; S. Santarelli, E. Altshuler, B. Kaanta, J. McGinty, Air Force Research Lab. [6228-32]

2:05 pm: **Application of genetic algorithm to steganalysis** (*Invited Paper*), J. A. Marsh, T. Knapik, E. Lo, SI International [6228-33]

2:30 pm: **Open-set speaker identification with classifier systems** (*Invited Paper*), J. C. Oh, Syracuse Univ.; M. Blowers, Air Force Research Lab. [6228-34]

2:55 pm: **ECM techniques generator** (*Invited Paper*), P. Marshall, Air Force Research Lab. [6228-35]

Coffee Break 3:20 to 3:50 pm

SESSION 9

Room: Tampa 3 Thurs. 3:50 to 5:05 pm

Evolutionary Computation for Battlefield Dynamics

Chair: Sushil J. Louis, Univ. of Nevada/Reno

3:50 pm: **Learning to play like a human: case injected genetic algorithms for strategic computer gaming** (*Invited Paper*), S. J. Louis, C. Miles, Univ. of Nevada/Reno [6228-36]

4:15 pm: **Course of action for effects-based operations using evolutionary algorithms**, A. H. Levis, S. Haider, George Mason Univ. [6228-37]

4:40 pm: **Modeling military information operations with multi-agent complex adaptive system techniques**, C. J. Willers, Council for Scientific and Industrial Research (South Africa) [6228-39]

Friday 21 April

SESSION 10

Room: Tampa 3 Fri. 8:30 to 10:10 am

M&S for Design and Analysis

Chair: Kevin Schum, Air Force Research Lab.

8:30 am: **Calculation of IR signatures from airborne vehicles**, M. Johansson, M. Dalenbring, Swedish Defence Research Agency (Sweden) [6228-40]

8:50 am: **The simulation of laser-based guided weapon engagements**, M. Al Jaber, M. A. Richardson, Cranfield Univ. (United Kingdom) [6228-41]

9:10 am: **Spectral reflectance and thermal capacitance effects on the accuracy of real-time infrared signature modeling**, P. L. Rynes, D. M. Less, S. Kangas, ThermoAnalytics, Inc. [6228-42]

9:30 am: **Development and integration of the Army's advanced multispectral simulation test acceptance resource (AMSTAR) HWIL facilities**, J. W. Morris, U.S. Army Aviation and Missile Command; W. M. Lowry, U.S. Army Redstone Technical Test Ctr. [6228-43]

9:50 am: **Adoption, impact, and vision of model-based design**, B. M. Tannenbaum, D. B. Jackson, The MathWorks, Inc. [6228-44]

Coffee Break 10:10 to 10:40 am

SESSION 11

Room: Tampa 3 Fri. 10:40 to 11:55 am

M&S for Technology Assessment

Chair: Kevin Schum, Air Force Research Lab.

10:40 am: **Simulation-based planning for peacekeeping operations: selection of robust plans**, C. M. Cekova, B. Chandrasekaran, J. Josephson, A. V. Pantaleev, The Ohio State Univ. [6228-45]

11:05 am: **A comprehensive simulation environment for sensor fusion**, R. E. Macior, Air Force Research Lab. and Black River Systems Co.; S. M. Walter, S. A. Scott, Air Force Research Lab.; M. P. Kozak, M. P. Blount, S. M. Mercurio, Black River Systems Co. [6228-47]

11:30 am: **Scenario management and automated scenario generation (SGen)**, W. E. McKeever, Jr., Air Force Research Lab.; D. A. Gilmour, Air Force Research Lab.; L. A. Lehman, A. Stirtzinger, Securborator [6228-48]

Wrap Up and Discussion

Room: Tampa 3 Fri. 12:20 to 12:30 pm

Chair: Kevin Schum, Air Force Research Lab.

Related Courses

SC783 **How to Validate Your Models and Simulations (Law)** Tuesday 1:30 pm to 5:30 pm

See SPIE Cashier to Register.

Intelligent Computing: Theory and Applications IV

Conference Chairs: **Kevin L. Priddy**, Air Force Research Lab.; **Emre Ertin**, The Ohio State Univ.

Program Committee: **Gianfranco Basti**, Pontificia Univ. Lateranense (Italy); **Krzysztof J. Cios**, Univ. of Colorado/Denver and Health Sciences Ctr.; **David B. Fogel**, Natural Selection, Inc.; **Charles W. Glover**, Oak Ridge National Lab.; **Amy L. Magnus**, Air Force Office of Scientific Research; **Anke Meyer-Bäse**, Florida State Univ.; **Mark E. Oxley**, Air Force Institute of Technology; **Antonio L. Perrone**, Pontificia Univ. Lateranense (Italy); **Eugene Santos, Jr.**, Univ. of Connecticut; **Robert L. Williams**, Air Force Research Lab.

Monday 17 April

Opening Remarks

Room: Daytona 1-2 Mon. 8:30 to 8:40 am

Chair: **Kevin L. Priddy**, Air Force Research Lab.

SESSION 1

Room: Daytona 1-2 Mon. 8:40 to 11:30 am

Information Processing

Chair: **Kevin L. Priddy**, Air Force Research Lab.

8:40 am: **Information retrieval in highly dynamic search spaces** (*Invited Paper*), E. Santos, Jr., Dartmouth College; E. E. Santos, Virginia Polytechnic Institute and State Univ.; H. Nguyen, Univ. of Wisconsin/Whitewater; L. Pan, J. Korah, Virginia Polytechnic Institute and State Univ.; Q. Zhao, Dartmouth College; M. Pittkin, Virginia Polytechnic Institute and State Univ. [6229-01]

9:10 am: **Information forensics and the art of inquiry** (*Invited Paper*), M. E. Oxley, Air Force Institute of Technology; A. L. Magnus, Air Force Office of Scientific Research [6229-02]

9:40 am: **PEGASUS: an information mining system for TV news videos**, Y. Zhai, J. Liu, M. A. Shah, Univ. of Central Florida [6229-03]

Coffee Break 10:00 to 10:30 am

10:30 am: **Computer-assisted threat evaluation**, J. Bains, L. Davies, Channel Logistics, LLC [6229-04]

10:50 am: **Quantitative fuzzy cognitive maps for data integration**, K. A. Perusich, Purdue Univ. [6229-05]

11:10 am: **Agent-based reasoning for distributed multi-INT analysis**, M. E. Inghiosa, M. T. Parker, NuTech Solutions, Inc. [6229-06]

Lunch Break 11:30 am to 1:00 pm

SESSION 2

Room: Daytona 1-2 Mon. 1:00 to 2:30 pm

Networking Applications

Chair: **William S. Hortos**, Associates in Communication Engineering Research and Technology

1:00 pm: **Intelligent self-organization methods for wireless ad hoc sensor networks based on limited resources** (*Invited Paper*), W. S. Hortos, Associates in Communication Engineering Research and Technology [6229-07]

1:30 pm: **Cellular neuron and large wireless neural network**, T. P. Jansson, T. Forrester, Physical Optics Corp.; B. E. Ambrose, M. I. Kazantzidis, F. S. Lin, Broaddata Communications, Inc. [6229-08]

1:50 pm: **Self organization in wireless sensor networks through distributed optimization**, E. Ertin, The Ohio State Univ. [6229-09]

2:10 pm: **Secure architecture for extensible mobile internet transport systems**, L. J. Hash, P. W. Fitzgibbons, D. Das, State Univ. of New York/Institute of Technology [6229-31]

SESSION 3

Room: Daytona 1-2 Mon. 2:30 to 3:30 pm

Applications

Chair: **Todd V. Rovito**, Air Force Research Lab.

2:30 pm: **Model-based face recognition from UAV**, T. V. Rovito, D. A. Uppenkamp, Air Force Research Lab. [6229-10]

2:50 pm: **Evolving color constancy algorithms for improved target recognition**, D. E. Courte, Univ. of Dayton; L. A. Tamburino, M. M. Rizki, Wright State Univ. [6229-11]

3:10 pm: **Soft computing-based terrain visual sensing and data fusion for unmanned ground robotic systems** (*Invited Paper*), A. H. Shirkhodaie, Tennessee State Univ. [6229-12]

Coffee Break 3:30 to 3:50 pm

SESSION 4

Room: Daytona 1-2 Mon. 3:50 to 5:40 pm

Optimization

Chair: **Emre Ertin**, The Ohio State Univ.

3:50 pm: **Cortically plausible inverse problem method applied to complex perceptual and planning tasks** (*Invited Paper*), D. W. Arathorn, General Intelligence Corp. [6229-13]

4:20 pm: **A multi-agent approach for a self-reconfigurable electronic power distribution system**, J. Gómez-Gualdrón, M. Vélez-Reyes, Univ. de Puerto Rico Mayagüez [6229-14]

4:40 pm: **Investigating effects of communications modulation technique on targeting performance**, E. P. Blasch, G. Eusebio, E. Huling, Air Force Research Lab. [6229-16]

5:00 pm: **Terrain discovery and navigation of a multi-articulated linear robot using map-seeking circuits**, R. K. Snider, Snider Technology, Inc.; D. W. Arathorn, General Intelligence Corp. [6229-17]

5:20 pm: **A market-based optimization approach to sensor and resource management**, D. Schrage, C. Farnham, P. G. Gonsalves, Charles River Analytics, Inc. [6229-18]

Tuesday 18 April

SESSION 5

Room: Daytona 1-2 Tues. 9:00 to 10:20 am

Image Processing

Chair: Anke Meyer-Bäse, Florida State Univ.

9:00 am: **Compression-designs for the signal coding of SAR images used as prior knowledge**, J. R. Guerci, DARPA; E. H. Fera, College of Staten Island/CUNY [6229-19]

9:20 am: **Visualization of suspicious lesions in breast MRI based on supervised and unsupervised artificial neural networks**, A. Meyer-Bäse, Florida State Univ. [6229-20]

9:40 am: **Fusion of multifocus images to maximize image information**, A. A. Goshtasby, Wright State Univ. [6229-21]

10:00 am: **Content-based 3D mosaics for dynamic urban scenes**, Z. Zhu, H. Tang, G. Wolberg, City College/CUNY; J. R. Layne, Air Force Research Lab. [6229-22]

Coffee Break 10:20 to 10:50 am

SESSION 6

Room: Daytona 1-2 Tues. 10:50 am to 12:10 pm

Tracking Applications I

Chair: Lang Hong, Wright State Univ.

10:50 am: **Active vision through invariant representations and saccade movements**, J. A. Starzyk, Y. Li, H. He, Ohio Univ. [6229-23]

11:10 am: **Adaptive particle filtering**, M. R. Stevens, N. Checka, M. S. Snorrason, Charles River Analytics, Inc. [6229-24]

11:30 am: **Feature-aided multiple target tracking in the image plane**, A. P. Brown, K. J. Sullivan, Toyon Research Corp.; D. J. Miller, The Pennsylvania State Univ. [6229-25]

11:50 am: **Modeling and resolving tracking ambiguities using features for long-term tracking**, C. S. Agate, C. Ahn, Toyon Research Corp. [6229-26]

Lunch/Exhibition Break 12:10 to 1:30 pm

SESSION 7

Room: Daytona 1-2 Tues. 1:30 to 2:10 pm

Tracking Applications II

Chair: Lang Hong, Wright State Univ.

1:30 pm: **Efficient multirate interacting multiple model particle filter for target tracking**, L. Hong, Wright State Univ.; M. Bakich, J. R. Layne, Air Force Research Lab. [6229-27]

1:50 pm: **Terrain following flight in unmanned intelligent systems**, M. Rahim, M. B. Malaek, Sharif Univ. of Technology (Iran) [6229-28]

SESSION 8

Room: Daytona 1-2 Tues. 2:10 to 2:50 pm

Theory

Chair: Kevin L. Priddy, Air Force Research Lab.

2:10 pm: **Data model predictive control as a new mathematical frame work for simulation VV&A**, H. M. Jaenisch, dtech Systems Inc.; J. W. Handley, SPARTA, Inc.; M. Barnett, Computer Sciences Corp.; D. A. Grover, Washington Square Associates, Inc. [6229-29]

2:30 pm: **Dynamical aspects of unsupervised competitive neural networks**, A. Meyer-Bäse, Florida State Univ. [6229-30]

Coffee Break 2:50 to 3:30 pm

Panel Discussion

Room: Daytona 1-2 Tues. 3:30 to 5:00 pm

The Role of Computational Intelligence in the Discovery Process?

Chair: Kevin L. Priddy, Air Force Research Lab.



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Unmanned Systems Technology VIII

Conference Chairs: **Grant R. Gerhart**, U.S. Army TARDEC/RDECOM; **Charles M. Shoemaker**, Army Research Lab.; **Douglas W. Gage**, XPM Technologies

Program Committee: **James S. Albus**, National Institute of Standards and Technology; **John G. Blitch**, Blitz Solutions Inc.; **Johann Borenstein**, Univ. of Michigan; **Jonathan A. Bornstein**, Army Research Lab.; **Bruce E. Brendle, Jr.**, U.S. Army TARDEC/RDECOM; **Bruce L. Digney**, Defence R&D Canada/Suffield (Canada); **Rajiv V. Dubey**, Univ. of South Florida; **Philip J. Emmerman**, ElanTech, Inc.; **Bart Everett**, Space and Naval Warfare Systems Ctr., San Diego; **Scott Fish**, Science Applications International Corp.; **David J. Gorsich**, U.S. Army TARDEC/RDECOM; **Helen Greiner**, iRobot Corp.; **Eugene C. Hudson**, Office of the Secretary of Defense; **Karl D. Iagnemma**, Massachusetts Institute of Technology; **Lawrence D. Jackel**, DARPA; **Clinton W. Kelly III**, Science Applications International Corp.; **Gene A. Klager**, U.S. Army Night Vision & Electronic Sensors Directorate; **Andreas F. Koschan**, The Univ. of Tennessee; **Larry H. Matthies**, Jet Propulsion Lab.; **Elena R. Messina**, National Institute of Standards and Technology; **Kevin L. Moore**, Johns Hopkins Univ.; **Robin R. Murphy**, Univ. of South Florida; **Hoa G. Nguyen**, Space and Naval Warfare Systems Ctr., San Diego; **James L. Overholt**, U.S. Army TARDEC/RDECOM; **Marc Raibert**, Boston Dynamics; **Klaus-Juergen Schilling**, Julius-Maximilians Univ. Würzburg (Germany); **Nahid N. Sidki**, Science Applications International Corp.; **Harpreet Singh**, Wayne State Univ.; **Magnús S. Snorrason**, Charles River Analytics, Inc.; **Anthony Stentz**, Carnegie Mellon Univ.; **David L. Stone**, Mechatron Consulting; **Morley O. Stone**, DARPA; **Mel Torre**, Autonomous Solutions Inc.; **Brian H. Wilcox**, Jet Propulsion Lab.; **Robert M. Wilcox**, Titan Corp.; **Gary Witus**, Turing Associates, Inc.

Monday 17 April

SESSION 1

Room: Miami 2-3 Mon. 1:00 to 2:30 pm

Perception I

Chair: **Magnús S. Snorrason**, Charles River Analytics, Inc.

1:00 pm: **Historical perspective on perception for UGVs (Invited Paper)**, C. W. Kelly III, Science Applications International Corp. [6230-01]

1:30 pm: **Object detection with single-camera stereo**, M. S. Snorrason, J. C. McBride, N. Checka, A. Reiter, G. Foil, M. R. Stevens, Charles River Analytics, Inc. [6230-02]

1:50 pm: **System trade analysis for an ultra-wideband forward imaging radar**, L. H. Nguyen, Army Research Lab.; M. Soumekh, Univ. at Buffalo [6230-04]

2:10 pm: **Systems engineering for a vehicle inspection robot to detect explosive's trace vapor**, G. Witus, Turing Associates, Inc.; A. K. Pandya, Wayne State Univ.; W. J. Smuda, H. J. Andrusz, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. [6230-05]

SESSION 2

Room: Miami 2-3 Mon. 2:30 to 4:40 pm

Perception II

Chair: **Andreas F. Koschan**, The Univ. of Tennessee

2:30 pm: **Vision-based terrain learning**, R. E. Karlsen, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.; G. Witus, Turing Associates, Inc. [6230-07]

2:50 pm: **Modular robotics and intelligent imaging for unmanned systems**, D. L. Page, A. F. Koschan, M. A. Abidi, The Univ. of Tennessee [6230-08]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Autonomous navigation and obstacle avoidance for unmanned surface vehicles**, M. H. Bruch, Space and Naval Warfare Systems Ctr., San Diego [6230-09]

4:00 pm: **Multisensor integration for unmanned terrain modeling**, S. R. Sukumar, S. Yu, D. L. Page, A. F. Koschan, M. A. Abidi, The Univ. of Tennessee [6230-11]

4:20 pm: **A volumetric sensor for real-time 3D mapping and robot navigation**, B. Ricard, Defence Research and Development Canada (Canada); J. Fournier, Univ. Laval (Canada) [6230-12]

Tuesday 18 April

SESSION 3

Room: Miami 2-3 Tues. 8:00 to 10:00 am

Human Robot Interface

Chair: **Gary Witus**, Turing Associates, Inc.

8:00 am: **Human-robotic interface for controlling an armed unmanned ground vehicle**, K. Massey, Chatten Associates, Inc. [6230-13]

8:20 am: **Supporting delegation of autonomy in human-robot teams**, E. A. M. DeKoven, J. D. Zaiantz, A. K. G. Murphy, Soar Technology, Inc. [6230-14]

8:40 am: **A deontic implementation of adjustable autonomy for command and control of robotic assets**, S. A. Lisse, J. T. Beard, Soar Technology, Inc.; M. J. Huber, Intelligent Reasoning Systems, Inc.; G. Morgan, J. Crossman, E. A. M. DeKoven, Soar Technology, Inc. [6230-15]

9:00 am: **Current challenges in autonomous vehicle development**, J. Connelly, W. S. Hong, R. B. Mahoney, Jr., D. A. Sparrow, Institute for Defense Analyses [6230-16]

9:20 am: **Human-robot coordination using scripts**, L. E. Barnes, R. R. Murphy, J. D. Craighead, Univ. of South Florida [6230-17]

9:40 am: **An improved control system for a remotely operated vessel**, R. A. Bachnak, Texas A&M Univ. [6230-18]

Coffee Break 10:00 to 10:30 am

SESSION 4

Room: Miami 2-3 Tues. 10:30 am to 12:30 pm

Unmanned Vehicle Research at DDRC

Chair: **Bruce L. Digney**, Defence Research and Development Canada (Canada)

10:30 am: **The ALS Project: lessons learned**, S. P. Monckton, G. S. Broten, J. A. Collier, J. L. Giesbrecht, Defence Research and Development Canada (Canada) [6230-19]

10:50 am: **Architecture for autonomy**, G. S. Broten, S. P. Monckton, J. L. Giesbrecht, J. A. Collier, Defence Research and Development Canada (Canada) [6230-20]

11:10 am: **Intelligent mobility research for robotic locomotion in complex terrain**, M. Trentini, B. H. Beckman, I. Vincent, B. L. Digney, Defence Research and Development Canada (Canada) [6230-21]

11:30 am: **UAV autonomy for complex environments**, M. Lauzon, B. L. Digney, Defence Research and Development Canada (Canada) [6230-22]

11:50 am: **Coordination of unmanned aerial systems for maritime surveillance: a synthetic environment challenge problem**, P. J. Hubbard, Defence Research and Development Canada (Canada) [6230-23]

12:10 pm: **MultiAgent Tactical Sentry (MATS) Project overview**, S. G. Penzes, Defence Research and Development Canada (Canada) [6230-24]

Lunch/Exhibition Break 12:30 to 1:30 pm

SESSION 5

Room: Miami 2-3 Tues. 1:30 to 3:10 pm

Safety, Security, and Rescue Robots

Chairs: Robin R. Murphy, Univ. of South Florida; Richard M. Voyles, Univ. of Minnesota

- 1:30 pm: **Field studies of SSR technologies through training and response activities**, R. R. Murphy, S. Stover, Univ. of South Florida and University of South Florida [6230-25]
- 1:50 pm: **Invisible joystick for gloves-on human/computer interaction**, R. M. Voyles, Univ. of Minnesota [6230-26]
- 2:10 pm: **Human-robot teams for emergency scenarios**, K. Schilling, Univ. Würzburg (Germany) [6230-27]
- 2:30 pm: **UGV shake down testing**, J. A. Kramer, R. R. Murphy, Univ. of South Florida [6230-29]
- 2:50 pm: **Dispersion and exploration algorithms for robots in unknown environments**, M. Gini, S. Damer, L. Ludwig, M. A. LaPoint, N. P. Papanikolopoulos, Univ. of Minnesota and Safety Security Rescue Research Ctr.; J. Budenske, Architecture Technology Corp.-New York and Safety Security Rescue Research Ctr. [6230-30]
- Coffee Break 3:10 to 3:30 pm

SESSION 6

Room: Miami 2-3 Tues. 3:30 to 5:10 pm

Small Robot Teams

Chairs: Philip J. Emmerman, ElanTech, Inc.; Helen Greiner, iRobot Corp.

- 3:30 pm: **Lessons learned from UAVs provide leading indicators for UGVs**, J. W. Dyer, iRobot Corp. [6230-32]
- 3:50 pm: **Robotic awareness, behavior, and visualization**, P. J. Emmerman, ElanTech, Inc. [6230-33]
- 4:10 pm: **Autonomous urban reconnaissance using man-portable UGVs**, B. M. Yamauchi, iRobot Corp. [6230-34]
- 4:30 pm: **Collaborative network range extension for small robots**, P. P. Budulas, Army Research Lab. [6230-35]
- 4:50 pm: **Autonomous maritime navigation: developing autonomy skill sets for USVs**, E. C. Hansen, U.S. Navy [6230-36]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Global path planning for unmanned ground vehicles**, T. S. Choe, Agency for Defense Development (South Korea) [6230-95]
- ✓ **Finite state modeling of mobile robot for complexity determination**, R. Ranjan, H. Singh, A. Awasthi, Wayne State Univ.; W. J. Smuda, G. R. Gerhart, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. [6230-96]
- ✓ **Immune-based intelligent control for a mobile robot**, S. Ozcelik, Texas A&M Univ.; M. R. Blackburn, Space and Naval Warfare Systems Ctr., San Diego [6230-97]
- ✓ **Development of a UGV-mounted automated UAV refueling system**, K. Mullens, M. L. Wills, A. B. Burmeister, Space and Naval Warfare Systems Ctr., San Diego; T. A. Deneviller, N. C. Stroumstos, Science Applications International Corp. [6230-98]
- ✓ **External view of the DARPA Grand Challenge**, P. A. Frederick, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. [6230-99]
- ✓ **FIRRE remote sensor station (RSS)**, J. Cruickshanks, C. W. Gardner, T. A. Kramer, R. T. Laird, Space and Naval Warfare Systems Ctr., San Diego [6230-100]
- ✓ **Trajectory generation for an on-road autonomous vehicle**, J. A. Horst, A. J. Barbera, National Institute of Standards and Technology [6230-101]
- ✓ **Energy scavenging modes from renewable sources for unmanned surface vehicles: a survey of concepts**, S. Suryanarayanan, D. A. Cartes, Florida State Univ.; R. Sidley, Custom Manufacturing & Engineering, Inc. [6230-102]
- ✓ **An active emergency stop design and protocol for unmanned vehicles**, G. L. Crum, Autonomous Solutions, Inc. [6230-103]
- ✓ **An intelligent control grip and its applications in unmanned vehicle systems**, S. Cai, L. Yan, D. Sulkowski, Ultra Electronics Measurement Systems, Inc. [6230-104]
- ✓ **SNEAKY™: a small, highly mobile, vision-enabled, IP-ready, tele-operable robot**, V. Varghese, N. Natarajan, S. Lakshmanan, M-Bots, Inc. [6230-105]
- ✓ **BigDog**, R. Playter, M. G. Buehler, M. Raibert, Boston Dynamics [6230-106]

Wednesday 19 April

Sessions 7-8 runs concurrently with Session 10

SESSION 7

Room: Miami 2-3 Wed. 8:00 to 10:00 am

Collaborative UAV/UGV Unmanned Systems

Chair: **Kathy Mullens**,

Space and Naval Warfare Systems Ctr., San Diego

8:00 am: **Collaborative engagement experiment**, K. Mullens, Space and Naval Warfare Systems Ctr., San Diego; R. L. Wade, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; B. Troyer, Science Applications International Corp.; B. K. Skibba, Air Force Research Lab.; M. D. Dunn, Science Applications International Corp. [6230-37]

8:20 am: **Integration of unmanned systems for tactical operations within hostile environments**, J. D. Lawrence, C. D. Bosco, G. A. Maddux, The Univ. of Alabama in Huntsville [6230-38]

8:40 am: **Vision-based on-board collision avoidance system for aircraft navigation**, R. Kasturi, S. Sarkar, D. B. Goldfog, Univ. of South Florida . [6230-39]

9:00 am: **Experiments teaming aerial and ground robots in autonomous counter-mine missions**, G. V. Miller, D. J. Bruemmer, S. G. Bauer, Idaho National Lab. [6230-40]

9:20 am: **Multisensor fusion for mini-UAV platforms**, N. Raksuntorn, A. Orduyilmaz, Q. Du, L. M. Bruce, V. Anantharaj, Mississippi State Univ.; S. Wright, AOSI [6230-41]

9:40 am: **Target following in unmanned aerial vehicle**, F. Rafi, Univ. of Central Florida [6230-42]

Coffee Break 10:00 to 10:20 am

SESSION 8

Room: Miami 2-3 Wed. 10:20 am to 12:20 pm

Government Programs

Chairs: **Jonathan A. Bornstein**, Army Research Lab.;

Bruce E. Brendle, Jr., U.S. Army Tank-automotive and Armaments Command

10:20 am: **Joint Service EOD Robotics Program**, K. A. Hacker, B. Brezina, C. K. DeBolt, Naval Explosive Ordnance Disposal Technology Div. [6230-43]

10:40 am: **Cohort: UxV teams in support of urban/complex operations**, B. L. Digney, Defence Research and Development Canada (Canada) . . . [6230-44]

11:00 am: **Intelligent autonomy for unmanned naval systems**, M. Steinberg, Naval Air Systems Command [6230-45]

11:20 am: **A Franco-German unmanned countermine system demonstrator**, F. Le Gusquet, V. Marion, Thales Group (France); K. Neugebauer, Bundesamt für Wehrtechnik und Beschaffung (Germany); F. Gerard, Defence Procurement Agency (France); A. Kaspari, Rheinmetall LandSysteme GmbH (Germany); D. Hembise, MBDA, Inc. (France) [6230-46]

11:40 am: **ARV robotic technologies (ART): a risk reduction effort for future unmanned systems**, J. F. Jaster, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. [6230-47]

12:00 pm: **Road sign detection and recognition**, M. O. Shneier, National Institute of Standards and Technology [6230-49]

Lunch/Exhibition Break 12:20 to 2:00 pm

SESSION 10

Room: Miami 1 Wed. 8:00 am to 12:20 pm

Joint Session with conference 6249

Self Organizing Collaborative ISR Robotic Teams I

Chair: **Ken Augustyn**, General Dynamics Advanced Information Systems; **Nahid N. Sidki**, Science Applications International Corp.

8:00 am: **Demonstrating tactical information services from coordinated UAV operations (Invited Paper)**, J. S. Bay, Air Force Research Lab. [6249-17]

8:30 am: **Cooperative operations in urban terrain**, D. C. Gross, General Dynamics Advanced Information Systems; J. Casey, Air Force Research Lab.; S. J. Rasmussen, General Dynamics Advanced Information Systems . . [6249-18]

8:50 am: **An information-based approach to decentralized multiplatform sensor management**, C. M. Kreucher, K. D. Kastella, J. W. Wegrzyn, B. Rickenbach, General Dynamics Advanced Information Systems . . . [6249-19]

9:10 am: **A tracking approach to localization and synchronization in mobile ad hoc sensor networks**, P. Bidigare, C. M. Kreucher, R. Conti, General Dynamics Advanced Information Systems [6249-20]

9:30 am: **Considering dendritic networks: a perspective approach to network-enabled information**, D. W. Prior, General Dynamics United Kingdom Ltd. (United Kingdom) [6249-21]

9:50 am: **Reliable service discovery for network-centric systems**, R. M. Bradford, G. W. Daugherty, K. Ghoshdastidar, Rockwell Collins, Inc. [6249-22]

10:10 am: **Autonomous collaborative behaviors for multi-UAV missions**, Y. Chen, M. A. Peot, J. Lee, V. Sundareswaran, T. W. Altshuler, Rockwell Scientific Co., LLC [6249-23]

Coffee Break 10:30 to 11:00 am

11:00 am: **Coordination rule design for constrained optimization using mobile sensor/actuator nodes**, K. L. Moore, Colorado School of Mines [6230-59]

11:20 am: **Smart Cruise Control: UAV sensor operator intent estimation and its application**, H. Cheng, D. Butler, R. Kumar, Sarnoff Corp. [6230-60]

11:40 am: **Using unattended sensors with unmanned vehicles**, G. T. Kogut, H. Nguyen, L. Drymon, B. Stratton, Space and Naval Warfare Systems Ctr., San Diego [6230-61]

12:00 pm: **A reconfigurable computing platform for plume detection with mobile sensor networks**, R. M. Voyles, Univ. of Minnesota and University of Minnesota; C. D'Souza, J. A. Hesch, S. I. Roumeliotis, Univ. of Minnesota [6230-62]

Lunch/Exhibition Break 12:20 to 1:30 pm

Session 9 runs concurrently with Session 11

SESSION 9

Room: Miami 2-3 **Wed. 2:00 to 5:30 pm**

Bio-Inspired and Soft Robots

*Chairs: Morley O. Stone, Air Force Research Lab.;
Marc Raibert, Boston Dynamics*

- 2:00 pm: **The RiSE climbing robot**, A. Saunders, M. G. Buehler, Boston Dynamics; R. J. Full, Univ. of California/Berkeley [6230-50]
- 2:20 pm: **Gait generation and control in a climbing hexapod robot**, A. A. Rizzi, Carnegie Mellon Univ.; R. J. Full, Univ. of California/Berkeley; D. E. Koditschek, Univ. of Pennsylvania [6230-51]
- 2:40 pm: **Foot design and integration for bioinspired climbing robots**, M. J. Spenko, M. Cutkosky, Stanford Univ.; R. S. Fearing, Univ. of California/Berkeley; K. Autumn, Lewis & Clark College [6230-52]
- 3:00 pm: **Transforming insect electromyograms into pneumatic muscle control**, R. D. Quinn, B. Rutter, R. E. Ritzmann, L. Mu, Case Western Reserve Univ. [6230-53]
- 3:20 pm: **Toward gait generation for snake robots**, H. Choset, E. Shammas, Carnegie Mellon Univ. [6230-54]
- Coffee Break 3:40 to 4:10 pm
- 4:10 pm: **Interface evaluation for soft robotic manipulators**, K. Moore, W. Rodes, M. Csencits, M. Kwoka, J. Gomer, C. C. Pagano, Clemson Univ. [6230-55]
- 4:30 pm: **City Climber: a new generation of mobile robot with wall-climbing capability**, J. Xiao, S. Ali, A. Calle, M. Elliott, W. Morris, City College/CUNY [6230-56]
- 4:50 pm: **Artificial Spider: eight-legged insect and autonomous learning of locomotion**, N. I. Alshurafa, J. Harmon, Univ. of California/Los Angeles [6230-57]
- 5:10 pm: **Design and experimental testing of the OctArm soft robot manipulator**, W. McMahan, Clemson Univ.; M. Pritts, The Pennsylvania State Univ.; B. Jones, Mississippi State Univ.; D. Dienno, The Pennsylvania State Univ.; M. Csencits, Clemson Univ.; M. D. Grissom, The Pennsylvania State Univ.; V. Chitrakaran, I. D. Walker, Clemson Univ.; C. D. Rahn, The Pennsylvania State Univ.; D. M. Dawson, Clemson Univ. [6230-58]

SESSION 11

Room: Miami 1 **Wed. 1:30 to 4:40 pm**

Joint Session with conference 6249

Self Organizing Collaborative ISR Robotic Teams II

Chair: Nahid N. Sidki, Science Applications International Corp.

- 1:30 pm: **Acoustic sensor payload for small robots**, S. H. Young, M. V. Scanlon, Army Research Lab. [6230-63]
- 1:50 pm: **Robot/sensor webs with self-regulating bandwidth**, R. R. Murphy, S. Stover, W. D. Armitage, M. A. Labrador, Safety Security Rescue Research Ctr. [6230-64]
- 2:10 pm: **Visually estimated motion of vehicle-mounted cameras with global uncertainty**, D. Nister, C. Engels, Univ. of Kentucky [6230-65]
- 2:30 pm: **A semi-autonomous unmanned ground vehicle control system**, J. D. Anderson, D. Lee, Z. Wei, J. Archibald, Brigham Young Univ. [6230-66]
- 2:50 pm: **The multi-robot operator control unit (MOCU)**, M. H. Bruch, Space and Naval Warfare Systems Ctr., San Diego [6230-67]
- Coffee Break 3:10 to 3:40 pm
- 3:40 pm: **Integration of robotic resources to FORCEnet**, C. Nguyen, H. G. Nguyen, R. Samuel, D. Carroll, Space and Naval Warfare Systems Ctr., San Diego [6230-69]
- 4:00 pm: **Multi-unmanned vehicle systems (nUxV) at Defence R&D Canada**, S. R. Verret, Defence Research and Development Canada (Canada) ... [6230-70]

Thursday 20 April

SESSION 12

Room: Miami 2-3 **Thurs. 8:00 to 11:00 am**

Standards and Architectures

Chair: Elena R. Messina, National Institute of Standards and Technology

- 8:00 am: **Future of unmanned systems interoperability**, R. L. Wade, D. G. Gehring, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; J. J. Ackley, Science Applications International Corp. . [6230-72]
- 8:20 am: **Performance analysis of critical time points for moving object prediction in dynamic environments (PRIDE)**, R. Madhavan, Z. Kootbally, C. I. Schlenoff, National Institute of Standards and Technology [6230-73]
- 8:40 am: **Consensus standards for unmanned systems: ASTM International Committees F38 and F41**, P. A. Picariello, D. A. Schultz, ASTM International [6230-74]
- 9:00 am: **USARSim/MOAST: a combined framework for the development and testing of autonomous systems**, S. B. Balakirsky, C. Scraper, National Institute of Standards and Technology [6230-75]
- 9:20 am: **Performance analysis of a new road following algorithm based on color models**, C. Tan, Massachusetts Institute of Technology; T. H. Hong, M. Foedisch, T. Chang, M. O. Shneier, National Institute of Standards and Technology [6230-76]
- 9:40 am: **Performance standards for urban search and rescue robots**, E. R. Messina, A. Jacoff, National Institute of Standards and Technology [6230-77]
- Coffee Break 10:00 to 10:20 am
- 10:20 am: **Performance analysis of unmanned vehicle positioning and obstacle mapping**, R. V. Bostelman, National Institute of Standards and Technology [6230-78]
- 10:40 am: **Vehicle 3D pose tracking using distributed aperture sensors**, T. Oskiper, Sarnoff Corp; R. Kumar, S. Samarasekera, J. R. Fields, Sarnoff Corp. [6230-79]

SESSION 13

Room: Miami 2-3 **Thurs. 11:00 am to 12:00 pm**

Joint Robotic Programs I

*Chairs: Eugene C. Hudson, Office of the Secretary of Defense;
Robert M. Wilcox, L-3 Titan Group*

- 11:00 am: **Mobile detection assessment and response system: a force protection physical security operational success**, B. P. Shoop, M. L. Johnston, U.S. Army; R. H. Goehring, J. C. Moneyhun, U. S. Army; B. K. Skibba, U. S. Air Force [6230-80]
- 11:20 am: **Low-cost EOD robot using off-the-shelf parts: performance testing results**, A. P. Czop, J. S. Murphy, T. J. Zimmerman, K. A. Hacker, Naval Explosive Ordnance Disposal Technology Div. [6230-81]
- 11:40 am: **FIRRE joint battlespace command and control system for manned and unmanned assets (JBC2S)**, R. T. Laird, T. A. Kramer, J. Cruickshanks, M. Dinh, Space and Naval Warfare Systems Ctr., San Diego [6230-82]
- Lunch/Exhibition Break 12:00 to 1:00 pm

SESSION 14

Room: Miami 2-3 **Thurs. 1:00 to 2:20 pm**

Joint Robotic Programs II

*Chairs: Eugene C. Hudson, Office of the Secretary of Defense;
Robert M. Wilcox, L-3 Titan Group*

- 1:00 pm: **Using advanced computer vision algorithms on small mobile robots**, G. T. Kogut, E. B. Pacis, G. Ahuja, B. Sights, B. Everett, Space and Naval Warfare Systems Ctr., San Diego [6230-83]
- 1:20 pm: **An adapting localization system for outdoor/indoor navigation**, E. B. Pacis, H. R. Everett, B. Sights, G. Ahuja, Space and Naval Warfare Systems Ctr., San Diego [6230-84]
- 1:40 pm: **FIRRE command and control station**, J. Cruickshanks, T. A. Kramer, R. T. Laird, K. M. Thomas, Space and Naval Warfare Systems Ctr., San Diego; J. C. Moneyhun, Product Manager Force Protection Systems [6230-85]
- 2:00 pm: **JRP-supported efforts at Space and Naval Warfare Systems Center, San Diego**, H. G. Nguyen, H. R. Everett, Space and Naval Warfare Systems Ctr., San Diego [6230-86]

SESSION 15

Room: Miami 2-3 **Thurs. 2:20 to 5:30 pm**

Intelligent Mobility

*Chairs: Kevin L. Moore, Colorado School of Mines;
David L. Stone, Mechatron Consulting*

- 2:20 pm: **A robust nonlinear skid-steering control design applied to the MULE (6x6) unmanned ground vehicle**, J. Kaloust, Lockheed Martin Missiles and Fire Control [6230-87]
- 2:40 pm: **Mobility of lightweight robots over snow**, J. H. Lever, U.S. Army Corps of Engineers [6230-88]
- 3:00 pm: **Real-time terrain understanding for autonomous maneuver of UGVs**, R. A. Jones, M. W. Gray, D. A. Horner, U.S. Army Engineer Research and Development Ctr. [6230-89]
- Coffee Break 3:20 to 3:50 pm
- 3:50 pm: **Initial conditions of a simple passive-dynamic walker**, B. Hauelsen, Univ. of Michigan; G. R. Hudas, U.S. Army Tank-Automotive Research, Development and Engineering Ctr.; G. Hulbert, Univ. of Michigan; K. Nebel, U.S. Army Tank-Automotive Research, Development and Engineering Ctr. ... [6230-90]
- 4:10 pm: **Application of an off-road mobility model to autonomous cross-country routing of unmanned ground vehicles**, C. L. Cummins, G. McKinley, B. Q. Gates, Jr., U.S. Army Engineer Research and Development Ctr. ... [6230-91]
- 4:30 pm: **Establishing UGV power requirements based on mission profiles**, J. D. Priddy, R. A. Jones, B. Q. Gates, Jr., J. R. Fairley, U.S. Army Engineer Research and Development Ctr. [6230-92]
- 4:50 pm: **Application of historical mobility testing to sensor-based robotic performance**, W. E. Willoughby, R. A. Jones, U.S. Army Engineer Research and Development Ctr.; J. H. Lever, S. A. Shoop, U.S. Army Corps of Engineers [6230-93]
- 5:10 pm: **Coordinated intelligent adaptive control of legged robots**, L. McLauchlan, M. Mehrubeoglu, Texas A&M Univ. [6230-94]



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SC549 **Incorporating GPS Technology into Commercial and Military Applications** (*Uijt de Haag*) Tuesday 8:30 am to 12:30 pm

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Unattended Ground, Sea, and Air Sensor Technologies and Applications VIII

Conference Chair: **Edward M. Carapezza**, DARPA and Cochair of DoD/DoJ Joint Program Committee Steering Group

Program Committee: **John G. Blitch**, Blitz Solutions Inc.; **John C. Carrano**, Luminex Corp.; **Christina J. Csanadi**, Space and Naval Warfare Systems Ctr., San Diego; **Douglas S. Deadrick**, BAE Systems; **John S. Eicke**, Army Research Lab.; **Eric Eisenstadt**, DARPA; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego; **Ivan Kadar**, Interlink Systems Sciences, Inc.; **Michael A. Kolodny**, Army Research Lab.; **Frank Patton**, DARPA; **Nino Srouer**, Army Research Lab.; **Huub A. van Hoof**, TNO (Netherlands)

Monday 17 April

SESSION 1

Room: Sun Ballroom B Mon. 1:00 to 2:20 pm

Acoustic Sensors

Chairs: **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Douglas S. Deadrick**, BAE Systems

1:00 pm: **Acoustic transient detection and localization from a tethered aerostat during the NATO TG-53 test**, M. V. Scanlon, C. G. Reiff, Army Research Lab. [6231-01]

1:20 pm: **Distributed acoustic sensor data processing for target classification**, T. R. Damarla, Army Research Lab. [6231-02]

1:40 pm: **Current capability of a matured disposable acoustic sensor network**, D. A. Beale, N. J. Geddes II, A. L. Hume, QinetiQ Ltd. (United Kingdom). [6231-04]

2:00 pm: **Robust beamforming algorithms for acoustic tracking of ground vehicles**, M. R. Azimi-Sadjadi, Information Systems Technologies, Inc. and Colorado State Univ.; N. J. Roseveare, Colorado State Univ. [6231-05]

SESSION 2

Room: Sun Ballroom B Mon. 2:20 to 3:20 pm

Seismic Sensors

Chairs: **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Douglas S. Deadrick**, BAE Systems

2:20 pm: **New seismic unattended small-size module for foot-step detection**, A. Pakhomov, E. T. Goldburt, General Sensing Systems LLC [6231-06]

2:40 pm: **Seismic detection algorithm and sensor deployment recommendations for perimeter security**, J. Lacombe, L. Peck, T. S. Anderson, D. J. Fisk, U.S. Army Engineer Research and Development Ctr. [6231-07]

3:00 pm: **Seismic array monitoring of artillery and small arms during the November 2005 ARL-NATO field experiment at YPG**, T. S. Anderson, D. J. Fisk, J. Fiori, S. Decato, D. Punt, N. Lamie, U.S. Army Engineer Research and Development Ctr. [6231-08]

Coffee Break 3:20 to 3:50 pm

SESSION 3

Room: Sun Ballroom B Mon. 3:50 to 5:10 pm

Electro-optic/IR/Imaging Sensors

Chairs: **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.; **Douglas S. Deadrick**, BAE Systems

3:50 pm: **Unconventional optical imaging using a high-speed neural network based smart sensor**, W. W. Arrasmith, Florida Institute of Technology [6231-09]

4:10 pm: **Extending the range and performance of non-line-of-sight ultraviolet communication links**, G. A. Shaw, A. M. Siegel, J. Model, MIT Lincoln Lab. [6231-10]

4:30 pm: **Analysis of visible band sensors for personnel detection**, J. M. Cathcart, B. Mauro, Georgia Institute of Technology [6231-11]

4:50 pm: **Real-time stereoscopic catadioptric omni-detection system**, S. Ro, A. A. Kostrzewski, Physical Optics Corp.; R. K. Rao, Stream Processors, Inc.; E. K. Tsui, U.S. Army Tank-automotive and Armaments Command [6231-12]

Tuesday 18 April

SESSION 4

Room: Sun Ballroom B Tues. 8:00 to 8:50 am

Keynote Session

Chairs: **Michael A. Kolodny**, Army Research Lab.; **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego

Keynote Presentation

8:00 am: **ISR needs and strategies (Invited Paper)**, E. Bair, U.S. Army Intelligence, Electronic Warfare & Sensors [6231-13]

SESSION 5

Room: Sun Ballroom B Tues. 8:50 to 9:50 am

Chem/Bio/Radar/Magnetic Sensors

Chairs: **Todd M. Hintz**, Space and Naval Warfare Systems Ctr., San Diego; **Jeffrey R. Heberley**, U.S. Army Armament Research, Development and Engineering Ctr.

8:50 am: **Ultra-wideband ground wave communication for a distributed sensor network**, J. A. LaComb, Naval Undersea Warfare Ctr. [6231-15]

9:10 am: **Self-sensing array (SSA) technology for unattended sensing applications**, B. S. Rogers, R. Whitten, J. D. Adams, Nevada Nanotech Systems, Inc. [6231-16]

9:30 am: **MEMS multimode and multiparameter integrated sensor arrays for land and sea applications**, S. Rajic, Tesla Technologies and Oak Ridge National Lab. [6231-17]

Coffee Break 9:50 to 10:30 am

SESSION 6

Room: Sun Ballroom B Tues. 10:30 to 11:30 am

Systems-Enabling Technologies

Chair: **Jeffrey R. Heberley**,

U.S. Army Armament Research, Development and Engineering Ctr.

10:30 am: **Evaluation of distributed cluster management techniques for unattended ground sensor networks**, M. A. Essawy, C. A. Stelzig, General Dynamics Advanced Information Systems; K. W. Brendley, Artis LLC; S. S. Logan, S. Minor, U.S. Army Night Vision & Electronic Sensors Directorate [6231-18]

10:50 am: **Associated neural network independent component analysis structure**, K. Kim, A. A. Kostrzewski, Physical Optics Corp. [6231-19]

11:10 am: **Single-cycle nonlinear cell for fast independent component analysis algorithm**, V. K. Jain, Univ. of South Florida [6231-21]

Lunch/Exhibition Break 11:30 am to 1:30 pm

SESSION 7

Room: Sun Ballroom B Tues. 1:20 to 3:00 pm
Enabling Technologies (Fusion, Power, MEMS, etc.) I

Chairs: Edward M. Carapezza, DARPA and DoD/DoJ Joint Program Committee Steering Group; Michael A. Kolodny, Army Research Lab.

- 1:20 pm: **Hybrid power supplies for unattended wireless sensors**, C. Lakeman, P. Fleig, J. DeGreeff, T. Trainor, TPL, Inc. [6231-23]
- 1:40 pm: **The Core Transceiver: a software defined radio for UGSS applications**, G. J. Valentino, M. Geoghegan, Nova Engineering, Inc. . . . [6231-24]
- 2:00 pm: **New classification results using temporal and spatial fusion**, G. Prado, SenTech Inc. [6231-26]
- 2:20 pm: **Advances in unattended ground sensors radio**, R. Tobin, Army Research Lab. [6231-27]
- 2:40 pm: **The design of a broadband ocean acoustic laboratory**, R. Carpenter, Naval Undersea Warfare Ctr.; M. T. Silvia, Sittel Corp.; B. A. Cray, Naval Undersea Warfare Ctr. [6231-28]
- Coffee Break 3:00 to 3:20 pm

SESSION 8

Room: Sun Ballroom B Tues. 3:20 to 5:00 pm
Enabling Technologies (Fusion, Power, MEMS, etc.) II

Chairs: Edward M. Carapezza, DARPA and DoD/DoJ Joint Program Committee Steering Group; Michael A. Kolodny, Army Research Lab.

- 3:20 pm: **Reconfigurable transceiver architecture for unattended ground sensors**, T. J. Bruns, Nova Engineering, Inc. [6231-29]
- 3:40 pm: **Enabling unattended data logging and publication by data model change detection and environmental awareness**, H. M. Jaenisch, dtech Systems Inc.; J. W. Handley, Sparta, Inc.; M. Barnett, Computer Sciences Corp.; D. A. Grover, Washington Square Associates, Inc. [6231-30]
- 4:00 pm: **Seafloor microbial fuel cell: Scaling law and systems**, P. Bandyopadhyay, Naval Undersea Warfare Ctr. [6231-31]
- 4:20 pm: **Target tracking and localization using infrared video imagery**, V. H. Berk, C. Behre, G. V. Cybenko, Dartmouth College [6231-32]
- 4:40 pm: **Tracking in complex situations and environments**, V. Crespi, California State Univ./Los Angeles; Y. Sheng, G. V. Cybenko, Dartmouth College [6231-33]

Wednesday 19 April

SESSION 9

Room: Sun Ballroom B Wed. 9:00 to 9:50 am
Keynote Session

Chairs: Edward M. Carapezza, DARPA and DoD/DoJ Joint Program Committee Steering Group; Todd M. Hintz, Space and Naval Warfare Systems Ctr., San Diego

Keynote Presentation

- 9:00 am: **Remote sensors on the battlefield: a retrospective (Invited Paper)**, J. J. Rocchio, Army Research Lab. [6231-34]

SESSION 10

Room: Sun Ballroom B Wed. 9:50 to 11:50 am
Sniper and Motar Detection

Chairs: Nino Srouf, Army Research Lab.;

Todd M. Hintz, Space and Naval Warfare Systems Ctr., San Diego

- 9:50 am: **NATO TG-53: acoustic detection of weapon firing joint field experiment**, T. Pham, M. V. Scanlon, N. Srouf, C. G. Reiff, L. Sim, D. Thompson, Army Research Lab. [6231-35]
- 10:10 am: **Seismic detection of direct and indirect fire**, T. S. Anderson, U.S. Army Engineer Research and Development Ctr. [6231-36]
- Coffee Break 10:30 to 10:50 am
- 10:50 am: **Wide-aperture arrays for locating impulsive sound sources in-air and underwater**, B. Ferguson, Defence Science and Technology Organisation (Australia) [6231-37]
- 11:10 am: **Sound detection and localization of small arms, mortars, and artillery guns**, P. Naz, French German Research Institute of Saint-Louis (France); C. R. Marty, l'Établissement Technique de Bourges (France) [6231-38]
- 11:30 am: **Operating ferret on a patrol boat**, J. Bédard, Defence R&D Canada/Valcartier (Canada) [6231-39]
- Lunch/Exhibition Break 11:50 am to 1:00 pm

SESSION 11

Room: Sun Ballroom B Wed. 1:00 to 2:50 pm
UGS Systems I

Chairs: Michael A. Kolodny, Army Research Lab.;
Ivan Kadar, Interlink Systems Sciences, Inc.

- 1:00 pm: **Military requirements and applications for forward depth deployed UGS (Invited Paper)**, D. A. Beale, QinetiQ Ltd. (United Kingdom); A. J. Gray, Defence Science and Technology Lab. (United Kingdom) [6231-40]
- 1:30 pm: **Disposable sensor system: low-cost UGS for urban operations**, W. Calcutt, B. Jones, R. S. Fish, M. A. Winston, McQ Associates, Inc.; J. G. Houser, Army Research Lab. [6231-41]
- 1:50 pm: **Airborne plume tracking with sensor networks**, G. T. Nofsinger, G. V. Cybenko, Dartmouth College [6231-42]
- 2:10 pm: **Unattended ground sensors: integration with C4ISR infrastructure**, R. L. Steadman, S. Hansen, D. Risseeuw, Textron Systems Corp. [6231-43]
- 2:30 pm: **Challenges and performance of light vehicle tracking with seismic-acoustics UGS**, J. Fitzgerald, R. L. Steadman, J. F. Martino, Textron Systems Corp. [6231-44]
- Coffee Break 2:50 to 3:20 pm

SESSION 12

Room: Sun Ballroom B Wed. 3:20 to 5:10 pm
UGS Systems II

Chairs: Michael A. Kolodny, Army Research Lab.;
Ivan Kadar, Interlink Systems Sciences, Inc.

- 3:20 pm: **Sea satellites: a concept for data linking unmanned/unattended blue water and littoral sensor systems (Invited Paper)**, D. H. Steinbrecher, Naval Undersea Warfare Ctr. [6231-45]
- 3:50 pm: **Unattended ground sensors: the way ahead**, M. A. Kolodny, Army Research Lab. [6231-46]
- 4:10 pm: **A high-performance imagery system for unattended ground sensor tactical deployments**, D. C. Hartup, K. Bobier, B. A. Marks, W. J. Dirr, Nova Engineering, Inc.; R. S. Salisbury, A. J. C. Brown, B. Cairnduff, Thermoteknix Systems Ltd (United Kingdom) [6231-47]
- 4:30 pm: **Multimodal unattended ground sensor system**, L. Zong, J. G. Houser, T. R. Damarla, Army Research Lab. [6231-48]
- 4:50 pm: **Human signatures in urban environments using low-cost sensors**, M. A. Winston, W. Calcutt, B. Jones, R. S. Fish, McQ Associates, Inc. . . . [6231-49]

Thursday 20 April

SESSION 13

Room: Sun Ballroom B Thurs. 8:00 to 8:50 am

Keynote Session

Chairs: **Edward M. Carapezza**, DARPA and DoD/DoJ Joint Program Committee Steering Group; **Michael A. Kolodny**, Army Research Lab.

Keynote Presentation

8:00 am: **Unmanned/unattended naval sensor systems: technologies and challenges for the future** (*Invited Paper*), D. J. Pistacchio, Naval Undersea Warfare Ctr. [6231-50]

SESSION 14

Room: Sun Ballroom B Thurs. 8:50 to 11:50 am

UGS Systems III

Chair: **Michael A. Kolodny**, Army Research Lab.

8:50 am: **Sustained littoral presence with unmanned and unattended sensor systems**, E. M. Carapezza, DARPA and DoD/DoJ Joint Program Committee Steering Group [6231-51]

9:10 am: **Persistent sensing: the way ahead**, J. S. Eicke, Army Research Lab. [6231-52]

9:30 am: **Air launch wireless sensor nodes for battle damage assessment**, J. M. Back, SRS Technologies; E. Hoenes, S. D. Beck, M. A. Frank, BAE Systems North America [6231-53]

9:50 am: **Smart unattended sensor networks with scene understanding capabilities**, G. Kuvich, Smart Computer Vision Systems [6231-54]

Coffee Break 10:10 to 10:30 am

10:30 am: **The Jellyfish: smart electro-active polymers for an autonomous distributed sensing node**, J. B. Blottman III, R. T. Richards, Naval Undersea Warfare Ctr.; D. Jones, Defence R&D Canada/ Atlantic (Canada) [6231-55]

10:50 am: **Aircraft detection using MASINT UGS**, A. Vanderbilt, Army Research Lab. and Wave Technologies [6231-56]

11:10 am: **RDECOM UGS IPT**, M. A. Kolodny, Army Research Lab. [6231-57]

11:30 am: **Using UGS in combination with attended sensor systems: an application**, J. Harrison, Army Research Lab. [6231-20]

Lunch/Exhibition Break 11:50 am to 1:00 pm

SESSION 15

Room: Sun Ballroom B Thurs. 1:00 to 2:30 pm

UGS DoD Programs and Requirements

Chair: **Michael A. Kolodny**, Army Research Lab.

1:00 pm: **Army UGS Requirements** (*Presentation Only*), J. Hust, U.S. Army TSM Ground Sensor Systems [6231-58]

1:15 pm: **SOCOM UGS Requirements** (*Presentation Only*), P. Porter, U.S. Special Operations Command [6231-59]

1:30 pm: **Marine UGS Requirements** (*Presentation Only*), S. Perry, Integrated Team Solutions Facility [6231-60]

1:45 pm: **Navy UGS Requirements** (*Presentation Only*), D. J. Pistacchio, Naval Undersea Warfare Ctr. [6231-61]

2:00 pm: **U.S. Army INSCOM Requirements** (*Presentation Only*), R. Gonzales, U.S. Army [6231-62]

2:15 pm: **UGS Acquisition Requirements** (*Presentation Only*), R. Young, U.S. Army [6231-63]

Panel Discussion

Room: Sun Ballroom B Thurs. 2:30 to 4:30 pm

UGS User

Chair: **Edward M. Carapezza**, DARPA and Co-Chair Dept. of Defense/Dept. of Justice Joint Program Committee

Related Courses

- SC194 **Multispectral and Hyperspectral Image Sensors** (*Lomheim*) Friday 1:30 pm to 5:30 pm
 - SC640 **Introduction to Sensor Networks** (*Rao*) Monday 8:30 am to 5:30 pm
- See SPIE Cashier to Register.

Intelligent Integrated Microsystems

Conference Chairs: **Ravindra A. Athale**, MITRE Corp.; **John C. Zolper**, DARPA

Program Committee: **Richard G. Baraniuk**, Rice Univ.; **Leonard J. Buckley**, DARPA/DSO; **John C. Carrano**, Luminex Corp.; **Ronald R. Coifman**, Yale Univ.; **Mitra Dutta**, Univ. of Illinois at Chicago; **Lorenzo Faraone**, The Univ. of Western Australia (Australia); **William J. Gunning III**, Rockwell Scientific Co., LLC; **Dennis M. Healy, Jr.**, DARPA; **Philip Perconti**, U.S. Army Night Vision & Electronic Sensors Directorate; **Dennis W. Prather**, Univ. of Delaware; **George J. Simonis**, Army Research Lab.; **Rick L. Thompson**, BAE Systems North America

Wednesday 19 April

Opening Remarks

Room: Tallahassee 1 Wed. 1:00 to 1:10 pm

Chair: **Ravindra A. Athale**, MITRE Corp.

SESSION 1

Room: Tallahassee 1 Wed. 1:10 to 3:10 pm

Keynote Session

Chair: **Ravindra A. Athale**, MITRE Corp.

1:10 pm: **The path to adaptable microsystems** (*Invited Paper*), J. C. Zolper, Defense Advanced Research Projects Agency [6232-01]

1:40 pm: **Paleolithic era of adaptive microelectronics: examples of systems, sub-systems, and components** (*Invited Paper*), D. M. Healy, Jr., Defense Advanced Research Projects Agency [6232-02]

2:10 pm: **Intelligent chip-scale diagnostics for medical and bio-defense applications** (*Invited Paper*), J. C. Carrano, Luminex Corp. [6232-03]

2:40 pm: **Intelligent integrated microsystems: a DoD perspective** (*Invited Paper*), R. F. Leheny, Defense Advanced Research Projects Agency [6232-04]

Coffee Break 3:10 to 3:40 pm

SESSION 2

Room: Tallahassee 1 Wed. 3:40 to 5:40 pm

Compressive Sensing I

Chair: **John C. Zolper**, DARPA

3:40 pm: **Compressive sensing: a new framework for computational signal processing** (*Invited Paper*), R. G. Baraniuk, Rice Univ. [6232-05]

4:10 pm: **Random filters for compressive signal acquisition** (*Invited Paper*), J. A. Tropp, Univ. of Michigan [6232-06]

4:40 pm: **Compressive sampling** (*Invited Paper*), E. J. Candes, California Institute of Technology [6232-07]

5:10 pm: **Active learning versus compressed sensing** (*Invited Paper*), R. D. Nowak, Univ. of Wisconsin/Madison [6232-08]

Thursday 20 April

SESSION 3

Room: Tallahassee 1 Thurs. 8:00 to 9:50 am

Compressive Sensing II

Chair: **Dennis M. Healy, Jr.**, DARPA

8:00 am: **Active digital perception for sensor arrays** (*Invited Paper*), R. R. Coifman, Plain Sight Systems, Inc. [6232-09]

8:30 am: **Compressive imaging sensors** (*Invited Paper*), N. P. Pitsianis, A. D. Portnoy, X. Sun, D. J. Brady, Duke Univ.; T. J. Suleski, M. A. Fiddy, Univ. of North Carolina/Charlotte; R. D. Tekolste, M. R. Feldman, Digital Optics Corp. [6232-10]

9:00 am: **Single pixel compressive camera** (*Invited Paper*), K. F. Kelly, Rice Univ. [6232-11]

9:30 am: **Compressive sampling strategies for integrated microspectrometers**, P. Potuluri, Centice Corp.; M. E. Gehm, N. P. Pitsianis, X. Sun, D. J. Brady, Duke Univ. [6232-12]

Coffee Break 9:50 to 10:30 am

SESSION 4

Room: Tallahassee 1 Thurs. 10:30 am to 12:00 pm

Adaptive Technologies I

Chair: **John C. Carrano**, Luminex Corp.

10:30 am: **Optofluidic technology** (*Invited Paper*), D. Psaltis, California Institute of Technology [6232-13]

11:00 am: **Adaptive imaging with uncooled LWIR detectors** (*Invited Paper*), J. J. Talghader, Univ. of Minnesota [6232-14]

11:30 am: **Dual-band adaptive focal plane array: an example of the challenges and potential of intelligent integrated microsystems** (*Invited Paper*), W. J. Gunning III, Rockwell Scientific Co., LLC [6232-15]

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 5

Room: Tallahassee 1 Thurs. 1:30 to 2:30 pm

Adaptive Technologies II

Chair: **John C. Carrano**, Luminex Corp.

1:30 pm: **Adaptive focal plane array (AFPA) technologies for integrated infrared microsystems** (*Invited Paper*), P. Mitra, DRS Infrared Technologies LP; L. Faraone, The Univ. of Western Australia (Australia) [6232-16]

2:00 pm: **Translation, rotation, and scale invariant object recognition using a holographic eye** (*Invited Paper*), S. M. Shahriar, Northwestern Univ. [6232-17]

SESSION 6

Room: Tallahassee 1 Thurs. 2:30 to 5:10 pm

Three-Dimensional Technologies

Chair: **Demetri Psaltis**, California Institute of Technology

2:30 pm: **Multiscale 3D optics** (*Invited Paper*), G. Barbastathis, Massachusetts Institute of Technology [6232-18]

3:00 pm: **An evolvable hardware approach to intelligent integrated microsystems** (*Invited Paper*), A. Stoica, Jet Propulsion Lab. [6232-19]

Coffee Break 3:30 to 4:00 pm

4:00 pm: **Three-dimensional system architectures** (*Invited Paper*), V. Ozguz, J. Stern, Irvine Sensors Corp. [6232-20]

4:30 pm: **Three-dimensional near-infrared photonic crystals for optical interconnects using conventional silicon microfabrication techniques**, B. S. Citla, Univ. of Delaware; S. Venkataraman, Intel Corp.; J. A. Murakowski, G. J. Schneider, S. Shi, D. W. Prather, Univ. of Delaware [6232-21]

4:50 pm: **Integrated microsystems multifunctional packaging with LCP**, P. Jaynes, L. W. Shacklette, Harris Corp. [6232-22]

Friday 21 April

SESSION 7

Room: Tallahassee 1 Fri. 8:00 to 10:20 am

Imaging Systems I

Chair: Richard G. Baraniuk, Rice Univ.

8:00 am: **Recent progress on multidomain optimization for ultrathin cameras** (*Invited Paper*), M. A. Neifeld, The Univ. of Arizona [6232-23]

8:30 am: **Optimal design of a generalized compound eye particle detector array** (*Invited Paper*), A. Nehorai, Z. Liu, Univ. of Illinois at Chicago; E. Paldi, Technion - Israel Institute of Technology (Israel) [6232-24]

9:00 am: **Room-temperature 2.4-micron cutoff wavelength AlGaAsSb/InGaAsSb heterophototransistors**, K. Swaminathan, O. V. Sulima, Univ. of Delaware; T. F. Refaat, NASA Langley Research Ctr.; N. N. Faleev, Univ. of Delaware; A. N. Semenov, V. A. Solov'ev, S. V. Ivanov, A.F. Ioffe Physico-Technical Institute (Russia); M. Abedin, U. N. Singh, NASA Langley Research Ctr.; D. W. Prather, Univ. of Delaware [6232-25]

9:20 am: **Development of photonic devices for MMW sensing and imaging**, C. Huang, C. A. Schuetz, R. Shireen, T. H. Hwang, S. Shi, D. W. Prather, Univ. of Delaware [6232-26]

9:40 am: **Annular folded optic imagers**, E. J. Tremblay, Univ. of California/San Diego; R. A. Stack, Distant Focus Corp.; J. Ford, Univ. of California/San Diego [6232-27]

10:00 am: **Polarimetric imaging with metamaterials**, U. Levy, L. Pang, J. Ford, Y. Fainman, Univ. of California/San Diego [6232-28]

Coffee Break 10:20 to 10:50 am

SESSION 8

Room: Tallahassee 1 Fri. 10:50 am to 1:10 pm

Mixed Signal Systems

Chair: Ravindra A. Athale, MITRE Corp.

10:50 am: **Adaptive power amplifiers for military and commercial communications** (*Invited Paper*), P. M. Asbeck, D. Qiao, Univ. of California/San Diego [6232-29]

11:20 am: **Mixed-signal behavioral models for design exploration of intelligent analog to information systems** (*Invited Paper*), Y. Massoud, Rice Univ. [6232-30]

11:50 am: **Analog signal processing for low-power sensor systems** (*Invited Paper*), P. Hasler, Georgia Institute of Technology [6232-31]

12:20 pm: **S-Ku-band intelligent amplifier microsystem** (*Invited Paper*), G. Jerinic, K. J. Herrick, R. P. Molfino, S. M. Lardizabal, Raytheon Co. [6232-32]

12:50 pm: **Intelligent RF front-end technology for high-performance military receivers**, L. J. Lembo, Northrop Grumman Corp. [6232-33]



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Algorithms and Technologies for Multispectral, Hyperspectral, and Ultraspectral Imagery XII

Conference Chairs: **Sylvia S. Shen**, The Aerospace Corp.; **Paul E. Lewis**, National Geospatial-Intelligence Agency

Program Committee: **Gail P. Anderson**, Air Force Research Lab.; **Hsiao-hua K. Burke**, MIT Lincoln Lab.; **Chein-I Chang**, Univ. of Maryland/Baltimore County; **Eustace L. Dereniak**, Optical Sciences Ctr./The Univ. of Arizona; **Michael T. Eismann**, Air Force Research Lab.; **Glenn E. Healey**, Univ. of California/Irvine; **James O. Jensen**, U.S. Army Edgewood Chemical Biological Ctr.; **Fred A. Kruse**, Horizon Geolmaging, LLC; **Alan P. Schaum**, Naval Research Lab.; **Joel Susskind**, NASA Goddard Space Flight Ctr.; **Grady H. Tuell**, Optech International, Inc.; **Miguel Vélez-Reyes**, Univ. de Puerto Rico Mayagüez

Monday 17 April

Opening Remarks

Room: Osceola Breakout 5-6..... Mon. 8:35 to 11:15 am

Chair: **Sylvia S. Shen**, The Aerospace Corp.

SESSION 1

Room: Osceola Breakout 5-6..... Mon. 8:35 to 11:15 am

Detection and Identification

Chair: **Sylvia S. Shen**, The Aerospace Corp.

8:35 am: **Analytical comparison of the matched filter and orthogonal subspace projection detectors in structured models for hyperspectral images**, P. Bajorski, Rochester Institute of Technology [6233-01]

8:55 am: **Adaptive smoothing for subpixel target detection in hyperspectral imaging**, P. Bajorski, Rochester Institute of Technology; P. Hall, The Australian National Univ. (Australia) [6233-02]

9:15 am: **Kernel canonical correlation analysis for hyperspectral anomaly detection**, H. Kwon, N. M. Nasrabadi, Army Research Lab. [6233-03]

9:35 am: **Discriminant analysis with nonparametric estimates for subpixel detection of 3D objects**, Y. Liu, G. Healey, Univ. of California/Irvine ... [6233-04]

9:55 am: **Hyperspectral detection algorithms: from old ideas to operational concepts to next generation**, A. P. Schaum, Naval Research Lab. [6233-05]

Coffee Break 10:15 to 10:35 am

10:35 am: **A classification approach and comparison to other object identification algorithms for hyperspectral imagery**, R. R. Mayer, Y. Antoniadis, M. M. Baumbach, D. Chester, A. Goldstein, D. Haas, S. Henderson, BAE Systems Advanced Information Technologies [6233-06]

10:55 am: **Signature evolution with covariance equalization in oblique hyperspectral imagery**, R. A. Leathers, A. P. Schaum, T. V. Downes, Naval Research Lab. [6233-07]

SESSION 2

Room: Osceola Breakout 5-6..... Mon. 11:15 am to 12:15 pm

Spectral Resolution Enhancement and Restoration

Chair: **Miguel Vélez-Reyes**, Univ. de Puerto Rico Mayagüez

11:15 am: **Acceleration of tomographic hyperspectral restoration algorithms**, H. C. Schau, Raytheon Co..... [6233-08]

11:35 am: **Enhancing the resolution of spectral-polarimetric resolution**, T. F. Blake, U.S. Air Force; M. E. Goda, S. Cain, Air Force Institute of Technology; K. Jerkatis, Boeing SVS, Inc. [6233-09]

11:55 am: **Restoration and resolution enhancement of hyperspectral imagery**, A. Umaña-Díaz, M. Vélez-Reyes, Univ. de Puerto Rico Mayagüez [6233-10]

Lunch Break 12:15 to 1:40 pm

SESSION 3

Room: Osceola Breakout 5-6..... Mon. 1:40 to 3:00 pm

Spectral Methodologies and Applications I

Chair: **Chein-I Chang**, Univ. of Maryland/Baltimore County

1:40 pm: **Multispectral change detection for finding small targets using MANTIS-3T data**, J. J. Dirbas, P. Henderson, R. W. Fries, PAR Government Systems Corp.; A. R. Lovett, Naval Air Systems Command [6233-11]

2:00 pm: **Vehicle tracking with multitemporal hyperspectral imagery**, J. P. Kerekes, M. Muldowney, K. Strakerjan, L. E. Smith, Rochester Institute of Technology [6233-12]

2:20 pm: **Real-time cloud detection for remotely sensed data with a small number of bands**, S. P. Hagerty, J. Gaines, Ball Aerospace & Technologies Corp. [6233-14]

2:40 pm: **Mean-class hyperspectral propagation**, S. T. Kacenjar, D. M. Pustai, D. A. Bennett, Lockheed Martin Corp. [6233-15]

Coffee Break 3:00 to 3:20 pm

SESSION 4

Room: Osceola Breakout 5-6..... Mon. 3:20 to 5:40 pm

Spectral Data Analysis Methodologies I

Chair: **Glenn E. Healey**, Univ. of California/Irvine

3:20 pm: **Hyperspectral image analysis using noise-adjusted principal component transform**, Q. Du, Mississippi State Univ. [6233-16]

3:40 pm: **Using spatial filtering to improve spectral distribution invariants**, C. Kuan, G. Healey, Univ. of California/Irvine [6233-17]

4:00 pm: **Sparse linear filters for detection and classification in hyperspectral imagery**, J. Theiler, S. J. Perkins, Los Alamos National Lab.; K. Glocer, Los Alamos National Lab. and Univ. of California/Santa Cruz [6233-18]

4:20 pm: **Classification of hyperspectral spatial/spectral patterns using Gaussian Markov random field models**, H. A. Smartt, Sandia National Labs. and Univ. of New Mexico; J. S. Tyo, The Univ. of New Mexico [6233-19]

4:40 pm: **Sample spectral correlation-based measures for subpixels and mixed pixels in real hyperspectral imagery**, W. Liu, C. Chang, Univ. of Maryland/Baltimore County [6233-20]

5:00 pm: **A new 3D receiver operating characteristic curve for detection performance analysis**, H. Ren, National Central Univ. (Taiwan) [6233-21]

5:20 pm: **An algorithm for wavelength calibration in hyperspectral imaging camera**, E. Lo, Susquehanna Univ.; A. W. Fountain III, U.S. Military Academy [6233-22]

Tuesday 18 April

SESSION 5

Room: Osceola Breakout 5-6 Tues. 8:10 to 11:10 am

Sensor Design and Performance

Chair: Eustace L. Dereniak, College of Optical Sciences/The Univ. of Arizona

8:10 am: **Pseudo imaging**, R. J. Nelson, J. M. Mooney, Solid State Scientific Corp.; W. S. Ewing, Air Force Research Lab. [6233-23]

8:30 am: **Design of an LWIR snapshot imaging spectropolarimeter**, R. W. Aumiller, N. Hagen, E. L. Dereniak, College of Optical Sciences/The Univ. of Arizona; R. E. Sampson, I Technology Applications [6233-24]

8:50 am: **Compact CMOS multispectral/polarimetric camera**, B. E. Catanzaro, CFE Services; J. M. Lorenz, M. S. Dombrowski, Surface Optics Corp. [6233-25]

9:10 am: **Performance and application of a very high-speed 2-12 μ m ultraspectral FTIR imager**, M. S. Dombrowski, M. Szczesniak, M. T. Beecroft, J. P. Ferguson, Surface Optics Corp.; B. E. Catanzaro, CFE Services [6233-26]

9:30 am: **Object discrimination and optical performance of a real-time 2-5 μ m hyperspectral imager**, M. S. Dombrowski, R. L. Dombrowski, Surface Optics Corp.; B. E. Catanzaro, CFE Services; E. Hillenbrand, Naval Surface Warfare Ctr. [6233-27]

9:50 am: **Innovative manufacturing and test technologies**, L. E. Comstock, Corning NetOptix; P. G. Dewa, M. M. Dunn, Corning Tropel Corp. [6233-28]

Coffee Break 10:10 to 10:30 am

10:30 am: **Image registration for Fizeau Fourier transform imaging spectroscopy**, S. T. Thurman, J. R. Fienup, Univ. of Rochester [6233-29]

10:50 am: **Analyzing sensors with highly overlapping spectral bands**, Z. Wang, J. S. Tyo, M. M. Hayat, The Univ. of New Mexico. [6233-30]

SESSION 6

Room: Osceola Breakout 5-6 Tues. 11:10 am to 12:10 pm

Special Event: The Use of Civil Remote Sensing in Improving Hurricane Forecasting and Assisting Emergency Responders

Chair: Paul E. Lewis, National Geospatial-Intelligence Agency

11:10 am: **The use of remotely sensed data and innovative modeling to improve hurricane prediction** (*Invited Paper*), R. M. Atlas, NOAA Atlantic Oceanographic and Meteorological Lab. [6233-31]

11:40 am: **U.S. Environmental Protection Agency civil airborne rapid needs assessment efforts in the aftermath of Hurricanes Katrina and Rita** (*Invited Paper*), M. J. Thomas, U.S. Environmental Protection Agency Region VII [6233-32]

Lunch/Exhibition Break 12:10 to 1:30 pm

SESSION 7

Room: Osceola Breakout 5-6 Tues. 1:30 to 2:50 pm

Spectral Methodologies and Applications II

Chair: Michael T. Eismann, Air Force Research Lab.

1:30 pm: **Comparisons between spectral quality metrics and analyst performance in hyperspectral target detection**, J. P. Kerekes, B. Leahy, D. W. Messinger, Rochester Institute of Technology; R. E. Simmons, ITT Industries [6233-34]

1:50 pm: **Perceptual display strategies of hyperspectral imagery based on PCA and ICA**, H. Zhang, D. W. Messinger, E. Montag, Rochester Institute of Technology [6233-35]

2:10 pm: **Spectral observations of SO₂ plumes**, M. Porter, R. C. Olsen, R. M. Harkins, Naval Postgraduate School [6233-36]

2:30 pm: **Image data transfer over the Internet protocol for air quality studies**, C. J. Wong, Univ. Sains Malaysia (Malaysia) [6233-37]

Coffee Break 2:50 to 3:20 pm

SESSION 8

Room: Osceola Breakout 5-6 Tues. 3:20 to 5:40 pm

Spectral Data Analysis Methodologies II

Chair: Fred A. Kruse, Horizon Geolmaging, LLC

3:20 pm: **Haralick texture features expanded into the spectral domain**, A. M. Puetz, R. C. Olsen, Naval Postgraduate School [6233-38]

3:40 pm: **Change detection in hyperspectral imagery using temporal principal components**, V. Ortiz-Rivera, M. Vélez-Reyes, Univ. de Puerto Rico Mayagüez; B. Roysam, Rensselaer Polytechnic Institute [6233-39]

4:00 pm: **Exploration of virtual dimensionality in hyperspectral image analysis**, C. Chang, Univ. of Maryland/Baltimore County [6233-40]

4:20 pm: **Applications of independent component analysis (ICA) to abundance quantification for hyperspectral imagery**, J. Wang, C. Chang, Univ. of Maryland/Baltimore County [6233-41]

4:40 pm: **PDE methods for hyperspectral image processing**, J. M. Duarte-Carvajalino, M. Vélez-Reyes, P. Castillo, Univ. de Puerto Rico Mayagüez [6233-42]

5:00 pm: **Commodity cluster and hardware-based massively parallel implementations of algorithms for hyperspectral analysis**, A. J. Plaza, Univ. de Extremadura (Spain) [6233-43]

5:20 pm: **An algorithm for computing partial pixel in hyperspectral imaging camera calibration**, E. Lo, Susquehanna Univ.; A. W. Fountain III, U.S. Military Academy [6233-44]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

✓ **Adaptive branch and bound algorithm for selecting optimal features in hyperspectral data**, S. Nakariyakul, D. P. Casasent, Carnegie Mellon Univ. [6233-86]

✓ **Adaptive histogram subsection modification for infrared image enhancement**, H. Qu, Q. Chen, Nanjing Univ. of Science & Technology (China) [6233-87]

✓ **PCA-based image fusion**, S. K. S. Sathasivam, St. Joseph's College of Engineering (India); M. Muthan, Anna Univ. (India) [6233-88]

Wednesday 19 April

SESSION 9

Room: Osceola Breakout 5-6 Wed. 8:30 to 11:10 am

Atmospheric Instrumentation, Measurements, and Forecasting

Chair: Joel Susskind, NASA Goddard Space Flight Ctr.

8:30 am: **Lessons from three years of hyperspectral data from the atmospheric infrared sounder (AIRS) on the EOS AQUA**, H. H. Aumann, D. Elliott, Jet Propulsion Lab. [6233-45]

8:50 am: **Improved soundings and error estimates using AIRS/AMSU data**, J. Susskind, NASA Goddard Space Flight Ctr.; R. M. Atlas, NOAA Atlantic Oceanographic and Meteorological Lab. [6233-46]

9:10 am: **Importance of the AIRS shortwave sounding channels**, J. Susskind, NASA Goddard Space Flight Ctr.; L. Kouvaris, Science Applications International Corp. [6233-47]

9:30 am: **The use of error estimates with AIRS profiles to improve short-term weather forecasts**, G. J. Jedlovec, S. Chou, NASA Marshall Space Flight Ctr.; B. Zavadsky, The Univ. of Alabama in Huntsville; B. Lapenta, NASA Marshall Space Flight Ctr. [6233-48]

9:50 am: **Satellite hyperspectral IR sensors for monitoring greenhouse effects**, H. K. Burke, J. W. Snow, F. W. Chen, K. E. Farrar, MIT Lincoln Lab. [6233-49]

Coffee Break 10:10 to 10:30 am

10:30 am: **Satellite sounder-based OLR-, cloud-, and atmospheric temperature climatologies for climate analyses**, G. I. Molnar, J. Susskind, NASA Goddard Space Flight Ctr. [6233-50]

10:50 am: **Neural network retrieval of atmospheric temperature and moisture profiles from AIRS/AMSU data in the presence of clouds**, W. J. Blackwell, MIT Lincoln Lab. [6233-51]

SESSION 10

Room: Osceola Breakout 5-6 Wed. 11:10 am to 12:10 pm
Atmospheric Characterization and Correction

Chair: Gail P. Anderson, Air Force Research Lab.

11:10 am: **MODTRAN5: 2006 update**, G. P. Anderson, Air Force Research Lab.; A. Berk, P. K. Acharya, L. S. Bernstein, L. Muratov, J. Lee, M. J. Fox, S. M. Adler-Golden, Spectral Sciences, Inc.; J. H. Chetwynd, Jr., M. L. Hoke, R. B. Lockwood, J. A. Gardner, T. W. Cooley, Air Force Research Lab.; C. C. Borel, Ball Aerospace & Technologies Corp.; P. E. Lewis, National Geospatial-Intelligence Agency [6233-52]

11:30 am: **Applying the OSS radiative transfer method to MODTRAN**, H. E. Snell, T. C. Connor, T. S. Zaccheo, AER Inc.; A. Berk, Spectral Sciences, Inc. [6233-53]

11:50 am: **Reflectance recovery for AVIRIS scenes**, K. Chandra, G. E. Healey, Univ. of California/Irvine [6233-54]

Lunch/Exhibition Break 12:10 to 1:30 pm

SESSION 11

Room: Osceola Breakout 5-6 Wed. 1:30 to 4:10 pm
Spectral Phenomenology, Measurements, and Experiments

Chair: Hsiao-hua K. Burke, MIT Lincoln Lab.

1:30 pm: **Analysis of a multi-temporal hyperspectral dataset over a common target scene**, D. W. Messinger, M. Richardson, Rochester Institute of Technology [6233-55]

1:50 pm: **Design and modeling of spectral-thermal unmixing targets for airborne hyperspectral imagery**, P. E. Clare, Defence Science and Technology Lab. (United Kingdom) [6233-56]

2:10 pm: **Tree canopy closure assessment using digital photography**, P. C. Baker, Science Applications International Corp.; C. S. Allen, Northrop Grumman Corp. [6233-57]

2:30 pm: **Reflectance of water-wetted sand**, M. B. Satterwhite, Science Applications International Corp. [6233-58]

2:50 pm: **Reflectance spectra of some liquid hydrocarbons on a sand**, C. S. Allen, Northrop Grumman Corp.; M. B. Satterwhite, Science Applications International Corp. [6233-59]

Coffee Break 3:10 to 3:30 pm

3:30 pm: **MWIR plume radiance phenomenology**, C. R. Quick, Jr., R. R. Petrin, Los Alamos National Lab. [6233-60]

3:50 pm: **The relationship between air pollution and satellite data from OCTS**, C. J. Wong, Univ. Sains Malaysia (Malaysia) [6233-61]

SESSION 12

Room: Osceola Breakout 5-6 Wed. 4:10 to 5:30 pm
Data Fusion

Chair: Fred A. Kruse, Horizon Geomaging, LLC

4:10 pm: **Analysis LIDAR and spectral imagery for scene classification in forested areas**, M. F. Helt, R. C. Olsen, A. M. Puetz, Naval Postgraduate School [6233-62]

4:30 pm: **Anomaly detection using the hyperspectral imaging testbed system**, D. B. Cavanaugh, Surface Optics Corp. [6233-63]

4:50 pm: **High-performance fusion of multispectral and hyperspectral data**, M. E. Winter, Univ. of Hawai'i at Manoa; E. M. Winter, Technical Research Associates, Inc.; S. G. Beaven, Space Computer Corp.; A. J. Ratkowski, Air Force Research Lab. [6233-64]

5:10 pm: **Overcoming combined effect of geometric distortion and object change in image registration and conflation**, B. Kovalerchuk, Y. Kamatkova, Central Washington Univ. [6233-65]

Thursday 20 April

SESSION 13

Room: Osceola Breakout 5-6 Thurs. 8:30 to 10:10 am

Emissive Remote Sensing

Chair: Paul E. Lewis, National Geospatial-Intelligence Agency

8:30 am: **Nonlinear signal contamination effects for gaseous plume detection in hyperspectral imagery**, J. Theiler, B. R. Foy, A. M. Fraser, Los Alamos National Lab. [6233-66]

8:50 am: **Land surface temperature and emissivity retrieval from thermal infrared hyperspectral imagery**, M. Boonmee, J. R. Schott, D. W. Messinger, Rochester Institute of Technology [6233-67]

9:10 am: **Temperature/emissivity separation (TES) utilizing a temperature-modulated spectrally-homogeneous region: an alternative perspective**, K. M. Lausten, R. G. Resmini, The Boeing Co. and The National Geospatial-Intelligence Agency [6233-68]

9:30 am: **Airborne mapping of chemical plumes in the aftermath of Hurricanes Katrina and Rita**, P. E. Lewis, National Geospatial-Intelligence Agency; B. Kroutil, Los Alamos National Lab.; M. J. Thomas, U.S. Environmental Protection Agency Region VII; R. J. Combs, Research and Technology Consultants; T. Curry, U.S. Environmental Protection Agency Region VII; A. Cummings, Tetra Tech EM Inc. [6233-69]

9:50 am: **Hyperspectral requirements for detection of trace explosive agents**, H. C. Schau, Raytheon Co. [6233-70]

Coffee Break 10:10 to 10:30 am

SESSION 14

Room: Osceola Breakout 5-6 Thurs. 10:30 am to 12:10 pm

Modeling and Simulation

Chair: Hsiao-hua K. Burke, MIT Lincoln Lab.

10:30 am: **Fast Monte Carlo full-spectrum scene simulation**, S. Richtsmeier, R. L. Sundberg, Spectral Sciences, Inc.; F. O. Clark, R. E. Haren, Air Force Research Lab. [6233-71]

10:50 am: **Application of large-eddy simulations of industrial effluents for hyperspectral remote sensing systems**, D. S. DeCroix, Los Alamos National Lab. [6233-72]

11:10 am: **Hyperspectral clutter statistics, generative models, and anomaly detection**, O. J. Watkins, M. Bernhardt, J. P. Heather, Waterfall Solutions Ltd. (United Kingdom) [6233-73]

11:30 am: **Johnson distribution models of hyperspectral image data clusters**, E. C. Meidunas, S. C. Gustafson, Air Force Institute of Technology; D. G. Manolakis, MIT Lincoln Lab. [6233-74]

11:50 am: **Principle of indirect comparison (PIC): simulation and analysis of PIC-based anomaly detection in multispectral data**, D. S. Rosario, Army Research Lab. [6233-75]

SESSION 15

Room: Osceola Breakout 5-6 Thurs. 12:10 to 12:25 pm

Special Presentation

Chair: Paul E. Lewis, National Geospatial-Intelligence Agency

12:10 pm: **Academic research program at the National Geospatial-Intelligence Agency (Invited Paper)**, S. A. Loomer, National Geospatial-Intelligence Agency [6233-76]

Lunch/Exhibition Break 12:25 to 1:40 pm

SESSION 16

Room: Osceola Breakout 5-6 Thurs. 1:40 to 3:00 pm

Spectral Unmixing

Chair: Glenn E. Healey, Univ. of California/Irvine

1:40 pm: **Improving the hyperspectral linear unmixing problem with unsupervised clustering and covariance estimates**, E. Brevdo, Princeton Univ.; K. Luu, Air Force Research Lab. [6233-77]

2:00 pm: **A comparison of algorithms to compute the positive matrix factorization and their application to unsupervised unmixing**, Y. M. Masalmah, M. Vélez-Reyes, Univ. de Puerto Rico Mayagüez [6233-78]

2:20 pm: **Error rates of unmixed hyperspectral imagery**, M. E. Winter, Univ. of Hawai'i at Manoa [6233-79]

2:40 pm: **Evaluations of spectral unmixing algorithms using ground based satellite imaging**, J. F. Scholl, College of Optical Sciences/The Univ. of Arizona; E. K. Hege, MKS Imaging Technology, LLC and Steward Observatory/The Univ. of Arizona; D. O'Connell, Oceanit, Inc.; W. R. Johnson, Jet Propulsion Lab.; E. L. Dereniak, College of Optical Sciences/Univ. of Arizona [6233-80]

Coffee Break 3:00 to 3:20 pm

SESSION 17

Room: Osceola Breakout 5-6 Thurs. 3:20 to 5:00 pm

Spectral Feature Extraction and Data Compression

Chair: Sylvia S. Shen, The Aerospace Corp.

3:20 pm: **Feature selection for spectral sensors with overlapping noisy spectral bands**, B. S. Paskaleva, M. M. Hayat, J. S. Tyo, Z. Wang, M. L. Martinez, The Univ. of New Mexico [6233-81]

3:40 pm: **Fukunaga-Koontz transform based dimensionality reduction for hyperspectral imagery**, S. Ochilov, M. S. Alam, A. Bal, Univ. of South Alabama [6233-82]

4:00 pm: **Linearly constrained band selection for hyperspectral imagery**, sS. Wang, C. Chang, Univ. of Maryland/Baltimore County [6233-83]

4:20 pm: **Spectral feature probabilistic coding for hyperspectral signatures**, S. Chakravarty, C. Chang, Univ. of Maryland/Baltimore County [6233-84]

4:40 pm: **Comparison of minimum spanning tree reordering with bias-adjusted reordering for lossless compression of 3D ultraspectral sounder data**, B. Huang, A. Ahuja, H. A. Huang, Univ. of Wisconsin/Madison; M. D. Goldberg, National Oceanic and Atmospheric Administration [6233-85]



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Related Courses

- SC149 **Multi-Sensor, Multi-Source Information Fusion: Architectures, Algorithms, and Applications** (*Dasarathy*) Tuesday 8:30 am to 5:30 pm
- SC158 **Fundamentals of Automatic Target Recognition** (*Nasr*) Thursday 8:30 am to 5:30 pm
- SC174 **Multispectral Image Processing** (*Schowengerdt*) Friday 8:30 am to 5:30 pm
- SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers** (*Vollmerhausen*) Monday 8:30 am to 5:30 pm
- SC194 **Multispectral and Hyperspectral Image Sensors** (*Lomheim*) Friday 1:30 pm to 5:30 pm
- SC714 **From FFTs to Wavelets for Image & Signal Processing** (*Smith, Burrus*) Tuesday 8:30 am to 12:30 pm
- SC715 **Real World Solutions by Blind Sources Separations & ICA** (*Szu, Makino*) Tuesday 1:30 pm to 5:30 pm
- SC728 **Network Centric Target Tracking and Classification** (*Drummond*) Friday 8:30 am to 5:30 pm

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Automatic Target Recognition XVI

Conference Chair: **Firooz A. Sadjadi**, Lockheed Martin Corp.

Program Committee: **Farid Amoozegar**, Jet Propulsion Lab.; **Mahmood R. Azimi-Sadjadi**, Colorado State Univ.; **David P. Casasent**, Carnegie Mellon Univ.; **Leon Cohen**, Hunter College/CUNY; **Belur V. Dasarathy**, Consultant; **Frederick D. Garber**, Wright State Univ.; **Guillermo C. Gaunard**, Army Research Lab.; **Izidor Gertner**, City College/CUNY; **Patti S. Gillespie**, Army Research Lab.; **Riad I. Hammoud**, Delphi Automotive Systems; **Bahram Javidi**, Univ. of Connecticut; **Ismail I. Jouny**, Lafayette College; **Behzad Kamgar-Parsi**, Naval Research Lab.; **Timothy J. Klausitis**, Air Force Research Lab.; **Wolfgang Kober**, Data Fusion Corp.; **Aaron D. Lanterman**, Georgia Institute of Technology; **Abhijit Mahalanobis**, Lockheed Martin Missiles & Fire Control; **Arthur W. Mansfield**, NASA Goddard Space Flight Ctr.; **Randolph L. Moses**, The Ohio State Univ.; **Robert R. Muise**, Lockheed Martin Missiles and Fire Control; **Nasser M. Nasrabadi**, Army Research Lab.; **Leslie M. Novak**, BAE Systems Advanced Information Technologies; **Joseph A. O'Sullivan**, Washington Univ.; **S. Richard F. Sims**, U.S. Army RDECOM, Aviation and Missile Research, Development and Engineering Ctr.; **Alan J. Van Nevel**, Naval Air Warfare Ctr.; **Bradley C. Wallet**, Automated Decisions, LLC; **Edmund G. Zelnio**, Air Force Research Lab.

Tuesday 18 April

SESSION 1

Room: Tampa 1 Tues. 8:30 am to 12:00 pm

3D/Laser-based Techniques

Chair: **Alan J. Van Nevel**, Naval Air Warfare Ctr.

- 8:30 am: **Rapid and scalable 3D object recognition using lidar data**, B. C. Matei, H. S. Sawhney, Sarnoff Corp. [6234-05]
- 8:50 am: **Multiresolution target manifold characterization for 3D imaging LADAR**, E. Whittenberger, D. E. Waagen, N. N. Shah, D. R. Hulsey, Raytheon Missile Systems [6234-02]
- 9:10 am: **Hierarchical searching in model-based LADAR ATR using statistical separability tests**, S. P. DelMarco, E. C. Sobel, J. Douglas, BAE Systems Advanced Information Technologies [6234-03]
- 9:30 am: **Using graphical models to segment airborne laser swath map (ALSM) data clouds**, J. T. Cobb, Naval Surface Warfare Ctr.; C. Slatton, Univ. of Florida [6234-04]
- Coffee Break 9:50 to 10:20 am

Keynote Presentation

10:20 am: **Three-dimensional imaging and recognition of microorganisms using computational holography** (*Invited Paper*), B. Javidi, S. Yeom, I. Moon, Univ. of Connecticut; E. M. Carapezza, DARPA and Cochair of DoD/DoJ Joint Program Committee Steering Group [6234-01]

- 11:00 am: **Model-based target detection and recognition with lidar imagery**, S. K. Ralph, C. S. Monnier, M. S. Snorrason, Charles River Analytics, Inc. [6234-06]
- 11:20 am: **Minimum probability of error recognition of three-dimensional laser-scanned targets**, M. D. DeVore, X. Zhou, Univ. of Virginia [6234-07]
- 11:40 am: **A statistical analysis of 3D structure sensors generated from LADAR imagery**, M. A. Ordaz, D. R. Hulsey, D. E. Waagen, Raytheon Missile Systems [6234-08]
- Lunch/Exhibition Break 12:00 to 1:00 pm

SESSION 2

Room: Tampa 1 Tues. 1:00 to 2:40 pm

Advanced Concepts in Target Classification I

Chair: **Robert R. Muise**, Lockheed Martin Missiles and Fire Control

- 1:00 pm: **Genetic algorithm based composite wavelet-matched filter for 0 to 360 degree out-of-plane rotations for target recognition**, A. K. Gupta, N. K. Nishchal, V. K. Beri, Instruments Research and Development Establishment (India) [6234-09]
- 1:20 pm: **Automated target detection and recognition in the process of interaction between visual and object buffers of scene understanding system based on network-symbolic models**, G. Kuvich, Smart Computer Vision Systems [6234-10]
- 1:40 pm: **Nonimaging detection of target shape, size, and pose**, S. M. Chandler, G. W. Lukesh, Nukove Scientific Consulting, LLC [6234-11]
- 2:00 pm: **A new methodology for target recognition and reconstruction of moving rigid-body targets**, S. Fazio, Defense Acquisition Univ.; L. Hong, Wright State Univ. [6234-12]
- 2:20 pm: **Model-based recognition using 3D invariants and stereo imaging**, M. T. Rahman, M. S. Alam, Univ. of South Alabama [6234-13]

SESSION 3

Room: Tampa 1 Tues. 2:40 to 5:30 pm

Correlation Filter-based Approaches in Target Classification

Chair: **Abhijit Mahalanobis**, Lockheed Martin Missiles and Fire Control

- 2:40 pm: **Subdivision of training image sets for composite correlation filter banks**, D. W. Carlson, A. Ramirez, N. N. Shah, D. E. Waagen, Raytheon Missile Systems [6234-14]
- 3:00 pm: **Adaptive determination of Eigenvalues and Eigenvectors from perturbed autocorrelation matrices for automatic target recognition**, P. Ragothaman, W. B. Mikhael, Univ. of Central Florida; R. R. Muise, A. Mahalanobis, Lockheed Martin Missiles and Fire Control; T. C. Yang, Embry-Riddle Aeronautical Univ. [6234-15]
- Coffee Break 3:20 to 3:50 pm
- 3:50 pm: **Target detection using texture operators**, J. M. Coggins, BAE Systems Advanced Information Technologies [6234-16]
- 4:10 pm: **Improved target detection algorithm using Fukunaga-Koontz transform and distance classifier correlation filter**, A. Bal, M. S. Alam, Univ. of South Alabama [6234-17]
- 4:30 pm: **Implementation of three-dimensional linear phase coefficient composite filter for head pose estimation**, D. S. Woon, L. G. Hassebrook, D. L. Lau, Z. Wang, Univ. of Kentucky [6234-18]
- 4:50 pm: **Binary phase-only reference for invariant pattern recognition with the joint transform correlator**, J. A. Butt, T. D. Wilkinson, Univ. of Cambridge (United Kingdom) [6234-19]
- 5:10 pm: **Effect of convolution and modulation on the time-varying spectrum of a signal with application in target recognition**, P. J. Loughlin, Univ. of Pittsburgh [6234-20]

Automatic Target Recognition Technical Group

Tues. 7:45 to 9:00 pm • Room: Tampa 1

Chair: **Farooz A. Sadjadi**, Lockheed Martin Corp.

Wednesday 19 April

SESSION 4

Room: Tampa 1 **Wed. 8:00 to 10:40 am**
EO/IR-based Techniques in Target Classification

Chair: Douglas G. Jones, Air Force Research Lab.

- 8:00 am: **Human detection and tracking** (*Invited Paper*), M. A. Shah, Univ. of Central Florida [6234-21]
- 8:40 am: **Real-time pre-ATR video data reduction in wireless networks**, T. P. Jansson, A. A. Kostrzewski, Physical Optics Corp. [6234-22]
- 9:00 am: **Efficient image stabilization and automatic target detection in aerial FLIR sequences**, E. Estalayo, L. Salgado, N. N. Garcia, F. Jaureguizar, Univ. Politécnica de Madrid (Spain) [6234-23]
- 9:20 am: **Target detection in FLIR imagery using independent component analysis**, A. Sadeque, M. S. Alam, A. Bal, Univ. of South Alabama. [6234-24]
- 9:40 am: **Multifractal simulation of atmospheric turbulence for long-distance surveillance in the infrared**, J. Blanc-Talon, M. Lemaitre, Ctr. d'Expertise Parisien (France) [6234-25]
- 10:00 am: **AKSED: adaptive knowledge-based system for event detection using collaborative unmanned aerial vehicles**, X. S. Wang, B. S. Lee, The Univ. of Vermont; F. A. Sadjadi, Lockheed Martin Corp. [6234-26]
- 10:20 am: **Toward practical pattern-theoretic ATR algorithms for infrared imagery**, J. A. Dixon, A. D. Lanterman, Georgia Institute of Technology . [6234-44]
- Coffee Break 10:40 to 11:00 am

SESSION 5

Room: Tampa 1 **Wed. 11:00 am to 12:00 pm**
Radar-based Target Classification I

Chair: Guillermo C. Gaunaud, Army Research Lab.

- 11:00 am: **MSTAR object classification and confuser and clutter rejection using MINACE filters**, R. Patnaik, D. P. Casasent, Carnegie Mellon Univ. [6234-27]
- 11:20 am: **Interferometer, ISAR, and passive identification**, M. Li, Consultant [6234-28]
- 11:40 am: **Bistatic SAR ATR using PCA-based features**, A. K. Mishra, B. Mulgrew, Univ. of Edinburgh (United Kingdom) [6234-29]
- Lunch/Exhibition Break 12:00 to 1:00 pm

SESSION 6

Room: Tampa 1 **Wed. 1:00 to 2:20 pm**
Radar-based Target Classification II

Chair: Guillermo C. Gaunaud, Army Research Lab.

- 1:00 pm: **Recognition of UWB radar targets**, I. I. Jouny, Lafayette College [6234-30]
- 1:20 pm: **Advances in Doppler recognition for ground moving target indication**, P. G. Kealey, M. Jahangir, QinetiQ Ltd. (United Kingdom) . . . [6234-31]
- 1:40 pm: **New experiments in the use of support vector machines in polarimetric radar target classification**, F. A. Sadjadi, Lockheed Martin Corp. [6234-32]
- 2:00 pm: **High-frequency sparse array synthesis for target identification signatures**, M. A. Hussain, U.S. Army Armament Research, Development and Engineering Ctr. [6234-46]

SESSION 7

Room: Tampa 1 **Wed. 2:20 to 4:20 pm**
Performance Evaluation Issues

Chair: S. Richard F. Sims, U.S. Army RDECOM, Aviation and Missile Research, Development and Engineering Ctr.

- 2:20 pm: **Comparison of optimization-algorithm based feature extraction from time data or time-frequency data for target recognition purposes**, H. C. Strifors, S. Abrahamson, T. Andersson, Swedish Defence Research Agency (Sweden); G. C. Gaunaud, Army Research Lab. [6234-33]
- 2:40 pm: **Image database generation using image metric constraints: an application within the CALADIOM project**, S. Landeau, T. Dagobert, Ctr. d'Expertise Parisien (France) [6234-34]
- Coffee Break 3:00 to 3:20 pm
- 3:20 pm: **Development of scale model imagery for ATR investigations**, J. M. Irvine, S. M. Bergeron, N. T. Delp, D. R. Lewis, Science Applications International Corp. [6234-35]
- 3:40 pm: **One-dimensional fractal error metric for motion detection in an image sequence**, B. S. Allen, L-3 Communications Cincinnati Electronics, Inc; D. Jansing, The Aerospace Corp. [6234-36]
- 4:00 pm: **Evaluation testbed for ATD performance prediction (ETAPP)**, S. K. Ralph, Charles River Analytics, Inc.; J. M. Irvine, Science Applications International Corp.; M. R. Stevens, M. S. Snorrason, Charles River Analytics, Inc. [6234-37]

SESSION 8

Room: Tampa 1 **Wed. 4:20 to 6:20 pm**
Advanced Concepts in Target Classification II

Chair: Izidor Gertner, City College/CUNY

- 4:20 pm: **Registration, detection, and tracking in 1/6-Hz barscan imagery**, A. Mahalanobis, A. V. Forman, J. C. Perez, H. Beydoun, Lockheed Martin Missiles and Fire Control [6234-38]
- 4:40 pm: **Recognition of propagating vibrations and invariant features for classification**, G. Okopal, P. J. Loughlin, Univ. of Pittsburgh; L. Cohen, Hunter College/CUNY [6234-40]
- 5:00 pm: **Recognition and classification of nonstationary background noises**, L. Cohen, Hunter College/CUNY; L. Galleani, Politecnico di Torino (Italy) [6234-41]
- 5:20 pm: **Evolutionary approach to human body registration**, I. V. Maslov, The Graduate Ctr./CUNY; I. Gertner, City College/CUNY [6234-42]
- 5:40 pm: **Distributed sensor networks data fusion schemes for detection of suspicious behaviors**, A. H. Shirkhodaie, H. Rababaah V, E. Kusco, Tennessee State Univ. [6234-43]
- 6:00 pm: **Information-theoretic bounds on target recognition performance from laser radar data**, J. A. Dixon, A. D. Lanterman, Georgia Institute of Technology [6234-45]

Related Courses

- SC158 **Fundamentals of Automatic Target Recognition (Nasr)** Thursday 8:30 am to 5:30 pm
- SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers (Vollmerhausen)** Monday 8:30 am to 5:30 pm
- SC714 **From FFTs to Wavelets for Image & Signal Processing (Smith, Burrus)** Tuesday 8:30 am to 12:30 pm
- SC715 **Real World Solutions by Blind Sources Separations & ICA (Szu, Makino)** Tuesday 1:30 pm to 5:30 pm
- SC728 **Network Centric Target Tracking and Classification (Drummond)** Friday 8:30 am to 5:30 pm

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Signal Processing, Sensor Fusion, and Target Recognition XV

Conference Chair: **Ivan Kadar**, Interlink Systems Sciences, Inc.

Program Committee: **Mark G. Alford**, Air Force Research Lab.; **Erik P. Blasch**, Air Force Research Lab.; **Mark J. Carlotto**, General Dynamics Corp.; **Kuo Chu Chang**, George Mason Univ.; **Chee-Yee Chong**, BAE Systems Advanced Information Technologies; **Marvin N. Cohen**, Georgia Tech Research Institute; **Mohammad Farooq**, Royal Military College of Canada (Canada); **Charles W. Glover**, Oak Ridge National Lab.; **I. R. Goodman**, Space and Naval Warfare Systems Ctr., San Diego; **Lynne L. Grewe**, California State Univ./Hayward; **Michael L. Hinman**, Air Force Research Lab.; **Kenneth J. Hintz**, George Mason Univ.; **Jon S. Jones**, Air Force Research Lab.; **Thiagalingam Kirubarajan**, McMaster Univ. (Canada); **Martin E. Liggins II**, The Mitre Corp.; **Perry C. Lindberg**, Teledyne Brown Engineering; **James Llinas**, SUNY/Univ. at Buffalo; **Ronald P. Mahler**, Lockheed Martin Corp.; **Raj P. Malhotra**, Air Force Research Lab.; **Alastair D. McAulay**, Lehigh Univ.; **Raman K. Mehra**, Scientific Systems Co., Inc.; **Harley R. Myler**, Lamar Univ.; **David Nicholson**, BAE Systems plc (United Kingdom); **Leslie M. Novak**, BAE Systems Advanced Information Technologies; **Andrew G. Tescher**, AGT Associates; **Stelios C. Thomopoulos**, Intelnet Inc. (Greece); **Wiley E. Thompson**, New Mexico State Univ.

Monday 17 April

SESSION 1

Room: Osceola 3-4 Mon. 8:15 to 9:55 am

Multisensor Fusion, Multitarget Tracking, and Resource Management I

Chairs: **Ivan Kadar**, Interlink Systems Sciences, Inc.;

Mohammad Farooq, Royal Military College of Canada (Canada)

8:15 am: **Observable operator model-based joint target tracking and classification**, S. Sutharsan, A. Sinha, T. Kirubarajan, McMaster Univ. (Canada) [6235-02]

8:35 am: **Impact time and point prediction: an analysis of the capabilities of a neural extended Kalman filter**, S. C. Stubberud, The Boeing Co.; K. A. Kramer, Univ. of San Diego [6235-03]

8:55 am: **A nonlinear filtering and predication (NFP) method for maneuvering target tracking**, H. Chen, K. C. Chang, George Mason Univ. [6235-04]

9:15 am: **Radar signals dismount imaging for tracking during urban operations**, E. P. Blasch, U. K. Majumder, M. J. Minardi, Air Force Research Lab. [6235-05]

9:35 am: **Multiple target tracking with a steerable airborne video sensor**, P. O. Arambel, M. Antone, BAE Systems Advanced Information Technologies [6235-06]

Coffee Break 9:55 to 10:25 am

SESSION 2

Room: Osceola 3-4 Mon. 10:25 am to 12:25 pm

Multisensor Fusion, Multitarget Tracking, and Resource Management II

Chairs: **Kenneth J. Hintz**, George Mason Univ.;

Mohammad Farooq, Royal Military College of Canada (Canada);

Ivan Kadar, Interlink Systems Sciences, Inc.

10:25 am: **Automatic motion model estimation and target detection in video sequences with arbitrary camera motion**, L. Ma, Arizona State Univ.; G. P. Abousleman, General Dynamics C4 Systems; J. Si, Arizona State Univ. [6235-07]

10:45 am: **Localized particle subset tracking for real-time video applications**, L. Ma, Arizona State Univ.; G. P. Abousleman, General Dynamics C4 Systems; J. Si, Arizona State Univ. [6235-08]

11:05 am: **Autonomous search, classification, and tracking by multiple cooperative UAVs**, A. Sinha, T. Kirubarajan, McMaster Univ. (Canada); Y. Bar-Shalom, Univ. of Connecticut [6235-09]

11:25 am: **An entropy-based approach to wide-area surveillance**, G. E. Collins, M. R. Meloon, K. J. Sullivan, Toyon Research Corp. [6235-10]

11:45 am: **A sparse sampling planner for sensor resource management**, M. Rudary, Univ. of Michigan; D. Khosla, HRL Labs., LLC; A. Dow, Univ. of California/Los Angeles; B. J. Blyth, Raytheon Co. [6235-11]

12:05 pm: **Instantiation of dynamic goals based on situation information in sensor management systems**, M. S. Henning, K. J. Hintz, George Mason Univ. [6235-12]

Lunch Break 12:25 to 1:40 pm

SESSION 3

Room: Osceola 3-4 Mon. 1:40 to 3:00 pm

Multisensor Fusion, Multitarget Tracking, and Resource Management III

Chairs: **Mohammad Farooq**, Royal Military College of Canada (Canada); **Thiagalingam Kirubarajan**, McMaster Univ. (Canada); **Ivan Kadar**, Interlink Systems Sciences, Inc.

1:40 pm: **Resource manager for autonomous control of a coordinated team of UAVs making meteorological measurements**, J. F. Smith III, Naval Research Lab. [6235-13]

2:00 pm: **Farsighted sensor management for feature-aided tracking**, A. Nedich, M. K. Schneider, X. Shen, BAE Systems Advanced Information Technologies; D. Lea, Air Force Research Lab. [6235-14]

2:20 pm: **A rollout algorithm to coordinate multiple sensor resources to track and discriminate targets**, M. K. Schneider, C. Chong, BAE Systems Advanced Information Technologies [6235-15]

2:40 pm: **Sensor management for multiple target tracking with heterogeneous sensor models**, J. L. Williams, J. W. Fisher III, A. S. Willsky, Massachusetts Institute of Technology [6235-16]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Osceola 3-4 Mon. 3:30 to 4:50 pm

Assisted Target Recognition (ATR)

Chairs: **Ivan Kadar**, Interlink Systems Sciences, Inc.;

Kenneth J. Hintz, George Mason Univ.

3:30 pm: **Real-time 3D ladar imaging**, P. L. Cho, H. Anderson, R. E. Hatch, P. Ramaswami, MIT Lincoln Lab. [6235-17]

3:50 pm: **START for evaluation of target detection and tracking**, S. K. Ralph, M. R. Stevens, Charles River Analytics, Inc.; J. M. Irvine, Science Applications International Corp.; J. Marvel, M. S. Snorasson, Charles River Analytics, Inc.; A. C. Rice, Air Force Research Lab. [6235-18]

4:10 pm: **Seeker-sensor fusion approaches for precision guided munitions**, W. C. Snyder, BAE Systems Advanced Information Technologies [6235-19]

4:30 pm: **Information management and target detection for multisensor airborne platforms**, K. J. Jaeger, M. Hebel, K. Bers, W. Armbruster, FGAN-FOM (Germany) [6235-20]

Invited Panel Discussion

Room: Osceola 3-4 Tues. 7:00 to 9:00 pm

Issues in Resource Management with Applications to Real-World Problems

Mon. 7:00 to 9:00 pm

*Chairs: Ivan Kadar, Interlink Systems Sciences, Inc.;
Ronald P. Mahler, Lockheed Martin Corp.*

*Moderators: Ivan Kadar, Interlink Systems Sciences, Inc.;
Thiagalingam Kirubarajan,
McMaster Univ. (Canada)*

*Panelists: David Castanon, Boston Univ.;
Mohamad Farooq, Royal Military College of Canada;
Kenneth Hinz, George Mason Univ.;
Ivan Kadar, Interlink Systems Sciences;
Thiagalingam Kirubarajan, McMaster Univ. (Canada);
Ronald P. Mahler, Lockheed Martin Corp.;
James Reich, Palo Alto Research Center (PARC)*

Tuesday 18 April

SESSION 5

Room: Osceola 3-4 Tues. 8:00 to 11:10 am

Multisensor Fusion Methodologies and Applications I

Chair: Ronald P. Mahler, Lockheed Martin Corp.

8:00 am: **A theory of PHD filters of higher order in target number**, R. P. Mahler, Lockheed Martin Corp. [6235-21]

8:20 am: **A distributed implementation of a sequential Monte Carlo probability hypothesis density filter for sensor networks**, K. Punithakumar, T. Kirubarajan, A. Sinha, McMaster Univ. (Canada) [6235-22]

8:40 am: **Advancements in situation assessment sensor management**, A. I. El-Fallah, A. Zatezalo, Scientific Systems Co., Inc.; R. P. Mahler, Lockheed Martin Corp.; R. K. Mehra, Scientific Systems Co., Inc.; M. G. Alford, Air Force Research Lab. [6235-23]

9:00 am: **Regularized multitarget particle filter for sensor management**, A. I. El-Fallah, A. Zatezalo, Scientific Systems Co., Inc.; R. P. Mahler, Lockheed Martin Corp.; R. K. Mehra, Scientific Systems Co., Inc.; M. G. Alford, Air Force Research Lab. [6235-24]

9:20 am: **Bayes-invariant transformations of uncertainty representations**, R. P. Mahler, Lockheed Martin Corp. [6235-25]

9:40 am: **Differential geometry measures of nonlinearity**, M. K. Mallick, Toyon Research Corp.; B. F. La Scala, The Univ. of Melbourne (Australia); M. S. Arulampalam, Defence Science and Technology Organisation (Australia) [6235-26]

Coffee Break 10:00 to 10:30 am

10:30 am: **Multi-environment NLF tracking assessment testbed (MENTAT): an update**, R. P. Mahler, Lockheed Martin Corp.; M. Ekhaus, Gibraltar Analytics, Inc.; J. A. Spinks, Lockheed Martin Corp.; L. Chen, Scientific Systems Co., Inc. [6235-28]

10:50 am: **Particle PHD-filter multitarget tracking and data association in sonar data**, D. E. Clark, J. M. Bell, Heriot-Watt Univ. (United Kingdom) [6235-29]

Lunch/Exhibition Break 11:10 am to 1:30 pm

SESSION 6

Room: Osceola 3-4 Tues. 1:30 to 4:40 pm

Multisensor Fusion Methodologies and Applications II

*Chairs: Martin E. Liggins II, The MITRE Corp.;
Chee-Yee Chong, BAE Systems Advanced Information Technologies;
Michael L. Hinman, Air Force Research Lab.*

1:30 pm: **A system approach to real-world data fusion**, F. E. Daum, Raytheon Co. [6235-30]

1:50 pm: **Algorithm comparison for autonomous distributed fusion**, M. E. Liggins II, The MITRE Corp. and George Mason Univ.; K. C. Chang, George Mason Univ. [6235-31]

2:10 pm: **Real-time radar data fusion and registration systems for single integrated air picture**, A. L. Drozd, ANDRO Computational Solutions; P. K. Varshney, Syracuse Univ.; I. P. Kasperovich, C. E. Carroll, ANDRO Computational Solutions; R. Niu, Syracuse Univ. [6235-32]

2:30 pm: **Performance measures for correlated ATR systems with multiple classifiers and multiple labels**, C. M. Schubert, S. N. Thorsen, M. E. Oxley, sK. W. Bauer, Jr., Air Force Institute of Technology [6235-33]

2:50 pm: **Quantifying the robustness of classification systems**, S. N. Thorsen, M. E. Oxley, Air Force Institute of Technology [6235-34]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Model-based multisource fusion for exploitation, classification, and recognition**, W. D. Williams, S. P. McCarty, E. R. Keydel, Science Applications International Corp. [6235-35]

4:00 pm: **Video image fusion process using fuzzy and neuro fuzzy technique**, T. J. Meitzler, U.S. Army Tank-automotive and Armaments Command [6235-36]

4:20 pm: **Optimization of multisource information fusion for resource management with remote sensing imagery: an aggregate regularization method with neural network implementation**, Y. V. Shkvarko IV, Ctr. de Investigación y de Estudios Avanzados (Mexico); S. Butenko, Texas A&M Univ. [6235-37]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

✓ Tropospheric aerosols remote sensing over the water surface of Penang Island, C. J. Wong, Univ. Sains Malaysia (Malaysia) [6235-62]

Wednesday 19 April

SESSION 7

Room: Osceola 3-4 Wed. 8:00 to 10:00 am

Multisensor Fusion Methodologies and Applications III

*Chairs: Michael L. Hinman, Air Force Research Lab.;
Ivan Kadar, Interlink Systems Sciences, Inc.*

8:00 am: **Issues and challenges of knowledge representation and reasoning methods in situation assessment (Level 2 Fusion)**, E. P. Blasch, Air Force Research Lab.; D. Corkill, Univ. of Massachusetts/Amherst; S. K. Das, Charles River Analytics, Inc.; I. Kadar, Interlink Systems Sciences, Inc.; M. M. Kokar, Northeastern Univ.; J. Llinas, SUNY/Univ. at Buffalo; G. M. Powell, U.S. Army CERDEC I2WD; E. H. Ruspini, SRI International; J. J. Salerno, Air Force Research Lab. [6235-38]

8:20 am: **Effective behavioral modeling and prediction even when few exemplars are available**, T. Goan, N. Kartha, Stottler Henke Associates, Inc. [6235-39]

8:40 am: **Evaluation of hybrid fusion 2+ approach for providing air-to-air situational awareness and threat assessment**, K. D. Lee, E. Wiesenfeld, M. Colony, Decisive Analytics Corp. [6235-40]
 9:00 am: **Belief network-based situation assessment for air operations centers**, P. G. Gonsalves, C. Call, Charles River Analytics, Inc. [6235-41]
 9:20 am: **Combination rules of evidence for situation assessment and target identification**, H. Sun, M. Farooq, Royal Military College of Canada (Canada) [6235-42]
 9:40 am: **Higher category theory as a paradigm for network applications**, J. R. Bonick, U.S. Army Night Vision & Electronic Sensors Directorate . . [6235-43]
 Coffee Break 10:00 to 10:30 am

SESSION 8

Room: Osceola 3-4 Wed. 10:30 to 11:50 am

Signal and Image Processing I

Chairs: **Lynne L. Grewe**, California State Univ./Hayward;
Alastair D. McAulay, Lehigh Univ.;
Mark G. Alford, Air Force Research Lab.

10:30 am: **A synergistic exploitation concept for wide-area search**, M. J. Carlotto, General Dynamics Corp. [6235-44]
 10:50 am: **Automatic clustering based on an information-theoretic approach with application to spectral anomaly detection**, M. J. Carlotto, General Dynamics Corp. [6235-45]
 11:10 am: **A fully automated image co-registration system**, D. A. Lavigne, Defence R&D Canada/Valcartier (Canada) [6235-46]
 11:30 am: **Automatic parameter selection for feature-based multisensor image registration**, S. P. DelMarco, V. T. Tom, H. F. Webb, A. Chao, BAE Systems Advanced Information Technologies [6235-47]
 Lunch/Exhibition Break 11:50 am to 1:00 pm

SESSION 9

Room: Osceola 3-4 Wed. 1:00 to 3:00 pm

Signal and Image Processing II

Chairs: **Mark G. Alford**, Air Force Research Lab.; **Lynne L. Grewe**, California State Univ./Hayward; **Alastair D. McAulay**, Lehigh Univ.

1:00 pm: **Strictly positive definite correlation functions**, J. T. Dolloff, B. A. Lofy, A. D. Sussman, C. R. Taylor, BAE Systems North America [6235-48]
 1:20 pm: **LAM: a landscape matching algorithm for respiratory data alignment**, L. Chen, T. McKenna, U.S. Army Medical Research and Materiel Command; A. Reisner, Massachusetts General Hospital; J. Reifman, U.S. Army Medical Research and Materiel Command [6235-49]
 1:40 pm: **Proximity graph analysis for linear networks extraction from high-resolution satellite imagery**, A. N. Skourikhine, Los Alamos National Lab. [6235-50]
 2:00 pm: **Image fusion for improved perception**, M. Ouendeno, S. P. Kozaitis, Florida Institute of Technology [6235-51]
 2:20 pm: **Hue-saturation-value feature analysis for robust ground moving target tracking in color aerial video**, S. M. Matechik, V. E. Zetterlind III, A. B. Johnson, The MITRE Corp. [6235-52]
 2:40 pm: **Secure and robust data hiding in binary images**, S. S. Agaian, R. C. Cherukuri, The Univ. of Texas at San Antonio [6235-53]
 Coffee Break 3:00 to 3:30 pm

SESSION 10

Room: Osceola 3-4 Wed. 3:30 to 5:50 pm

Signal and Image Processing III

Chairs: **Alastair D. McAulay**, Lehigh Univ.;
Mark G. Alford, Air Force Research Lab.;
Lynne L. Grewe, California State Univ./Hayward

3:30 pm: **Comparing artificial and biological dynamical neural networks**, A. D. McAulay, Lehigh Univ. [6235-54]
 3:50 pm: **Using self-organizing maps to determine observation threshold limit predictions in highly variant data**, C. Paganoni, Science Applications International Corp.; K. C. Chang, George Mason Univ.; M. Robblee, U.S. Geological Survey [6235-55]
 4:10 pm: **Measures of effectiveness for analysis of radar pulse train deinterleavers**, M. J. Thompson, S. Lin, J. C. Sciortino, Jr., Naval Research Lab. [6235-56]
 4:30 pm: **Transition matrices for the detection and removal of signal contamination in deinterleaved pulse trains**, D. C. Black, Naval Research Lab.; J. R. Altoft, Altek Systems Research LLC (Canada); J. C. Sciortino, Jr., Naval Research Lab. [6235-57]
 4:50 pm: **A comparison of TOA versus multiple parametric based radar pulse train deinterleavers**, S. Lin, M. J. Thompson, Naval Research Lab.; S. Davezac, Innovative Logistics Techniques, Inc.; J. C. Sciortino, Jr., Naval Research Lab. [6235-58]
 5:10 pm: **Performance measures for parameter extraction of sensor array point targets using the discrete chirp Fourier transform**, N. G. Santiago, C. Aceros, D. Rodriguez, Univ. de Puerto Rico Mayagüez [6235-59]
 5:30 pm: **Multiplicative mismatched filter for optimum sidelobe suppression in Barker codes**, A. T. Fam, I. Sarkar, SUNY/Univ. at Buffalo [6235-60]

Related Courses

- SC158 **Fundamentals of Automatic Target Recognition (Nasr)** Thursday 8:30 am to 5:30 pm
- SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers (Vollmerhausen)** Monday 8:30 am to 5:30 pm
- SC714 **From FFTs to Wavelets for Image & Signal Processing (Smith, Burrus)** Tuesday 8:30 am to 12:30 pm
- SC715 **Real World Solutions by Blind Sources Separations & ICA (Szu, Makino)** Tuesday 1:30 pm to 5:30 pm
- SC728 **Network Centric Target Tracking and Classification (Drummond)** Friday 8:30 am to 5:30 pm

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Signal and Data Processing of Small Targets 2006

Conference Chair: **Oliver E. Drummond**, Consulting Engineer

Program Committee: **Liyi Dai**, U.S. Army Research Office; **John R. Edwards**, SRS Technologies; **Lawrence E. Hoff**, Hoff Engineering; **Cornelius T. Leondes**, Univ. of California/Los Angeles; **Rabinder N. Madan**, Office of Naval Research; **Kachesh M. Pathak**, U.S. Army Space and Missile Defense Command; **Albert J. Perrella, Jr.**, Institute for Defense Analyses; **Richard D. Teichgraeber**, Lockheed Martin Corp.; **Juan R. Vasquez**, Air Force Institute of Technology; **Steven Waugh**, Missile Defense Agency

Luncheon Dialogues

Lunch breaks on Tuesday, Wednesday, and Thursday will provide an opportunity to meet in a small group with one or two distinguished individuals who will lead discussions on a topic of signal and data processing algorithms. Tables will be reserved for a no-host lunch. Make reservations at the entrance to the main conference room beginning Tuesday morning, 18 April.

Conference Location Will Alternate Each Year

In the year 2006, this conference is located in Orlando. Thereafter, it will alternate between San Diego in the Summer in odd years and Orlando in the Spring in even years.

Internet Web Posting

Program changes, workshop announcements, and the latest information about this conference will be posted on the Internet World Wide Web at: <http://home.att.net/~drummond/>

Invited Panel Discussion

Issues in Resource Management with Applications to Real-World Problems

Mon. 7:00 to 9:30 pm · Room: Osceola Breakout 3-4

Demonstrations and Open Discussion:

Signal and Data Processing

Tues. 8:00 to 10:00 pm · Room: Sarasota 1-2

Tuesday 18 April

SESSION 1

Room: Sarasota 1-2 Tues. 8:30 am to 12:00 pm
Small Target Signal Processing

Chairs: **Oliver E. Drummond**, Consulting Engineer;
Richard D. Teichgraeber, Lockheed Martin Corp.

- 8:30 am: **Novel nonlinear adaptive Doppler shift estimation technique (NADSET) for the coherent Doppler lidar system VALIDAR**, J. Y. Beyon, California State Univ./Los Angeles; G. J. Koch, NASA Langley Research Ctr. [6236-01]
- 8:55 am: **Analysis of subbanding techniques in blind source separation**, J. A. Kolba, I. I. Jouny, Lafayette College [6236-02]
- 9:20 am: **Tracking subpixel targets in domestic environments**, V. Govinda, J. F. Ralph, J. W. Spencer, J. Y. Goulermas, The Univ. of Liverpool (United Kingdom) [6236-03]
- 9:45 am: **Surveillance radar range-bearing centroid processing, part II: pulse compression waveforms and merged measurement processing**, B. J. Slocumb, Numerica Corp. [6236-45]
- Coffee Break 10:10 to 10:45 am
- 10:45 am: **Wind profiling by a coherent Doppler lidar system VALIDAR with a subspace decomposition approach**, J. Y. Beyon, California State Univ./Los Angeles; G. J. Koch, NASA Langley Research Ctr. [6236-05]
- 11:10 am: **Time-frequency methods for detection and classification of buried targets**, E. J. Kaminsky Bourgeois, M. Barbu, Univ. of New Orleans; L. D. Bibee, Naval Research Lab. [6236-06]
- 11:35 am: **Peak inspecting and signal recovery methods based on triple correlation**, H. Cao, Huazhong Univ. of Science and Technology (China) [6236-07]
- Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 2

Room: Sarasota 1-2 Tues. 1:30 to 5:25 pm
Small Target Data Processing

Chairs: **Liyi Dai**, U.S. Army Research Office;
Juan R. Vasquez, Air Force Institute of Technology

- 1:30 pm: **Improved target tracking using track quality measures**, A. Sinha, T. Kirubarajan, McMaster Univ. (Canada); Z. J. Ding, Raytheon Canada Ltd. (Canada) [6236-08]
- 1:55 pm: **Map-enhanced tracking II**, D. D. Sworder, Univ. of California/San Diego; J. E. Boyd, Cubic Defense Systems, Inc.; R. G. Hutchins, Naval Postgraduate School [6236-09]
- 2:20 pm: **Identification of missile guidance laws for missile warning systems applications**, J. F. Ralph, The Univ. of Liverpool (United Kingdom); M. I. Smith, J. P. Heather, Waterfall Solutions Ltd. (United Kingdom) [6236-10]
- 2:45 pm: **Nonlinear estimation techniques for impact point prediction of ballistic targets**, D. F. Hardiman, U.S. Army Research, Development and Engineering Command [6236-49]
- Coffee Break 3:10 to 3:45 pm

- 3:45 pm: **Maximum likelihood geolocation and track initialization using a ground moving target indicator (GMTI) report**, M. K. Mallick, P. Steiber, Toyon Research Corp. [6236-12]
- 4:10 pm: **Surface to air missile aim identification**, V. C. Ravindra, X. Lin, L. Lin, Y. Bar-Shalom, Univ. of Connecticut; S. R. Gottesman, Northrop Grumman Corp. [6236-13]
- 4:35 pm: **Monitoring of sensor covariance consistency**, S. S. Krigman, M. L. Smith, MIT Lincoln Lab. [6236-14]
- 5:00 pm: **Weiss-Weistein lower bound for maneuvering target tracking**, T. Sathyan, McMaster Univ. (Canada); M. L. Hernandez, QinetiQ Ltd. (United Kingdom); T. Kirubarajan, A. Sinha, McMaster Univ. (Canada) [6236-15]

✓ **Posters-Tuesday**

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 6:00 pm on Tuesday. Authors are asked to sign in, pick up their poster numbers, and receive board assignments at the poster desk in the Osceola Ballroom C. Posters that are not set-up by the 6:00 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Demonstration of a 5.12-GHz optoelectronics sampling circuit for analog-to-digital converters**, C. Villa, E. J. Donkor, P. D. Kumavor, Univ. of Connecticut [6236-46]
- ✓ **Adaptive processing to ensure practical application of a multiple hypothesis tracking system**, B. A. Cronin, B. K. Norman, R. J. Dempster, S. S. Blackman, Raytheon Space and Airborne Systems [6201-24] (Published in both proceedings volumes 6236 and 6201)

Wednesday 19 April

SESSION 3

Room: Sarasota 1-2 Wed. 8:30 am to 12:00 pm

Small Target Tracking

Chairs: **Kachesh M. Pathak**, U.S. Army Space and Missile Defense Command; **Steven Waugh**, Missile Defense Agency

- 8:30 am: **Conference Overview (Presentation Only)**, O. E. Drummond, CyberRnD, Inc. [6236-100]
- 8:55 am: **Enhanced multiple model tracker based on Gaussian mixture reduction for maneuvering targets in clutter**, P. S. Maybeck, M. C. Kozak, Air Force Institute of Technology [6236-16]
- 9:20 am: **Quasi-Monte Carlo particle filters: the junk filter**, F. E. Daum, Raytheon Co. [6236-17]
- 9:45 am: **IMM-based algorithms for target tracking with unknown ballistic coefficient**, Z. Zhao, H. Chen, Univ. of New Orleans; G. Chen, C. Kwan, Intelligent Automation Inc.; X. Li, Univ. of New Orleans [6236-18]
- Coffee Break 10:10 to 10:45 am
- 10:45 am: **Nonlinear tracking evaluation using absolute and relative metrics**, E. P. Blasch, A. C. Rice, Air Force Research Lab. [6236-19]
- 11:10 am: **Radar measurement noise variance estimation with targets of opportunity**, R. W. Osborne III, Y. Bar-Shalom, Univ. of Connecticut ... [6236-20]
- 11:35 am: **Optimal path planning for video-guided smart munition via multitarget tracking**, J. R. Vasquez, J. M. Borkowski, Air Force Institute of Technology [6236-21]
- Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 4

Room: Sarasota 1-2 Wed. 1:30 to 5:25 pm

Tracking and Related Data Processing

Chairs: **Oliver E. Drummond**, Consulting Engineer; **John R. Edwards**, SRS Technologies

- 1:30 pm: **Improving the passive sonar picture through reverse time tracking**, G. R. Mellema, Defense R&D Canada (Canada) [6236-22]
- 1:55 pm: **PHD filters of second order in target number**, R. P. Mahler, Lockheed Martin Corp. [6236-23]
- 2:20 pm: **Robust feature-aided association**, P. F. Singer, Raytheon Co. [6236-24]
- 2:45 pm: **Multiple target tracking with possibly unresolved radar measurements**, S. Mori, C. Chong, BAE Systems Advanced Information Technologies [6236-25]
- Coffee Break 3:10 to 3:45 pm
- 3:45 pm: **Fixed-lag sequential Monte Carlo data association**, M. Briers, QinetiQ Ltd. (United Kingdom) and Univ. of Cambridge (United Kingdom); A. Doucet, The Univ. of British Columbia (Canada); S. Maskell, QinetiQ Ltd. (United Kingdom) [6236-26]
- 4:10 pm: **Joint detection and tracking of unresolved targets with a joint-bin processing monopulse radar**, N. Nandakumaran, A. Sinha, T. Kirubarajan, McMaster Univ. (Canada) [6236-27]
- 4:35 pm: **Complexity reduction in MHT/MFA tracking, part II: hierarchical implementation and simulation results**, A. B. Poore, B. J. Slocumb, Numerica Corp. [6236-28]
- 5:00 pm: **A modified Murty algorithm for multiple hypothesis tracking**, Z. J. Ding, D. Vandervies, Raytheon Canada Ltd. (Canada) [6236-29]

Thursday 20 April

SESSION 5

Room: Sarasota 1-2 Thurs. 8:30 am to 12:00 pm

Multiple Sensor Data Fusion

Chairs: **Rabinder N. Madan**, Office of Naval Research; **Albert J. Perrella, Jr.**, Institute for Defense Analyses

- 8:30 am: **Multitarget-multisensor management for decentralized ad-hoc sensor networks**, R. Tharmarasa, T. Kirubarajan, McMaster Univ. (Canada); M. L. Hernandez, QinetiQ Ltd. (United Kingdom); A. Sinha, McMaster Univ. (Canada) [6236-30]
- 8:55 am: **Distributed multiple sensor tracking with the PMHT**, D. T. Dunham, Vectrass [6236-31]
- 9:20 am: **Improved trajectory tracking and launch point determination for ballistic missile defense**, R. G. Hutchins, P. E. Pace, Naval Postgraduate School [6236-32]
- 9:45 am: **Comparison of tracklet methods with deterministic dynamics and false signals**, O. E. Drummond, CyberRnD, Inc. [6236-33]
- Coffee Break 10:10 to 10:45 am
- 10:45 am: **Collaborative sensor management for multitarget tracking using decentralized Markov decision processes**, D. Akselrod, McMaster Univ. (Canada); C. Goldman, Univ. of Haifa (Israel); A. Sinha, T. Kirubarajan, McMaster Univ. (Canada) [6236-34]
- 11:10 am: **A hierarchical benchmark association problem**, J. A. Areta, Y. Bar-Shalom, Univ. of Connecticut; M. Levedahl, Raytheon Co. [6236-35]
- 11:35 am: **Advances in multisensor tracker performance modeling**, S. P. Coraluppi, NATO Undersea Research Ctr. (Italy) [6236-36]
- Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 6

Room: Sarasota 1-2 Thurs. 1:30 to 5:25 pm

Signal and Data Processing

*Chairs: Oliver E. Drummond, Consulting Engineer;
Richard D. Teichgraeber, Lockheed Martin Corp.*

- 1:30 pm: **Track management in a multisensor MHT for targets with aspect-dependent SNR**, W. R. Blanding, Univ. of Connecticut; S. P. Coraluppi, NATO Undersea Research Ctr. (Italy); P. K. Willett, Univ. of Connecticut [6236-37]
- 1:55 pm: **Sparse adaptive grids for nonlinear filters**, F. E. Daum, Raytheon Co. [6236-38]
- 2:20 pm: **On target track covariance consistency**, O. E. Drummond, CyberRnD, Inc.; A. J. Perrella, Jr., Institute for Defense Analyses; S. Waugh, Missile Defense Agency [6236-39]
- 2:45 pm: **On adaptive phased-array tracking in the presence of main-lobe jammer suppression**, W. Koch, FGAN-FHR (Germany) [6236-40]
- Coffee Break 3:10 to 3:45 pm
- 3:45 pm: **Nonlinear least-squares estimation for sensor and navigation biases**, S. M. Herman, A. B. Poore, Numerica Corp. [6236-41]
- 4:10 pm: **Estimating the DOA and SNR of separating targets**, L. M. Ehrman, Georgia Institute of Technology; W. D. Blair, Georgia Tech Research Institute; P. K. Willett, Univ. of Connecticut [6236-42]
- 4:35 pm: **The probability hypothesis density filter in detection of target spawn**, P. K. Willett, Y. Bar-Shalom, O. Erdinc, Univ. of Connecticut . . . [6236-43]
- 5:00 pm: **Joint IMM/MHT tracking and identification with confusers**, J. A. Lancaster, S. S. Blackman, E. T. Taniguchi, Raytheon Space and Airborne Systems [6236-44]

Related Courses

- SC158 **Fundamentals of Automatic Target Recognition** (*Nasr*) Thursday 8:30 am to 5:30 pm
- SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers** (*Vollmerhausen*) Monday 8:30 am to 5:30 pm
- SC714 **From FFTs to Wavelets for Image & Signal Processing** (*Smith, Burrus*) Tuesday 8:30 am to 12:30 pm
- SC715 **Real World Solutions by Blind Sources Separations & ICA** (*Szu, Makino*) Tuesday 1:30 pm to 5:30 pm
- SC728 **Network Centric Target Tracking and Classification** (*Drummond*) Friday 8:30 am to 5:30 pm

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Algorithms for Synthetic Aperture Radar Imagery XIII

Conference Chairs: **Edmund G. Zelnio**, Air Force Research Lab.; **Frederick D. Garber**, Wright State Univ.

Program Committee: **Bir Bhanu**, Univ. of California/Riverside; **Mujdat Çetin**, Massachusetts Institute of Technology; **Dan E. Dudgeon**, BAE Systems plc; **Gil J. Ettinger**, BAE Systems Advanced Information Technologies; **Robert A. Hummel**, DARPA; **Charles V. Jakowatz, Jr.**, Sandia National Labs.; **Eric R. Keydel**, Science Applications International Corp.; **John M. Miller**, Army Research Lab.; **Randolph L. Moses**, The Ohio State Univ.; **Brian D. Rigling**, Wright State Univ.; **Timothy D. Ross**, Air Force Research Lab.; **Gerard W. Titi**, DARPA; **Stephen P. Welby**, DAPRA; **Robert L. Williams**, Air Force Research Lab.

Innovative Format

This conference will follow a "Briefing, Poster Presentation, Panel Discussion/Workshop" format. During the first sessions of each day, authors will highlight the results for their work in 10 minute briefings. After the presentations, these same authors will be available for in-depth discussion in an extended poster session setting. After the Poster Presentation, there will be a Panel Discussion where experts and audience will address pressing issues from the sessions that day.

Monday 17 April

Prolog

Room: **Osceola Ballroom B** Mon. 1:50 to 2:00 pm
Chair: **Edmund G. Zelnio**, Air Force Research Lab.

SESSION 1

Room: **Osceola Ballroom B** Mon. 2:00 to 3:00 pm

Technical Challenges for Urban Environments

Chair: **Robert L. Williams**, Air Force Research Lab.

2:00 pm: **SAR challenges for urban environments** (*Invited Paper*), R. L. Williams, Air Force Research Lab. [6237-01]

2:20 pm: **Urban scene analysis from SAR image sequences**, D. Blacknell, R. D. Hill, C. P. Moate, QinetiQ Ltd. (United Kingdom) [6237-02]

2:30 pm: **Building recognition from multi-aspect high-resolution interferometric SAR data in urban areas**, A. Thiele, U. Thoennessen, U. Soergel, FGAN-FOM (Germany) [6237-03]

2:40 pm: **Radar signals dismount data production**, U. K. Majumder, M. J. Minardi, E. P. Blasch, Air Force Research Lab. [6237-04]

2:50 pm: **Theoretical radar-Doppler models for pivoting mechanical and biological objects-of-interest**, A. K. Mitra, Air Force Research Lab. [6237-05]

Coffee Break 3:00 to 3:30 pm

POSTER SESSION Mon. 3:30 to 4:30 pm

PANEL DISCUSSION/WORKSHOP Mon. 4:30 to 5:30 pm

Related Courses

- SC158 **Fundamentals of Automatic Target Recognition** (*Nasr*) Thursday 8:30 am to 5:30 pm
- SC162 **SAR Signal Processing** (*Soumekh*) Friday 8:30 am to 5:30 pm
- SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers** (*Vollmerhausen*) Monday 8:30 am to 5:30 pm
- SC714 **From FFTs to Wavelets for Image & Signal Processing** (*Smith, Burrus*) Tuesday 8:30 am to 12:30 pm
- SC715 **Real World Solutions by Blind Sources Separations & ICA** (*Szu, Makino*) Tuesday 1:30 pm to 5:30 pm
- SC728 **Network Centric Target Tracking and Classification** (*Drummond*) Friday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Tuesday 18 April

Introduction

Room: **Osceola Ballroom B** Tues. 8:30 to 8:35 am
Chair: **Charles V. Jakowatz, Jr.**, Sandia National Labs.

SESSION 2

Room: **Osceola Ballroom B** Tues. 8:35 to 9:25 am

Advanced 3D Imaging

Chair: **Charles V. Jakowatz, Jr.**, Sandia National Labs.

8:35 am: **Angular description for 3D scattering centers**, R. Bhalla, Science Applications International Corp.; A. Raynal, H. Ling, The Univ. of Texas at Austin; J. Moore, Science Applications International Corp.; V. J. Velten, Air Force Research Lab. [6237-06]

8:45 am: **IFSAR image reconstruction with multiple scattering centers in a resolution cell**, C. D. Austin, R. L. Moses, The Ohio State Univ. [6237-07]

8:55 am: **Feature extraction algorithm for scene visualization using 3D bistatic SAR**, J. A. Jackson, The Ohio State Univ.; B. D. Rigling, Wright State Univ.; R. L. Moses, The Ohio State Univ. [6237-08]

9:05 am: **SAR depth-of-focus: achieving three-dimensional resolution with wide-angle apertures**, L. Moore, L. C. Potter, The Ohio State Univ. [6237-10]

9:15 am: **A 6-18 GHz 3D ISAR data collection system**, C. J. Beaudoin, A. J. Gatesman, R. H. Giles, J. Waldman, Univ. of Massachusetts/Lowell; W. E. Nixon, U.S. Army National Ground Intelligence [6237-11]

Introduction

Room: **Osceola Ballroom B** Tues. 9:25 to 9:30 am
Chair: **Randolph L. Moses**, The Ohio State Univ.

SESSION 3

Room: **Osceola Ballroom B** Tues. 9:30 to 11:40 am

Advanced 2D Imaging

Chair: **Randolph L. Moses**, The Ohio State Univ.

9:30 am: **Efficient algorithm for SAR 2D stripmapping**, J. Burki, C. F. Barnes, Georgia Institute of Technology [6237-12]

9:40 am: **System analysis of a short-range SAR repeater**, J. A. Montes de Oca, B. D. Rigling, Wright State Univ. [6237-13]

9:50 am: **Joint image formation and anisotropy characterization in wide-angle SAR**, K. R. Varshney, Massachusetts Institute of Technology; M. Çetin, Sabanci Univ. (Turkey) and Massachusetts Institute of Technology; J. W. Fisher III, A. S. Willsky, Massachusetts Institute of Technology [6237-14]

Coffee Break 10:00 to 10:30 am

10:30 am: **A compact low-cost wide-angle radar test bed**, J. D. Gorman, SET Corp.; U. K. Majumder, Air Force Research Lab.; R. L. Dilsavor, J. C. Reed, SET Corp.; M. J. Minardi, E. G. Zelnio, Air Force Research Lab. [6237-15]

10:40 am: **A comparison of fully polarimetric x-band ISAR imagery of scaled model tactical targets**, T. M. Goyette, J. C. Dickinson, J. Waldman, R. H. Giles, Univ. of Massachusetts/Lowell; W. E. Nixon, U.S. Army National Ground Intelligence Ctr. [6237-16]

10:50 am: **Implementation and analysis of a fast backprojection algorithm** (*Invited Paper*), L. A. Gorham, Air Force Research Lab. [6237-17]

11:10 am: **Comparison of polar formatting and back-projection algorithms for spotlight-mode SAR image formation**, C. V. Jakowatz, Jr., N. E. Doren, Sandia National Labs. [6237-18]

11:20 am: **Correction of propagation-induced defocus effects in certain spotlight-mode SAR collections**, C. V. Jakowatz, Jr., Sandia National Labs.; S. Schmerwitz, DLR (Germany) [6237-19]

11:30 am: **Multistage entropy minimization for SAR image autofocus**, B. D. Rigling, Wright State Univ. [6237-20]

Lunch/Exhibition Break 11:40 am to 1:30 pm

POSTER SESSION Tues. 1:30 to 3:00 pm

Coffee Break 3:00 to 3:30 pm

PANEL DISCUSSION/WORKSHOP Tues. 3:30 to 4:30 pm

Wednesday 19 April

Introduction

Room: Osceola Ballroom B Wed. 9:00 to 9:05 am

Chair: Stephen P. Welby, DARPA

SESSION 4

Room: Osceola Ballroom B Wed. 9:05 to 10:05 am

Detection Techniques

Chair: Stephen P. Welby, DARPA

9:05 am: **A challenge problem for detection of targets in foliage**, M. Lundberg, L. M. Ulander, Swedish Defence Research Agency (Sweden); W. E. Pierson, Jr., Air Force Research Lab.; A. Gustavsson, Swedish Defence Research Agency (Sweden) [6237-21]

9:15 am: **Target detection using an improved fractal scheme**, D. Charalampidis, G. W. Stein, Univ. of New Orleans [6237-22]

9:25 am: **Unified measures of target detection performance**, D. R. Parker, S. C. Gustafson, Air Force Institute of Technology; T. D. Ross, Air Force Research Lab. [6237-23]

9:35 am: **Kernel Wiener filter-based change detection**, M. G. Tates, Army Research Lab. and Morgan State Univ.; N. M. Nasrabadi, H. Kwon, Army Research Lab.; C. White, Morgan State Univ. [6237-24]

9:45 am: **A new coherent change detection algorithm for FOPEN SAR** (*Invited Paper*), L. M. Novak, BAE Systems Advanced Information Technologies [6237-25]

Coffee Break 10:05 to 10:40 am

Introduction

Room: Osceola Ballroom B Wed. 10:40 to 10:45 am

Chair: Timothy D. Ross, Air Force Research Lab.

SESSION 5

Room: Osceola Ballroom B Wed. 10:45 to 11:45 am

Classification Techniques

Chair: Timothy D. Ross, Air Force Research Lab.

10:45 am: **Assessment of a novel decision and reject method for multiclass problems in a target classification framework for SAR scenarios**, W. Middelman, A. Ebert, U. Thoennessen, FGAN-FOM (Germany) [6237-28]

10:55 am: **Dependence of automatic target recognition accuracy on synthetic aperture radar phase distortion**, L. J. Montagnino, Raytheon Missile Systems [6237-29]

11:05 am: **Generalized bundle adjustment for joint target recognition and image registration**, E. M. Lavelly, BAE Systems Advanced Information Technologies; E. P. Blasch, Air Force Research Lab. [6237-30]

11:15 am: **Attaining desired ATR performance using non-forced declaration ROC curves**, E. P. Blasch, J. D. Leonard, Jr., Air Force Research Lab. . . [6237-31]

11:25 am: **Improved ATR value through enhancement accommodations and affordability** (*Invited Paper*), T. D. Ross, L. Goodwon, Air Force Research Lab. [6237-32]

Lunch/Exhibition Break 11:45 am to 1:40 pm

POSTER SESSION Wed. 1:40 to 3:10 pm

Coffee Break 3:10 to 3:30 pm

PANEL DISCUSSION/WORKSHOP Wed. 3:30 to 4:40 pm

Thursday 20 April

Introduction

Room: Osceola Ballroom B Thurs. 8:30 to 8:35 am

Chair: Gerard W. Titi, DARPA

SESSION 6

Room: Osceola Ballroom B Thurs. 8:35 to 9:55 am

SAR-based MTI Systems

Chair: Gerard W. Titi, DARPA

8:35 am: **Detecting moving targets in clutter in airborne SAR** (*Invited Paper*), D. M. Zasada, The MITRE Corp. [6237-33]

8:55 am: **SAR change detection MTI** (*Invited Paper*), G. J. Owirka, BAE Systems Advanced Information Technologies [6237-34]

9:15 am: **An iterative approach for moving target detection and geolocation in SAR** (*Invited Paper*), T. L. Lewis, Air Force Research Lab. [6237-36]

9:35 am: **Tracking analysis of long-dwell SAR-based MTI** (*Invited Paper*), M. J. Minardi, Air Force Research Lab. [6237-37]

Coffee Break 9:55 to 10:30 am

POSTER SESSION Thurs. 10:30 to 11:00 am

PANEL DISCUSSION/ WORKSHOP . Thurs. 11:00 am to 12:00 pm

Acquisition, Tracking, and Pointing XX

Conference Chairs: **Michael K. Masten**, Texas Instruments Inc.; **Larry A. Stockum**, The Boeing Co.; **William E. Thompson**, Air Force Research Lab.

Cochairs: **Ali T. Alouani**, Tennessee Technological Univ.; **Steven L. Chodos**, Boeing-SVS, Inc.; **James E. Kimbrell**, L-3 Communications/Brashear

Program Committee: **John E. Gray**, Naval Surface Warfare Ctr.; **Gillian K. Groves**, Raytheon Co.; **Ricky K. Hammon**, U.S. Army Aviation and Missile Command; **Luanne P. Obert**, U.S. Army Night Vision & Electronic Sensors Directorate; **Henry R. Sebesta**, Applied Technology Associates;

Larisa Stephan, Raytheon Co.; **Gregory A. Watson**, SPARTA, Inc.

Tuesday 18 April

SESSION 1

Room: Sarasota 3 Tues. 8:00 to 11:10 am

Laser Systems Acquisition, Tracking, and Pointing Technologies

Chairs: **William E. Thompson**, Air Force Research Lab.;
Larry A. Stockum, The Boeing Co.;
Henry R. Sebesta, Applied Technology Associates

8:00 am: **ARMS dual line-of-site acquisition, tracking, and pointing system**, A. Daniels, S. A. Baugh, D. R. Eastman, Boeing-SVS, Inc. [6238-01]

8:20 am: **Practical to tactical: an evolution of the dual line-of-sight experiment**, C. D. Stargardt, D. J. Riedle, K. J. Warden, A. A. Lazzaro, F. B. Zoltowski, Boeing SVS, Inc. [6238-02]

8:40 am: **Laser system for cooperative pointing and tracking of moving terminals over long distance**, D. S. Grinch, J. A. Cunningham, D. S. Fisher, ITT Industries, Inc. [6238-03]

9:00 am: **Estimation filters for missile tracking with airborne laser**, T. M. Clemons III, George Mason Univ. and Dept. of Defense; K. C. Chang, George Mason Univ. [6238-04]

9:20 am: **Characterization and removal of quasi-periodic elevation bias in airborne laser swath mapping data**, K. C. Slatton, K. Shih, T. Cossio, W. E. Carter, Univ. of Florida [6238-05]

9:40 am: **System integration for the coastal area tactical-mapping system (CATS)**, W. E. Carter, K. Shrestha, T. Cossio, K. C. Slatton, R. L. Shrestha, Univ. of Florida [6238-10]

Coffee Break 10:00 to 10:30 am

10:30 am: **Amplitude-phase adaptive correction of optical waves distortions**, V. P. Lukin, Institute of Atmospheric Optics (Russia) [6238-07]

10:50 am: **Methodology of furnace unit for growing large optic crystals in LWS**, A. A. Abgaryan, ARTGO LLC [6238-08]

SESSION 2

Room: Sarasota 3 Tues. 11:10 am to 12:10 pm

Tracking Systems Technologies I

Chairs: **James E. Kimbrell**, L-3 Brashear;
Michael K. Masten, Texas Instruments Inc.;
Steven L. Chodos, Boeing-SVS, Inc.

11:10 am: **Tracking filter algorithm for automatic video tracking**, M. A. McEver, J. E. Kimbrell, L-3 Brashear [6238-09]

11:30 am: **Autonomous target re-acquisition after image disturbance**, L. D. Wren, J. R. Thornton, D. White, J. L. Dale, Octec Ltd. (United Kingdom) [6238-06]

11:50 am: **Orbital ephemeris correction based on real-time observations**, J. E. Kimbrell, L-3 Brashear; R. S. Hujsak, Analytical Graphics, Inc. [6238-11]

Lunch/Exhibition Break 12:10 to 1:30 pm

SESSION 3

Room: Sarasota 3 Tues. 1:30 to 2:50 pm

Tracking Systems Technologies II

Chairs: **James E. Kimbrell**, L-3 Brashear;
Michael K. Masten, Texas Instruments Inc.;
Steven L. Chodos, Boeing-SVS, Inc.

1:30 pm: **Spherical alignment of imagers using optical flow fields**, B. Lambert, J. F. Ralph, The Univ. of Liverpool (United Kingdom); L. D. Wren, J. L. Dale, Octec Ltd. (United Kingdom) [6238-12]

1:50 pm: **Electronic image stabilization based on the spatial intensity gradient**, D. R. Droege, L-3 Communications Cincinnati Electronics, Inc. [6238-13]

2:10 pm: **Study of compact stereoscopic system for target distance estimation**, D. J. Bankman, Johns Hopkins Univ. [6238-14]

2:30 pm: **Automated position estimation of target using view extrapolation**, H. Noor, S. H. Mirza, NED Univ. of Engineering and Technology (Pakistan) [6238-16]

Coffee Break 2:50 to 3:30 pm

SESSION 4

Room: Sarasota 3 Tues. 3:30 to 4:30 pm

Algorithms for Radar Tracking Systems

Chairs: **Ali T. Alouani**, Tennessee Technological Univ.;
John E. Gray, Naval Surface Warfare Ctr.;
Michael K. Masten, Texas Instruments Inc.

3:30 pm: **A MUSIC (multiple signal classification) algorithm for specifying azimuth, elevation, and range of multiple sources**, R. R. Zito, Raytheon Co. [6238-17]

3:50 pm: **Performance analysis of fuzzy logic particle filter compared to fuzzy IMM in tracking high-performance targets**, H. Z. Kamel, W. Badawy, Univ. of Calgary (Canada) [6238-18]

4:10 pm: **Simplified generalized asynchronous track to track fusion filter**, A. T. Alouani, Tennessee Technological Univ.; J. E. Gray, Naval Surface Warfare Ctr. [6238-19]

Related Courses

- SC158 **Fundamentals of Automatic Target Recognition (Nasr)** Thursday 8:30 am to 5:30 pm
- SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers (Vollmerhausen)** Monday 8:30 am to 5:30 pm
- SC714 **From FFTs to Wavelets for Image & Signal Processing (Smith, Burrus)** Tuesday 8:30 am to 12:30 pm
- SC715 **Real World Solutions by Blind Sources Separations & ICA (Szu, Makino)** Tuesday 1:30 pm to 5:30 pm
- SC725 **Optical & Laser Scanning Technology: Devices, Systems & Applications (Marshall)** Wednesday 8:30 am to 5:30 pm
- SC728 **Network Centric Target Tracking and Classification (Drummond)** Friday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Targets and Backgrounds XII: Characterization and Representation

Conference Chairs: **Wendell R. Watkins**, Independent Consultant; **Dieter Clement**, FGAN-FOM (Germany)

Program Committee: **Jerrell R. Ballard, Jr.**, U.S. Army Corps of Engineers; **Scott D. Brown**, Rochester Institute of Technology; **Frank R. Carlen**, U.S. Army Aberdeen Test Ctr.; **Kevin M. Dennen**, U.S. Army Redstone Technical Test Ctr.; **Marilyn A. Gilmore**, Defence Science and Technology Lab. (United Kingdom); **Victoria R. Hahn**, Raytheon Missile Systems; **Heard S. Lowry III**, Aerospace Testing Alliance; **Frode B. Olsen**, Norwegian Defence Research Establishment (FFI) (Norway); **J. Warren Pickard, Jr.**, Trideum; **Ingmar G. E. Renhorn**, Swedish Defence Research Agency (Sweden); **Bernard Rosier**, ONERA (France); **David J. Thomas**, U.S. Army Tank-automotive and Armaments Command; **James C. Wiltse**, Georgia Institute of Technology; **Gary Witus**, Turing Associates, Inc.

Monday 17 April

Opening Remarks

Room: Gainesville 1-2 Mon. 8:40 to 8:45 am

Chair: **Wendell R. Watkins**, Independent Consultant

SESSION 1

Room: Gainesville 1-2 Mon. 8:45 am to 12:15 pm

New Sensing Detectors, Tools, and Techniques

Chairs: **Kevin M. Dennen**, U.S. Army Redstone Technical Test Ctr.;
Frode B. Olsen, Norwegian Defence Research
Establishment (FFI) (Norway)

8:45 am: **Informational processes in visual and object buffers of scene understanding system for reliable target detection, separation from background, and identification**, G. Kuvich, Smart Computer Vision Systems [6239-01]

9:05 am: **Online road appearance learning and road detection using domain knowledge and high-level reasoning**, H. Cheng, J. Cook, Sarnoff Corp. [6239-02]

9:25 am: **Maximizing diversity in synthesized hyperspectral images**, O. O. Fadiran, P. Molnar, Clark Atlanta Univ. [6239-03]

9:45 am: **Target classification using curvature scale spaces**, H. C. Morris, San José State Univ.; M. M. De Pass, Claremont Graduate Univ. [6239-04]

Coffee Break 10:05 to 10:35 am

10:35 am: **Attribution of soil information associated with modeling background clutter**, G. L. Mason, R. A. Melloh, U.S. Army Engineer Research and Development Ctr. [6239-05]

10:55 am: **Adaptive AOTF-based spectrometer for real-time environment monitoring**, V. I. Pustovoit, V. E. Pozhar, Russian Academy of Sciences (Russia) [6239-06]

11:15 am: **Numerical modeling of magnetic moments for UXO applications**, V. Sanchez, Y. Li, M. Nabighian, Colorado School of Mines; D. L. Wright, U.S. Geological Survey [6239-07]

11:35 am: **Analysis of Doppler measurements of people**, R. J. Tan, Army Research Lab. [6239-08]

11:55 am: **Development of a Terahertz short range imaging model**, S. G. O'Brien, D. H. Tofsted, Army Research Lab. [6239-09]

Lunch Break 12:15 to 1:30 pm

SESSION 2

Room: Gainesville 1-2 Mon. 1:30 to 5:00 pm

Target and Background Modeling

Chairs: **J. Warren Pickard, Jr.**, Trideum;
Ingmar G. E. Renhorn, Swedish Defence Research Agency (Sweden)

1:30 pm: **Hyperspectral signature modeling for terrain backgrounds**, J. M. Cathcart, A. D. Sheffer, Jr., R. D. Bock, Georgia Institute of Technology [6239-10]

1:50 pm: **Military applications of hyperspectral imagery**, X. Briottet, Y. Boucher, ONERA (France); A. Dimmeler, FGAN-FOM (Germany); A. Malaplate, ONERA (France); A. Cini, CiSAM (Italy); M. Diani, Univ. di Pisa (Italy); H. H. P. T. Bekman, TNO-FEL (Netherlands); P. B. W. Schwing, TNO (Netherlands); T. Skauli, I. Kåsen, Norwegian Defense Research Establishment (Norway); I. G. E. Renhorn, L. M. Klasen, Swedish Defence Research Agency (Sweden); M. A. Gilmore, D. Oxford, Defence Science and Technology Lab. (United Kingdom) ... [6239-11]

2:10 pm: **Irma 5.1 multisensor signature prediction model**, J. C. Savage, D. G. Edwards, Air Force Research Lab.; B. Thai, A. Chow, N. Yamaoka, C. Kim, Northrop Grumman Corp. [6239-12]

2:30 pm: **Adaptive Gabor filters for infrared target modeling in the modulation domain**, J. P. Havlicek, C. Nguyen, M. B. Yearly, Univ. of Oklahoma ... [6239-13]

2:50 pm: **Integrating CameoSim and MuSES to support vehicle-terrain interaction in an IR synthetic scene**, A. R. Curran, J. S. Curlee, ThermoAnalytics, Inc. [6239-14]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Real-time simulation tools in the CHORALE workshop**, T. Cathala, J. Latger, OKTAL Synthetic Environment (France); A. Y. Le Goff, DGA/DCE/CELAR (France); P. Gozard, DGA/DSP/Tour DGA (France) [6239-15]

4:00 pm: **Modeling optical turbulence in the atmospheric boundary layer**, D. H. Tofsted, S. G. O'Brien, Army Research Lab. [6239-16]

4:20 pm: **Marine environment background synthesis using MODTRAN 4**, V. Ross, AEREX avionique inc. (Canada); D. Dion, Jr., Defense Research Establishment Valcartier Canada (Canada) [6239-17]

4:40 pm: **MATISSE: version 1.4 and future developments**, P. Simoneau, K. Caillault, S. Fauqueux, T. Huet, L. Labarre, C. Malherbe, ONERA (France) [6239-18]

Tuesday 18 April

SESSION 3

Room: Gainesville 1-2 **Tues. 8:00 to 11:30 am**

Model Validations and System Comparisons

Chairs: **Marilyn A. Gilmore**, Defence Science and Technology Lab. (United Kingdom); **Bernard Rosier**, ONERA (France)

8:00 am: **Sea-surface simulation in the infrared modeling and validation**, F. Schwenger, E. Repasi, FGAN-FOM (Germany) [6239-19]

8:20 am: **Validation of ShipIR (v3.2): methodology and results**, D. A. Vaitekunas, W. R. Davis Engineering, Ltd. (Canada) [6239-20]

8:40 am: **Determination of apparent areas in temperature intervals in registered IR images and thermal simulations**, M. Georgson, M. Hörnberg, BAE Systems Hägglunds (Sweden); K. Johansson, D. Ponkala, Luleå Technical Univ. (Sweden) [6239-21]

9:00 am: **Validation of IR computation codes by confronting their results with measures on a solid aluminum composite propellant rocket motor plume**, A. P. Boisshot, ONERA (France) [6239-22]

9:20 am: **Validation methodology and robustness study of a infrared radiance contrast prediction model**, S. Barbe, ONERA (France) [6239-23]

9:40 am: **Smart ammunition behavior in a virtual battlefield**, P. Gozard, DGA/DSP/Tour DGA (France); T. Cathala, OKTAL Synthetic Environment (France) [6239-24]

Coffee Break 10:00 to 10:30 am

10:30 am: **Comparison of thermal modeling and experimental results of a generic model for ground vehicle**, A. B. Lessin, A. Reinov, Y. Bushlin, Institute for Advanced Research and Development (Israel) [6239-25]

10:50 am: **Mapping energy balance fluxes and root zone soil moisture in the White Volta Basin using optical imagery**, J. M. H. Hendrickx, S. Hong, New Mexico Institute of Mining and Technology; H. Compaore, C. Rodgers, P. Vlek, Univ. Bonn (Germany); J. Friesen, N. C. Van der Giesen, Technische Univ. Delft (Netherlands) [6239-26]

11:10 am: **Use of a vision model to quantify the significance of factors effecting target conspicuity**, M. A. Gilmore, Defence Science and Technology Lab. (United Kingdom) [6239-27]

Lunch/Exhibition Break 11:30 am to 1:30 pm

SESSION 4

Room: Sun Breakout 1-2 **Tues. 1:30 to 5:40 pm**

Joint Session with conference 6208

Chairs: **Heard S. Lowry III**, Aerospace Testing Alliance; **Victoria R. Hahn**, Raytheon Missile Systems

1:30 pm: **FLUENT-based modeling of rocket exhaust signatures**, J. L. Rapanotti, Defence R&D Canada/Valcartier (Canada) [6239-28]

1:50 pm: **Acquisition and analysis of a spectral and bidirectional database of urban materials over Toulouse (France)**, S. Lachérade, S. Pallotta, C. Miesch, X. Briottet, B. Tanguy, ONERA (France); H. Le Man, IGN (France) [6239-29]

2:10 pm: **Scene generation**, V. R. Hahn, Raytheon Missile Systems ... [6239-30]

2:30 pm: **Automatic 3D virtual scenes modeling for multisensors simulation**, T. Cathala, J. Latger, OKTAL Synthetic Environment (France); A. Y. Le Goff, DGA/DCE/CELAR (France); P. Gozard, DGA/DSP/Tour DGA (France) [6239-31]

2:50 pm: **The Standoff Aerosol Active Signature Testbed (SAAST) at Lincoln Laboratory**, J. M. Richardson, J. C. Aldridge, D. C. Harrison, A. G. Hayes, E. L. Hines, L. A. Jiang, K. I. Schultz, MIT Lincoln Lab. [6239-32]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Real-time target motion animation for missile warning system testing**, R. L. Sundberg, T. C. Perkins, Spectral Sciences, Inc.; J. F. Cordell, Z. Tun, Naval Air Systems Command; M. M. Owen, AMEWAS, Inc. [6208-13]

4:00 pm: **Automatic generation of high-fidelity urban scenes for sensor simulation**, M. R. Stevens, C. S. Monnier, M. S. Snorrason, S. Kapali, Charles River Analytics, Inc. [6208-14]

4:20 pm: **Comparison of MMW ground vehicle signatures**, A. V. Saylor, Simulation Technologies, Inc. [6208-15]

4:40 pm: **Multiclass correlated clutter map for high-resolution radar simulation**, P. Vanderford, Simulation Technologies, Inc.; J. W. Morris, U.S. Army Aviation and Missile Command; B. Sanders, R. F. Olson, Jr., D. Satterfield, Simulation Technologies, Inc. [6208-16]

5:00 pm: **Three-dimensional modeling of large targets and clutter utilizing Ka-band monopulse SAR**, J. A. Ray, U.S. Army Aviation and Missile Research, Development and Engineering Ctr.; D. P. Barr, R. Shurtz, R. Channell, Simulation Technologies, Inc. [6208-17]

5:20 pm: **Fast line-of-sight imagery for target and exhaust-plume signatures (FLITES) scene generation program**, D. R. Crow, Kinetics, Inc. [6208-18]

Related Courses

- SC158 **Fundamentals of Automatic Target Recognition (Nasr)** Thursday 8:30 am to 5:30 pm
- SC181 **Predicting Target Acquisition Performance of Electro-Optical Imagers (Vollmerhausen)** Monday 8:30 am to 5:30 pm
- SC545 **Infrared Characterization of Sources and Backgrounds (Jacobs)** Monday 8:30 am to 5:30 pm
- SC728 **Network Centric Target Tracking and Classification (Drummond)** Friday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Polarization: Measurement, Analysis, and Remote Sensing VII

Conference Chairs: **Dennis H. Goldstein**, Air Force Research Lab.; **David B. Chenault**, Polaris Sensor Technologies, Inc.

Program Committee: **Thomas R. Caudill**, Air Force Research Lab.; **Russell A. Chipman**, Optical Sciences Ctr./The Univ. of Arizona; **Aed M. El-Saba**, Univ. of South Alabama; **Matthew P. Fetrow**, Air Force Research Lab.; **David L. Ligon**, Army Research Lab.; **Joseph A. Shaw**, Montana State Univ./Bozeman; **J. Scott Tyo**, The Univ. of New Mexico; **Kyle J. Zeringue**, Photon Research Associates, Inc.

Thursday 20 April

SESSION 1

Room: Tampa 2 Thurs. 8:30 to 9:50 am

Remote Sensing and Processing I

Chair: **David B. Chenault**, Polaris Sensor Technologies, Inc.

- 8:30 am: **Quantifying surface normal estimation**, R. B. Reid, Air Force Institute of Technology [6240-01]
- 8:50 am: **Characterization and analysis of infrared images**, A. J. Raglin, A. Wetmore, D. L. Ligon, Army Research Lab. [6240-02]
- 9:10 am: **Application of passive imaging polarimetry in the discrimination and detection of different color targets of identical shapes using color-blind imaging sensor**, A. M. El-Saba, M. S. Alam, A. Surapaneni, Univ. of South Alabama [6240-03]
- 9:30 am: **Shape extraction from passive polarimetric images**, V. Thilak, D. G. Voelz, S. Damarla, C. D. Creusere, New Mexico State Univ. [6240-04]
- Coffee Break 9:50 to 10:20 am

SESSION 2

Room: Tampa 2 Thurs. 10:20 to 11:40 am

Remote Sensing and Processing II

Chair: **Joseph A. Shaw**, Montana State Univ.-Bozeman

- 10:20 am: **Real-time extraction of polarimetric information at the focal plane**, V. Gruev, J. Van der Spiegel, K. Wu, N. Engheta, Univ. of Pennsylvania . . [6240-05]
- 10:40 am: **Imaging spectropolarimetry of cloudy skies**, N. J. Pust, J. A. Shaw, Montana State Univ.-Bozeman [6240-06]
- 11:00 am: **Material classification based on multiband polarimetric images fusion**, Y. Zhao, Q. Pan, Northwestern Polytechnical Univ. (China) [6240-07]
- 11:20 am: **Fuse spectropolarimetric imagery by D-S reasoning**, Y. Zhao, Northwestern Polytechnical Univ. (China) [6240-08]
- Lunch/Exhibition Break 11:40 am to 1:30 pm

Technical Group Meeting

Polarization

Thurs. 11:40 am to 1:30 pm • Room: Tampa 2

Chairs: **Arthur Lompado**, Polaris Sensor Technologies, Inc.; **Derek S. Sabatke**, Ball Aerospace & Technologies Corp.

This Technical Group is focused on research, development, engineering, and applications in fields of optics where polarization and its measurement are key issues.

*Box lunches will be available for purchase.

SESSION 3

Room: Tampa 2 Thurs. 1:30 to 2:50 pm

Scattering and Phenomenology

Chair: **Dennis H. Goldstein**, Air Force Research Lab.

- 1:30 pm: **Polarization patterns and symmetries as a manifestation of helicity preserving characteristics of scattering media**, C. Schwartz, M. A. VonNiederhausern, A. Dogariu, Univ. of Central Florida [6240-09]
- 1:50 pm: **Reflective and polarimetric characteristics of urban materials**, D. G. Jones, D. H. Goldstein, J. C. Spaulding, Air Force Research Lab. . . [6240-10]
- 2:10 pm: **Modeling polarization effects in aiding detection of submerged objects**, M. A. VonNiederhausern, C. Schwartz, A. Dogariu, Univ. of Central Florida; J. W. Grantham, Northrop Grumman Corp. [6240-11]
- 2:30 pm: **Measurement and theory for monostatic Mueller matrix**, C. An, Photon Research Associates, Inc.; D. H. Goldstein, J. C. Spaulding, Air Force Research Lab.; K. J. Zeringue, Photon Research Associates, Inc. [6240-12]
- Coffee Break 2:50 to 3:30 pm

SESSION 4

Room: Tampa 2 Thurs. 3:30 to 5:10 pm

Polarimetry

Chair: **Kyle J. Zeringue**, Photon Research Associates, Inc.

- 3:30 pm: **Division-of-amplitude imaging polarimeter for the fast measurement of Stokes vector**, A. M. El-Saba, M. S. Alam, Univ. of South Alabama [6240-13]
- 3:50 pm: **Image processing methods to compensate for IFOV errors in microgrid imaging polarimeters**, B. M. Ratliff, J. K. Boger, Applied Technology Associates; M. P. Fetrow, Air Force Research Lab.; J. S. Tyo, The Univ. of New Mexico; W. T. Black, Applied Technology Associates [6240-14]
- 4:10 pm: **Quantifying DoLP sensitivities in a LWIR microgrid imaging polarimeter**, D. L. Bowers, B. M. Ratliff, J. K. Boger, Applied Technology Associates; M. P. Fetrow, Air Force Research Lab.; S. Ortega, D. Wellesms, W. T. Black, Applied Technology Associates; J. S. Tyo, The Univ. of New Mexico [6240-15]
- 4:30 pm: **Scanning linear polarimeter for aerosol sensing**, D. S. Sabatke, S. B. Petroy, T. Lin, M. A. Kuester, Ball Aerospace & Technologies Corp.; B. Karpowicz, Georgia Institute of Technology; P. Kaptchen, E. Coppock, Ball Aerospace & Technologies Corp. [6240-16]
- 4:50 pm: **Imaging polarimeter with enhanced detection range**, J. B. Woodruff, A. Lompado, Polaris Sensor Technologies, Inc. [6240-17]

Friday 21 April

SESSION 5

Room: Tampa 2 Fri. 8:30 to 9:50 am

Polarization Elements and Analysis I

Chair: Aed M. El-Saba, Univ. of South Alabama

8:30 am: **Visible Stokes imaging using programmable waveplate based on PLZT ceramic**, S. Breugnot, B. F. Pouet, P. Clemenceau, M. De Geuser, Bossa Nova Technologies [6240-18]

8:50 am: **Characterization of commercial sheet polarizer material**, D. H. Goldstein, Air Force Research Lab. [6240-19]

9:10 am: **All-glass broadband VIS-NIR linear polarizer for specialized applications**, R. Gafsi, K. R. Rossington, P. A. Schrauth, Corning Inc. [6240-20]

9:30 am: **Air-grid polarization splitter for infrared imaging systems**, T. Nakano, Y. Tamagawa, Mitsubishi Electric Corp. (Japan) [6240-21]

Coffee Break 9:50 to 10:30 am

SESSION 6

Room: Tampa 2 Fri. 10:30 to 11:30 am

Polarization Elements and Analysis II

Chair: Matthew P. Fetrow, Air Force Research Lab.

10:30 am: **Transmission ellipsometry of transparent-film transparent-substrate systems: closed-form inversion for the film optical constant**, A. R. M. Zaghoul, Georgia Institute of Technology and ITR Technologies Inc; M. Elshazly-Zaghoul, Y. A. Zaghoul, ITR Technologies Inc. and Georgia Institute of Technology [6240-22]

10:50 am: **Polarization effects in fiber aboard the Space Interferometry Mission**, J. M. Levin, M. G. Young, S. Dubovitsky, L. I. Dorsky, Jet Propulsion sLab. [6240-23]

11:10 am: **Transmission polarization-devices using an unsupported film/pellicle: closed-form design formula**, A. R. M. Zaghoul, Georgia Institute of Technology and ITR Technologies Inc; M. Elshazly-Zaghoul, ITR Technologies Inc. and Georgia Institute of Technology [6240-24]



Selected Titles for
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Data Mining, Intrusion Detection, Information Assurance, and Data Networks Security 2006

Conference Chair: **Belur V. Dasarathy**, Consultant

Program Committee: **Sheila B. Banks**, Calculated Insight; **Jorge E. Bardina**, NASA Ames Research Ctr.; **J. K. Burton**, Institute for Defense Analyses; **Dongming M. Cai**, Los Alamos National Lab.; **Ching-Cheng Lee**, California State Univ./Hayward; **Tsau Y. Lin**, San José State Univ.; **Robert S. Lynch, Jr.**, Naval Undersea Warfare Ctr.; **Vladimir Nikulin**, The Australian National Univ. (Australia); **Nikunj C. Oza**, NASA Ames Research Ctr.; **Basel Solaiman**, Ecole Nationale Supérieure des Télécommunications (France); **Martin R. Stytz**, Institute for Defense Analyses; **Rajkumar Thirumalainambi**, NASA Ames Research Ctr.; **Shusaku Tsumoto**, Shimane Univ. (Japan); **JingTao Yao**, Univ. of Regina (Canada)

Monday 17 April

SESSION 1

Room: Tallahassee 3 Mon. 8:30 to 10:10 am

Data Mining

Chairs: **Robert S. Lynch, Jr.**, Naval Undersea Warfare Ctr.;
Belur V. Dasarathy, Consultant

- 8:30 am: **An algorithmic approach to mining unknown clusters in training data**, R. S. Lynch, Jr., Naval Undersea Warfare Ctr.; P. K. Willett, Univ. of Connecticut [6241-01]
- 8:50 am: **Efficient mining of strongly correlated item pairs**, S. Li, R. Lee, S. Lang, Univ. of Central Florida [6241-02]
- 9:10 am: **Genetic program-based data mining to reverse engineer digital logic**, J. F. Smith III, Naval Research Lab. [6241-03]
- 9:30 am: **Database architecture for data mining to aid real-time range safety decision in a test range**, A. K. Checker, A. R. Raj, Government of India (India) [6241-04]
- 9:50 am: **Granular computing for data mining**, Y. Yao, Univ. of Regina (Canada) [6241-05]
- Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Tallahassee 3 Mon. 10:40 am to 12:20 pm

Information Assurance and Security

Chairs: **Martin R. Stytz**, Institute for Defense Analyses;
Vladimir Nikulin, The Australian National Univ. (Australia)

- 10:40 am: **Enhanced data mining information assurance by using ISO 17799**, W. G. Perry, Western Carolina Univ. [6241-06]
- 11:00 am: **Personal privacy, information assurance, and the threat posed by Malware technology**, M. R. Stytz, Institute for Defense Analyses; S. B. Banks, Calculated Insight [6241-07]
- 11:20 am: **Energy efficient link layer security solution for wireless LANs**, S. Ozdemir, Arizona State Univ. [6241-08]
- 11:40 am: **Image sensor for security applications with on-chip data authentication**, P. Stifter, K. Eberhardt, A. Erni, K. C. Hofmann, AIM Infrarot-Module GmbH (Germany) [6241-09]
- 12:00 pm: **Mining security events in Cougar agent society**, D. Dasgupta, J. M. Rodriguez, S. Balachandran, Univ. of Memphis [6241-10]
- Lunch Break 12:20 to 1:30 pm

SESSION 3

Room: Tallahassee 3 Mon. 1:30 to 3:10 pm

Intrusion Detection

Chairs: **Nikunj C. Oza**, NASA Ames Research Ctr.;;
Martin R. Stytz, Institute for Defense Analyses

- 1:30 pm: **Distinguishing false from true alerts in Snort by data mining patterns of alerts**, D. G. Schwartz, Florida State Univ. [6241-11]
- 1:50 pm: **A novel interacting multiple model-based network intrusion detection scheme**, R. Xin, V. Venkatasubramanian, H. Leung, Univ. of Calgary (Canada) [6241-12]
- 2:10 pm: **Attribute selection using information gain for a fuzzy logic intrusion detection system**, J. Gonzalez-Pino, J. Edmonds, M. Papa, Univ. of Tulsa [6241-13]
- 2:30 pm: **Threshold-based clustering for intrusion detection systems**, V. Nikulin, The Australian National Univ. (Australia) [6241-14]
- 2:50 pm: **Distributed intrusion detection system based on fuzzy rules**, P. Qiao, J. Su, C. Sun, Harbin Univ. of Science and Technology (China) . [6241-15]
- Coffee Break 3:10 to 3:40 pm

SESSION 4

Room: Tallahassee 3 Mon. 3:40 to 5:00 pm

Internet Applications

Chairs: **Sheila B. Banks**, Calculated Insight; **JingTao Yao**, Univ. of Regina (Canada)

- 3:40 pm: **Mining emotional profiles using e-mail messages for earlier warnings of potential terrorist activities**, B. Galitsky, Univ. of London (United Kingdom); B. Kovalerchuk, Central Washington Univ. [6241-16]
- 4:00 pm: **Detecting people of interest from internet data sources**, R. A. Cardillo IV, D. M. Boulware, J. J. Salerno, Air Force Research Lab. [6241-17]
- 4:20 pm: **Web-based dynamic Delphi: a new survey instrument**, J. Yao, Univ. of Regina (Canada) [6241-18]
- 4:40 pm: **Dimensional reduction of web traffic data**, V. Nikulin, The Australian National Univ. (Australia) [6241-19]

Tuesday 18 April

SESSION 5

Room: Tallahassee 3 Tues. 8:30 to 10:10 am

Miscellaneous Models and Applications

Chairs: Michael Cai, Spectralane;

Nikunj C. Oza, NASA Ames Research Ctr.

8:30 am: **A novel mark embedding and attack identifying technique for watermarking**, W. Q. Lin, Huaqiao Univ. (China) [6241-20]

8:50 am: **Broad frequency acoustic response of ground/floor to human footsteps**, A. E. Ekimov, J. M. Sabatier, The Univ. of Mississippi [6241-21]

9:10 am: **Toward a threat model for group communications**, J. L. Hester, W. J. Yurcik, Univ. of Illinois at Urbana-Champaign [6241-22]

9:30 am: **AutoCorrel: a neural network event correlation approach**, M. G. Dondo, Defence Research and Development Canada (Canada); N. Japkowicz, R. D. Smith, Univ. of Ottawa (Canada) [6241-23]

9:50 am: **Data modeling for predictive behavior hypothesis formation and testing**, H. M. Jaenisch, dtech Systems Inc.; J. W. Handley, SPARTA, Inc.; M. Barnett, Computer Sciences Corp.; D. A. Grover, Washington Square Associates, Inc. [6241-25]

Coffee Break 10:10 to 11:00 am

SESSION 6

Room: Tallahassee 3 Tues. 11:00 am to 12:20 pm

Intrusion Detection and Network Security

Chairs: Vladimir Nikulin, The Australian National Univ. (Australia);

Michael Cai, Spectralane

11:00 am: **Reliance on perimeter security**, K. Kumpf, SSH Communications Security, Inc. [6241-27]

11:20 am: **Extending key sharing: how to generate a key tightly coupled to a network security policy**, M. I. Kazantzidis, Broadata Communications, Inc. [6241-28]

11:40 am: **A novel unsupervised anomaly detection based on robust principal component classifier**, W. Qiu, Y. Wu, Chongqing Univ. of Posts and Telecommunication (China) [6241-29]

12:00 pm: **AINIDS: an immune-based network intrusion detection system**, Q. Yan, Tsinghua Univ. (China) [6241-30]

Lunch/Exhibition Break 12:20 to 2:00 pm

SESSION 7

Room: Tallahassee 3 Tues. 2:00 to 3:20 pm

Data Mining Algorithms and Applications

Chairs: JingTao Yao, Univ. of Regina (Canada);

Robert S. Lynch, Jr., Naval Undersea Warfare Ctr.

2:00 pm: **Clustering method via independent components for semi-structured documents**, T. Wang, D. Liu, Harbin Engineering Univ. (China) [6241-31]

2:20 pm: **Mining hospital management data**, S. Tsumoto, Shimane Univ. (Japan) [6241-32]

2:40 pm: **Visualization of similarities and dissimilarities in rules using MDS**, S. Tsumoto, Shimane Univ. (Japan) [6241-33]

3:00 pm: **Damage assessment of mission essential buildings based on simulation studies of low-yield explosives**, T. G. L. Allen, Air Force Research Lab. [6241-34]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

✓ **A noise-immune cryptographic information protection method for facsimile information transmission and the realization algorithms**, V. G. Krasilenko, Open International Univ. of Human Development (Ukraine); V. F. Bardachenko, Institute of Cybernetics (Ukraine); A. I. Nikolsky, A. A. Lazarev, K. V. Ogorodnik, Vinnitsa State Technical Univ. (Ukraine) [6241-36]

✓ **The design and application of data warehouse during modern enterprises environment**, L. Zhou, C. Liu, Capital Normal Univ. (China); C. Wang, Harbin Engineering Univ. (China) [6241-37]

✓ **A practical timing attack on RSA over a LAN**, M. J. Lodato, I. I. Jouny, Lafayette College [6241-39]

Related Courses

SC640 **Introduction to Sensor Networks (Rao)** Monday 8:30 am to 5:30 pm
 SC766 **Information Processing for Video Surveillance (Ebrahimi, Dufaux)** Wednesday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Multisensor, Multisource Information Fusion: Architectures, Algorithms, and Applications 2006

Conference Chair: **Belur V. Dasarathy**, Consultant

Program Committee: **Jerome J. Braun**, MIT Lincoln Lab.; **Nour-Eddin El Faouzi**, Institut National de Recherche sur les Transports (France); **Kai F. Goebel**, GE Global Research; **Eric Gregoire**, Univ. d'Artois (France); **Mieczyslaw M. Kokar**, Northeastern Univ.; **Damian M. Lyons**, Fordham Univ.; **Bruce N. Nelson**, Geo-Centers, Inc.; **Gee Wah Ng**, DSO National Labs. (Singapore); **Vahid R. Riasati**, Science Applications International Corp.; **Firooz A. Sadjadi**, Lockheed Martin Corp.; **John J. Salerno**, Air Force Research Lab.; **S. Richard F. Sims**, U.S. Army Research, Development and Engineering Command; **Pramod K. Varshney**, Syracuse Univ.

Wednesday 19 April

SESSION 1

Room: Daytona 1-2 Wed. 8:30 to 10:10 am

Situation Awareness

Chairs: **John J. Salerno**, Air Force Research Lab.;
Belur V. Dasarathy, Consultant

8:30 am: **Multisource evidence fusion for cyber-situation assessment**, B. Sabata, Aginova Inc.; C. J. Ornes, IET, Inc. [6242-01]

8:50 am: **Combining elements of information fusion and knowledge-based systems to support situation analysis**, J. Roy, Defence Research and Development Canada (Canada) [6242-02]

9:10 am: **Rule-based situation assessment for sea surveillance**, J. Edlund, M. Grönkvist, A. Lingvall, E. Sviestins, Saab Systems (Sweden) [6242-03]

9:30 am: **Realizing situation awareness within a cyber environment**, G. P. Tadda, J. J. Salerno, D. M. Boulware, M. L. Hinman, Air Force Research Lab.; S. Gorton, Skaion Corp. [6242-04]

9:50 am: **Measuring situational awareness and resolving inherent high-level fusion obstacles**, M. Sudit, SUNY/Univ. at Buffalo; A. D. Stotz, Calspan-UB Research Ctr., Inc.; M. Holender, SUNY/Univ. at Buffalo [6242-05]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Daytona 1-2 Wed. 10:40 am to 12:20 pm

Higher-Level Fusion

Chairs: **Mieczyslaw M. Kokar**, Northeastern Univ.;
Gee Wah Ng, DSO National Labs. (Singapore)

10:40 am: **Intent inference for attack aircraft through fusion**, G. W. Ng, K. H. Ng, R. Yang, DSO National Labs. (Singapore); P. H. Foo, National Univ. of Singapore (Singapore) [6242-06]

11:00 am: **Higher-level fusion for military operations based on abductive inference: proof of principle**, A. V. Pantaleev, J. R. Josephson, The Ohio State Univ. [6242-07]

11:20 am: **Fusing terrain and goals: agent control in urban environments**, V. Kaptan, E. Gelenbe, Imperial College London (United Kingdom) [6242-08]

11:40 am: **Hybrid methods for multisource information fusion and decision support**, J. J. Braun, Y. Gilina, MIT Lincoln Lab. [6242-09]

12:00 pm: **Classifiers and distance-based evidential fusion for road travel time estimation**, N. El Faouzi, Institut National de Recherche sur les Transports (France); E. Lefevre, Univ. d'Artois (France) [6242-10]

Lunch/Exhibition Break 12:20 to 1:45 pm

SESSION 3

Room: Daytona 1-2 Wed. 1:45 to 3:05 pm

Miscellaneous Applications

Chairs: **Damian M. Lyons**, Fordham Univ.;
Jerome J. Braun, MIT Lincoln Lab.

1:45 pm: **CommonSense: a preprocessing system to identify errors in large transcribed corpora**, R. Propper, K. Mohajer, V. R. Pratt, Stanford Univ. [6242-11]

2:05 pm: **Pedestrian detection by multisensor fusion in surveillance**, Y. Ma, Honeywell Technology [6242-12]

2:25 pm: **Feature extraction and fusion for protein structure identification in cryo-electron microscopic images**, V. R. Riasati, Science Applications International Corp. [6242-13]

2:45 pm: **Prediction of adverse outcomes of acute coronary syndrome using intelligent fusion of triage information with HUMINT**, C. L. McCullough, A. J. Novobilski, F. Fesmire, The Univ. of Tennessee at Chattanooga ... [6242-14]

Coffee Break 3:05 to 3:45 pm

SESSION 4

Room: Daytona 1-2 Wed. 3:45 to 5:05 pm

Aerospace and Defense Application

Chairs: **Jerome J. Braun**, MIT Lincoln Lab.; **Nour-Eddin El Faouzi**, Institut National de Recherche sur les Transports (France)

3:45 pm: **Target tracking for unattended ground sensors employing distributed cluster management**, C. A. Stelzig, M. A. Essawy, General Dynamics Advanced Information Systems; S. Minor, U.S. Army Night Vision & Electronic Sensors Directorate [6242-15]

4:05 pm: **A fusion approach for coarse-to-fine target recognition**, M. Folkesson, C. A. Grönwall, E. Jungert, Swedish Defence Research Agency (Sweden) [6242-37]

4:25 pm: **Feature selection for real-time tracking**, D. F. Hsu, D. M. Lyons, J. Ai, Fordham Univ. [6242-17]

4:45 pm: **NETWAR**, A. A. Keen, 21st Century Technologies [6242-18]

Thursday 20 April

SESSION 5

Room: Daytona 1-2 **Thurs. 8:30 to 9:50 am**

Miscellaneous Methods

Chairs: **Pramod K. Varshney**, Syracuse Univ.;
Eric Gregoire, Univ. d'Artois (France)

8:30 am: **Minimizing dropped formulas and concepts in knowledge fusion**,
E. Gregoire, Univ. d'Artois (France) [6242-19]

8:50 am: **Distributed sensor data compression algorithm**, B. E. Ambrose,
F. S. Lin, Broaddata Communications, Inc. [6242-20]

9:10 am: **Fusing diverse monitoring algorithms for robust change detection**,
K. F. Goebel, W. Yan, N. Eklund, N. Iyer, GE Global Research [6242-21]

9:30 am: **Noise reduction method for the multisensor system
measuring DC current**, J. Wang, Y. Geng, Z. Song, J. Wang, Xi'an Jiaotong Univ.
(China) [6242-22]

Coffee Break 9:50 to 10:30 am

SESSION 6

Room: Daytona 1-2 **Thurs. 10:30 am to 12:10 pm**

Miscellaneous Topics

Chairs: **Kai F. Goebel**, GE Global Research;
Pramod K. Varshney, Syracuse Univ.

10:30 am: **TANDI: threat assessment of network data and information**,
S. J. Yang, J. Holsopple, Rochester Institute of Technology; M. Sudit, SUNY/Univ.
at Buffalo [6242-23]

10:50 am: **The challenge of scalable fusion of disparate sources of
information**, S. J. Julier, ITT Industries - AES Division and Naval Research Lab.;
J. K. Uhlmann, Univ. of Missouri/Columbia; J. Walters, ITT Industries - AES
Division and Naval Research Lab. [6242-24]

11:10 am: **Fuselets: an agent-based architecture for fusion of heterogeneous
information and data**, J. Beyerer, M. Heizmann, Fraunhofer-Institut für
Informations - und Datenverarbeitung (Germany); J. Sander, Univ. Karlsruhe
(Germany) [6242-25]

11:30 am: **Data fusion on a distributed heterogeneous sensor network**,
P. Lamborn, Mississippi State Univ.; P. Williams, Sandia National Labs. . . [6242-26]

11:50 am: **Processing heterogeneous XML data from multisource**,
T. Wang, Harbin Engineering Univ. (China); X. Lin, Harbin Institute of Technology
(China) [6242-27]

Lunch/Exhibition Break 12:10 to 1:30 pm

SESSION 7

Room: Daytona 1-2 **Thurs. 1:30 to 3:50 pm**

Image Registration and Fusion

Chairs: **S. Richard F. Sims**, U.S. Army Research, Development and
Engineering Command; **Vahid R. Riasati**,
Science Applications International Corp.

1:30 pm: **A preprocessing and automated algorithm selection system for
image registration**, A. L. Drozd, A. C. Blackburn, ANDRO Computational
Solutions; P. K. Varshney, Syracuse Univ.; I. P. Kasperovich, ANDRO
Computational Solutions; M. Xu, B. Kumar, Syracuse Univ. [6242-28]

1:50 pm: **A measure for performance comparison of image registration
methods**, B. Kumar, P. K. Varshney, Syracuse Univ.; A. L. Drozd, ANDRO
Computational Solutions [6242-29]

2:10 pm: **MeRis and ETM image fusion for spatial resolution improvement**,
S. Mathieu, Alcatel Alenia Space (France); A. Minghelli-Roman, Univ. de
Bourgogne (France); L. Polidori, Institute of Research for Développement (France);
L. Loubersac, Institut Français de Recherche pour L'Exploitation de la Mer
(France); F. Cauneau, École des Mines de Paris (France) [6242-30]

2:30 pm: **A novel ICA domain multimodal image fusion algorithm**, N. S. Cvejic,
N. Canagarajah, D. R. Bull, Univ. of Bristol (United Kingdom) [6242-32]

2:50 pm: **A novel image fusion algorithm based on human vision system**,
Q. Miao, B. Wang, Xidian Univ. (China) [6242-33]

3:10 pm: **The finite ridgelet transform for image fusion**, Q. Miao, B. Wang,
Xidian Univ. (China) [6242-34]

3:30 pm: **The contourlet transform for image fusion**, Q. Miao, B. Wang, Xidian
Univ. (China) [6242-35]

Related Courses

SC149 **Multi-Sensor, Multi-Source Information Fusion: Architectures,
Algorithms, and Applications** (*Dasarathy*) Tuesday 8:30 am to 5:30
pm

SC174 **Multispectral Image Processing** (*Schowengerdt*) Friday 8:30 am to
5:30 pm

See SPIE Cashier to Register.

Enabling Photonics Technologies for Defense, Security, and Aerospace Applications II

Conference Chairs: **Michael J. Hayduk**, **Andrew R. Pirich**, Air Force Research Lab.; **Eric J. Donkor**, Univ. of Connecticut; **Peter J. Delfyett, Jr.**, College of Optics and Photonics/Univ. of Central Florida

Cochairs: **Bahram Javidi**, Univ. of Connecticut; **Guifang Li**, College of Optics and Photonics/Univ. of Central Florida; **Edward W. Taylor**, International Photonics Consultants, Inc.; **Fazio Nash**, Air Force Research Lab.; **Michael L. Fanto**, Air Force Research Lab.

Program Committee: **John P. Barrios**, Air Force Research Lab.; **Rebecca J. Bussjager**, Air Force Research Lab.; **Henry J. Caulfield**, Fisk Univ.; **Franz Haas**, **Robert L. Kaminski**, Air Force Research Lab.; **Henry Zmuda**, Univ. of Florida

Monday 17 April

Plenary Presentation

Room: Osceola Ballroom D Mon. 8:55 to 10:00 am

Quantum computing using linear optics and hybrid approaches
(Invited Paper, Presentation Only)

Speaker: **Prof. James Franson**, Johns Hopkins Univ.

Thursday 20 April

SESSION 1

Room: Destin 1 Thurs. 8:30 to 10:00 am

Airborne Networks I

Chairs: **John P. Barrios**, **Robert L. Kaminski**, Air Force Research Lab.

8:30 am: **AFRL highly integrated photonics (HIP) program** *(Invited Paper)*, M. A. Horne, H. Schantz, G. J. Whaley, S. Newcomer, Lockheed Martin Corp. [6243-01]

9:00 am: **SOI photonics technology for defense, and security**, J. K. Chan, R. Dutt, APIC Corp. [6243-02]

9:20 am: **Highly integrated DWDM photonics modules for avionics networks**, A. J. Bruce, J. Shmulovich, S. V. Frolov, Inplane Photonics, Inc.; G. J. Whaley, H. Schantz, M. A. Horne, Lockheed Martin Corp. [6243-03]

9:40 am: **Fabrication and testing of laser communication terminals for aircraft**, M. E. Gangl, ITT Industries, Inc. [6243-04]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Destin 1 Thurs. 10:30 am to 12:20 pm

Airborne Networks II

Chairs: **John P. Barrios**, **Robert L. Kaminski**, Air Force Research Lab.

10:30 am: **All-optical networks for platforms connected to the global information grid** *(Invited Paper)*, P. S. Guilfoyle, OptiComp Corp.; W. D. Hodges, The Boeing Co. [6243-05]

11:00 am: **Proposal for free-space optical communication network using WDM homodyne PSK facilitated by cloning of carrier-envelope phase-locked oscillators**, C. R. Doerr, P. J. Winzer, Lucent Technologies/Bell Labs. ... [6243-06]

11:20 am: **TCP-Fiber: direct measurement optical transport congestion control for beyond 10-gigabit networks**, M. I. Kazantzidis, Broaddata Communications, Inc. [6243-07]

11:40 am: **Wavelength division multiplexing and transmission of analog signals over fiber**, W. D. Potter, Univ. of Connecticut [6243-08]

12:00 pm: **The Optical Harness(tm): a light-weight EMI-immune replacement for legacy electrical wiring harnesses**, J. B. Stark, S. Jackson, W. Trethewey, Defense Photonics Group [6243-09]

Lunch/Exhibition Break 12:20 to 1:30 pm

SESSION 3

Room: Destin 1 Thurs. 1:30 to 3:00 pm

Coherent Optical Networks and Techniques

Chair: **Michael J. Hayduk**, Air Force Research Lab.

1:30 pm: **Advances in coherent optical communications** *(Invited Paper)*, G. Li, C. Kim, Y. Han, College of Optics and Photonics/Univ. of Central Florida [6243-10]

2:00 pm: **Coherent homodyne receiver systems based on a mode-locked semiconductor laser for an optical coherent CDMA system**, W. Lee, H. Izadpanah, M. Choi, P. J. Delfyett, Jr., College of Optics and Photonics/Univ. of Central Florida; S. Etemad, Telcordia Technologies, Inc. [6243-11]

2:20 pm: **Duobinary transmission using coherent detection**, G. Goldfarb, C. Kim, G. Li, College of Optics and Photonics/Univ. of Central Florida . [6243-12]

2:40 pm: **Complex constellation diagram measurement for optical communication**, I. Kim, G. Li, College of Optics and Photonics/Univ. of Central Florida [6243-13]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: Destin 1 Thurs. 3:30 to 5:20 pm

Enabling Photonic Components and Technologies I

Chair: **Andrew R. Pirich**, Air Force Research Lab.

3:30 pm: **Coherent optical receiver system with balanced photodetection**, R. Howard, A. M. Joshi, D. Mohr, D. Becker, C. Wree, Discovery Semiconductors, Inc. [6243-14]

3:50 pm: **All-optical switching and wavelength conversion using passive nonlinearities in semiconductor quantum wells** *(Invited Paper)*, J. Nah, P. LiKamWa, College of Optics and Photonics/Univ. of Central Florida .. [6243-15]

4:20 pm: **Low-voltage electro-optic polymer modulators**, R. Dinu, D. Jin, A. M. Barklund, D. Huang, L. Zheng, M. K. Koenig, S. G. Ferrier, Y. Fang, Lumera Corp. [6243-16]

4:40 pm: **Tunable multimode interference devices**, D. A. May-Arrijoa, P. LiKamWa, College of Optics and Photonics/Univ. of Central Florida .. [6243-17]

5:00 pm: **Computing fields in a cylindrically curved dielectric layered media**, A. D. McAulay, Lehigh Univ. [6243-18]

✓ **Posters-Thursday**

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Optical variable attenuator based on an double acousto-optic device**, G. M. Pacheco, J. E. B. Oliveira, M. A. Pires, Instituto Tecnológico de Aeronáutica (Brazil) [6243-37]
- ✓ **Optical time-frequency scaling for signal processing applications**, C. K. Madsen, A. Chintanpalli, Texas A&M Univ. [6243-38]

Friday 21 April

SESSION 5

Room: Destin 1 Fri. 8:30 to 10:00 am

Semiconductor and Fiber Lasers

Chair: Michael L. Fanto, Air Force Research Lab.

- 8:30 am: **Injection characterization of packaged bi-directional diamond-shaped ring lasers**, R. J. Bussjager, S. T. Johns, M. J. Hayduk, J. M. Osman, V. Kovanis, Air Force Research Lab.; A. J. Morrow, M. Green, BinOptics Corp.; N. Stoffel, S. Tan, C. Shick, Infotonics Technology Ctr.; W. H. Bacon, B. Beaman, Eastman Kodak Co. [6243-20]
- 8:50 am: **Mode-locked fiber lasers (Invited Paper)**, N. K. Dutta, Univ. of Connecticut [6243-21]
- 9:20 am: **Passive and active mode-locking of quantum-dot lasers for ultrashort, high-power, and low-noise optical pulse generation**, M. Choi, J. Kim, W. Lee, P. J. Delfyett, Jr., College of Optics and Photonics/Univ. of Central Florida [6243-22]
- 9:40 am: **Wavelength tunable mode-locked quantum dot laser**, J. Kim, M. Choi, W. Lee, P. J. Delfyett, Jr., College of Optics and Photonics/Univ. of Central Florida [6243-23]
- Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Destin 1 Fri. 10:30 am to 12:00 pm

Enabling Photonic Components and Technologies II

Chair: Eric J. Donkor, Univ. of Connecticut

- 10:30 am: **Frequency stabilized modelocked laser for photonic signal processing (Invited Paper)**, S. Gee, F. J. Quinlan, S. Ozharar, P. J. Delfyett, Jr., College of Optics and Photonics/Univ. of Central Florida [6243-24]
- 11:00 am: **Supermode noise suppression of a harmonically modelocked laser by external optical injection**, F. J. Quinlan, S. Gee, S. Ozharar, P. J. Delfyett, Jr., College of Optics and Photonics/Univ. of Central Florida [6243-25]
- 11:20 am: **Semiconductor mode-locked laser intracavity gain dynamics measurements under three wavelength operation**, L. C. Archundia-Berra, P. J. Delfyett, Jr., College of Optics and Photonics/Univ. of Central Florida [6243-26]
- 11:40 am: **Photonic crystals: fabrication, modeling, and applications**, V. Shklover, L. Braginsky, ETH Zürich (Switzerland) [6243-27]
- Lunch Break 12:00 to 1:30 pm

SESSION 7

Room: Destin 1 Fri. 1:30 to 3:00 pm

Laser Technology and Applications

Chair: Guifang Li,

College of Optics and Photonics/Univ. of Central Florida

- 1:30 pm: **High-power eye-safe single mode fiber laser for telecommunications and remote sensing**, M. E. Gangl, ITT Industries, Inc. [6243-28]
- 1:50 pm: **High-power single- and double-frequency tunable mini-laser with nanofilm selector for onboard applications**, I. I. Peshko, Univ. of Toronto (Canada); V. Rubtsov, Intelligent Optical Systems, Inc.; J. K. Jabczynski, K. Kopczyński, Wojskowa Akademia Techniczna (Poland) [6243-29]
- 2:10 pm: **All semiconductor high-power eXtreme chirped pulse amplification system (Invited Paper)**, K. Kim, S. Lee, P. J. Delfyett, Jr., College of Optics and Photonics/Univ. of Central Florida [6243-30]
- 2:40 pm: **Precision laser ranging using eXtremely chirped pulses from chirped fiber Bragg grating**, L. Kisimbi, K. Kim, L. C. Archundia-Berra, S. Lee, P. J. Delfyett, Jr., College of Optics and Photonics/Univ. of Central Florida [6243-31]
- Coffee Break 3:00 to 3:30 pm

SESSION 8

Room: Destin 1 Fri. 3:30 to 5:10 pm

RF Photonic and EO Technology

Chair: Peter J. Delfyett, Jr.,

College of Optics and Photonics/Univ. of Central Florida

- 3:30 pm: **Ultra-wideband photonic control of an adaptive phased array antenna**, H. Zmuda, J. Li, P. M. Sforza, Univ. of Florida [6243-32]
- 3:50 pm: **RF chirp extension via time-division multiplexing**, S. Ozharar, S. Gee, F. J. Quinlan, P. J. Delfyett, Jr., College of Optics and Photonics/Univ. of Central Florida [6243-33]
- 4:10 pm: **A novel nano-injector-based single-photon infrared detector**, H. Mohseni, Northwestern Univ. [6243-34]
- 4:30 pm: **High-speed wavelength-swept lasers**, K. Hsu, Micron Optics, Inc. [6243-35]
- 4:50 pm: **All-optical logic: what can this ambiguous term mean?**, H. J. Caulfield, Diversified Research Corp. [6243-36]



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Quantum Information and Computation IV

Conference Chairs: **Eric J. Donkor**, Univ. of Connecticut; **Andrew R. Pirich**, Air Force Research Lab.; **Howard E. Brandt**, Army Research Lab.

Program Committee: **Chip B. Elliott**, BBN Technologies; **Michael J. Foster**, National Science Foundation; **Samuel J. Lomonaco, Jr.**, Univ. of Maryland/Baltimore County; **John M. Myers**, Harvard Univ.; **Vladimir Privman**, Clarkson Univ.; **Alexander V. Sergienko**, Boston Univ.; **Lois D. Walsh**, Air Force Research Lab.; **Tai Tsun Wu**, Harvard Univ.

Monday 17 April

Plenary Presentation

Room: Osceola Ballroom D Mon. 8:55 to 10:00 am

Quantum computing using linear optics and hybrid approaches

(Invited Paper, Presentation Only)

Speaker: **Prof. James Franson**, Johns Hopkins Univ.

SESSION 1

Room: Naples 3 Mon. 10:30 am to 12:10 pm

Quantum Gates and Quantum Computation

Chair: **John M. Myers**, Harvard Univ.

10:30 am: **Rabi oscillations of inductively isolated Josephson junction qubits**, R. M. Lewis, H. Paik, T. A. Palomaki, S. K. Dutta, B. K. Cooper, A. Przybysz, J. R. Anderson, A. J. Dragt, C. J. Lobb, F. C. Wellstood, Univ. of Maryland/College Park [6244-01]

10:50 am: **Rapid purification and state preparation for a solid state charge qubit**, J. F. Ralph, The Univ. of Liverpool (United Kingdom) [6244-02]

11:10 am: **Role of valley-orbital splitting in electron spin dephasing for SiGe quantum dots**, Y. G. Semenov, K. W. Kim, North Carolina State Univ. ... [6244-03]

11:30 am: **Low-order qubit representation for two-dimensional Bose-Einstein condensates (BEC)**, G. Vahala, The College of William & Mary; J. Yezpez, Air Force Research Lab.; L. L. Vahala, Old Dominion Univ. [6244-04]

11:50 am: **Stability diagram and exchange interaction in coupled quantum dots in magnetic fields**, J. Leburton, D. Melnikov, L. Zhang, Univ. of Illinois at Urbana-Champaign [6244-05]

Lunch Break 12:10 to 1:40 pm

SESSION 2

Room: Naples 3 Mon. 1:40 to 4:10 pm

Decoherence, Entanglement

Chairs: **Howard E. Brandt**, Army Research Lab.; **Tai Tsun Wu**, Harvard Univ.

1:40 pm: **Universal dynamical protection of quantum information from decoherence (Invited Paper)**, G. Kurizki, A. G. Kofman, G. Gordon, A. Tal, Weizmann Institute of Science (Israel) [6244-06]

2:10 pm: **Timescales of decoherence of an open quantum system at low temperatures**, V. Privman, Clarkson Univ.; S. Saikin, Univ. of California/San Diego [6244-07]

2:30 pm: **Wave function collapse/non-collapse and the representation of classical bits**, M. O. Lanzagorta, Naval Research Lab.; J. K. Uhlmann, Univ. of Missouri/Columbia [6244-08]

2:50 pm: **Hyper-entangled two-photon states for quantum communication applications**, P. Mataloni, M. Barbieri, F. De Martini, Univ. degli Studi di Roma/La Sapienza (Italy) [6244-09]

3:10 pm: **Quantum entangled states on a pair of nanotubes**, G. A. Gumbs, Hunter College/CUNY [6244-10]

3:30 pm: **Collapse and revival of entanglement of two interacting qubits**, V. S. Malinovsky, MagiQ Technologies, Inc. [6244-13]

3:50 pm: **Incoherent control and entanglement for two-dimensional coupled systems**, R. Romano, D. D'Alessandro, Iowa State Univ. [6244-14]

Tuesday 18 April

SESSION 3

Room: Naples 3 Tues. 8:00 to 10:40 am

Cryptography, QKD, Secure Communication I

Chair: **Chip B. Elliott**, BBN Technologies

8:00 am: **Verification of the ARL quantum key distribution testbed (Invited Paper)**, G. H. Stolovy, Army Research Lab. [6244-15]

8:30 am: **Entangling probes of QKD (Invited Paper)**, H. E. Brandt, Army Research Lab. [6244-16]

9:00 am: **Quantum cryptography at 830 nm in standard telecommunications fiber**, B. C. Jacobs, S. Hendrickson, M. Dennis, J. D. Franson, Johns Hopkins Univ. [6244-17]

9:20 am: **Is quantum key distribution provably secure?**, T. Nakassis, J. C. Bienfang, P. Johnson, A. Mink, P. Rogers, X. Tang, C. J. Williams, National Institute of Standards and Technology [6244-18]

9:40 am: **Quantum cryptography on multi-user network architectures**, P. D. Kumavor, E. J. Donkor, A. Beal, S. Yelin, B. C. Wang, Univ. of Connecticut [6244-19]

10:00 am: **Matrix optimizations for quantum communications**, J. M. Myers, H. M. Shen, T. T. Wu, Harvard Univ. [6244-20]

10:20 am: **Secure communication with entangled photons**, A. S. Trifonov, MagiQ Technologies, Inc. [6244-21]

Coffee Break 10:40 to 11:10 am

SESSION 4

Room: Naples 3 Tues. 11:10 am to 12:30 pm

Cryptography, QKD, Secure Communication II

Chair: **Alexander V. Sergienko**, Boston Univ.

11:10 am: **High speed quantum key distribution system supports one-time pad encryption of real-time video**, A. Mink, X. Tang, National Institute of Standards and Technology [6244-22]

11:30 am: **Post-quantum Diffie-Hellman key exchange**, X. Li, M. M. Anshel, City College/CUNY [6244-23]

11:50 am: **Practical implementation of continuous-variable quantum key distribution**, T. Hirano, A. Shimoguchi, K. Shirasaki, S. Tokunaga, A. Furuki, Gakushuin Univ. (Japan); Y. Kawamoto, Sony Corp. (Japan); R. Namiki, Osaka Univ. (Japan) [6244-24]

12:10 pm: **Auto-compensated polarization coding fiber-based quantum key distribution system operating at sifted key-rate over 4Mbit/s**, X. Tang, L. Ma, A. Mink, National Institute of Standards and Technology [6244-25]

Lunch/Exhibition Break 12:30 to 2:00 pm

SESSION 5

Room: Naples 3 **Tues. 2:00 to 3:00 pm**

Quantum Measurement

Chair: Eric J. Donkor, Univ. of Connecticut

- 2:00 pm: **Noise and disturbance in quantum measurements and operations**, M. Ozawa, Tohoku Univ. (Japan) [6244-26]
- 2:20 pm: **Measurement of single-spin state for quantum computation based on optically detected methods**, M. E. Hawley, G. W. Brown, G. Berman, B. Chernobrod, Los Alamos National Lab. [6244-27]
- 2:40 pm: **Quantum weak measurements and complexity classes**, D. Ghoshal, George Mason Univ. [6244-28]
- Coffee Break 3:00 to 3:30 pm

SESSION 6

Room: Naples 3 **Tues. 3:30 to 4:50 pm**

Quantum Architectures and Systems

Chair: Eric J. Donkor, Univ. of Connecticut

- 3:30 pm: **Scheduling physical operations in a quantum information processor**, T. S. Metodiev, D. Thaker, Univ. of California/Davis; A. Cross, Massachusetts Institute of Technology; F. T. Chong, Univ. of California/Santa Barbara; I. L. Chuang, Massachusetts Institute of Technology [6244-29]
- 3:50 pm: **Two-dimensional optical cluster states**, G. N. Gilbert, M. Hamrick, Y. Weinstein, The MITRE Corp. [6244-30]
- 4:10 pm: **Information theoretic connotation to the Grover algorithm**, R. C. Venkatesan, Systems Research Corp. (India) [6244-31]
- 4:30 pm: **Quantum network addressing method and expandable quantum router**, Z. Han, Univ. of Science and Technology of China (China) [6244-33]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Geometric phase gate with a quantized driving field**, J. R. Gea-Banacloche, S. Siddiqui, Univ. of Arkansas [6244-44]
- ✓ **Finite temperature quantum logic**, D. Ghoshal, R. B. Gomez, George Mason Univ.; M. O. Lanzagorta, Naval Research Lab. and ITT Industries and George Mason Univ.; J. K. Uhlmann, Univ. of Missouri/Columbia [6244-46]
- ✓ **Toward the manipulation of a single spin in an AlGaAs/GaAs single-electron transistor**, S. Amasha, D. M. Zumbuhl, K. MacLean, I. Radu, M. A. Kastner, Massachusetts Institute of Technology; M. P. Hanson, A. C. Gossard, Univ. of California/Santa Barbara [6244-47]

Wednesday 19 April

SESSION 7

Room: Naples 3 **Wed. 8:30 to 10:20 am**

Quantum Algorithms and Information Theory I

Chair: Samuel J. Lomonaco, Jr., Univ. of Maryland/Baltimore County

- 8:30 am: **Spin networks and anyonic topological computing (Invited Paper)**, L. H. Kauffman, Univ. of Illinois at Chicago; S. J. Lomonaco, Jr., Univ. of Maryland/Baltimore County [6244-34]
- 9:00 am: **Topological quantum computing and the Jones polynomial**, S. J. Lomonaco, Jr., Univ. of Maryland/Baltimore County; L. H. Kauffman, Univ. of Illinois at Chicago [6244-35]
- 9:20 am: **Applications of the quantum computer condition**, G. N. Gilbert, M. Hamrick, J. Thayer, The MITRE Corp. [6244-36]
- 9:40 am: **Information accessible by measurement in mirror-symmetric ensembles of qubit states**, M. R. Frey, Bucknell Univ. [6244-37]
- 10:00 am: **Improved algorithmic cooling for scalable NMR quantum computers**, A. Kaltchenko, Wilfrid Laurier Univ. (Canada) and Univ. of Waterloo (Canada) [6244-38]
- Coffee Break 10:20 to 10:50 am

SESSION 8

Room: Naples 3 **Wed. 10:50 am to 12:10 pm**

Quantum Algorithms and Information Theory II

Chair: Vladimir Privman, Clarkson Univ.

- 10:50 am: **Quantum query complexity in computational geometry**, A. A. Bahadur, Indian Institute of Technology Bombay (India); C. Durr, Univ. Paris-Sud II (France); R. Kulkarni, The Univ. of Chicago; T. Lafaye, Univ. Paris-Sud II (France) [6244-40]
- 11:10 am: **Algorithm for symbolic computation of universal gates from Yang-Baxterization**, J. F. Ospina, M. E. Vélez, Univ. EAFIT (Colombia) [6244-41]
- 11:30 am: **Generalization of some hidden subgroup algorithms for input sets of arbitrary size**, D. Poslu, A. C. Say, Bogaziçi Univ. (Turkey) [6244-42]
- 11:50 am: **A note on the Schroedinger coordinate-wave function duality and information geometry**, R. C. Venkatesan, Systems Research Corp. (India) [6244-43]

Optical Pattern Recognition XVII

Conference Chairs: **David P. Casasent**, Carnegie Mellon Univ.; **Tien-Hsin Chao**, Jet Propulsion Lab.

Program Committee: **Mohammad S. Alam**, Univ. of South Alabama; **Don A. Gregory**, The Univ. of Alabama in Huntsville; **Bahram Javidi**, Univ. of Connecticut; **Joseph L. Stufflebeam**, NewTec; **Ashit Talukder**, Univ. of Southern California; **B.V.K. Vijaya Kumar**, Carnegie Mellon Univ.; **Rupert C. D. Young**, Univ. of Sussex at Brighton (United Kingdom)

Monday 17 April

Plenary Presentation

Room: Osceola Ballroom D Mon. 8:55 to 10:00 am

Quantum computing using linear optics and hybrid approaches

(Invited Paper, Presentation Only)

Speaker: **Prof. James Franson**, Johns Hopkins Univ.

Thursday 20 April

SESSION 1

Room: Destin 2 Thurs. 8:30 to 10:00 am

Pattern Recognition, Invited Papers I

Chair: **David P. Casasent**, Carnegie Mellon Univ.

8:30 am: **MSTAR 10-Class classification and confuser and clutter rejection using SVRDM** (Invited Paper), C. Yuan, Siemens Corporate Research; D. P. Casasent, Carnegie Mellon Univ. [6245-01]

9:00 am: **Recent results of integrated sensing and processing using a programmable hyperspectral imaging sensor** (Invited Paper), A. Mahalanobis, R. R. Muise, Lockheed Martin Missiles and Fire Control [6245-02]

9:30 am: **Recent progress of grayscale optical correlator for automatic target recognition** (Invited Paper), T. Chao, T. T. Lu, H. Zhou, Jet Propulsion Lab. [6245-03]

Coffee Break 10:00 to 10:30 am

SESSION 2

Room: Destin 2 Thurs. 10:30 am to 12:00 pm

Pattern Recognition, Invited Papers II

Chair: **David P. Casasent**, Carnegie Mellon Univ.

10:30 am: **Detection of moving individuals in cluttered scenes** (Invited Paper), G. Christogiannopoulos, R. C. D. Young, C. R. Chatwin, Univ. of Sussex at Brighton (United Kingdom) [6245-04]

11:00 am: **Target detection in hyperspectral imagery using one-dimensional fringe-adjusted joint transform correlation** (Invited Paper), M. S. Alam, S. Ochilov, Univ. of South Alabama [6245-05]

11:30 am: **Embedded predictive controller for optimal operation of wireless heterogeneous sensor networks** (Invited Paper), A. Talukder, Univ. of Southern California and Jet Propulsion Lab. [6245-06]

Lunch/Exhibition Break 12:00 to 1:30 pm

SESSION 3

Room: Destin 2 Thurs. 1:30 to 3:10 pm

Distortion Invariant Pattern Recognition Filters

Chairs: **Abhijit Mahalanobis**, Lockheed Martin Missiles and Fire Control; **B.V.K. Vijaya Kumar**, Carnegie Mellon Univ.

1:30 pm: **Automated filter synthesis and training set selection for the MINACE distortion-invariant filter**, R. Patnaik, D. P. Casasent, Carnegie Mellon Univ. [6245-07]

1:50 pm: **Position, rotation, scale, and orientation-invariant object tracking from cluttered scenes**, P. Bone, R. C. D. Young, C. R. Chatwin, Univ. of Sussex at Brighton (United Kingdom) [6245-08]

2:10 pm: **Multiframe distortion-tolerant correlation filtering for video sequences**, R. A. Kerekes, B. Narayanaswamy, M. J. Beattie, B.V.K. Vijaya Kumar, M. Savvides, Carnegie Mellon Univ. [6245-09]

2:30 pm: **Fusion of conditionally dependent correlation filter-based classifiers using OR rule for improved biometric verification**, K. Venkataramani, B.V.K. Vijaya Kumar, Carnegie Mellon Univ. [6245-10]

2:50 pm: **Improved clutter rejection in automatic target recognition and tracking using eigen-extended maximum average correlation height (EEMACH) filter and polynomial distance classifier correlation filter (PDCCF)**, M. F. Islam, M. S. Alam, Univ. of South Alabama [6245-11]

Coffee Break 3:10 to 3:40 pm

SESSION 4

Room: Destin 2 Thurs. 3:40 to 4:50 pm

Optical Correlator Hardware and New Architectures

Chair: **Mohammad S. Alam**, Univ. of South Alabama

3:40 pm: **High-speed image search engine using collinear holography** (Invited Paper), E. Watanabe, K. Kodate, Japan Women's Univ. (Japan) . [6245-12]

4:10 pm: **Use of shifted phase-encoded joint transform correlation for class-associative color pattern recognition**, M. N. Islam, M. S. Alam, Univ. of South Alabama [6245-13]

4:30 pm: **Enhanced rotation and scale-invariant target detection using the fringe-adjusted joint transform correlation**, A. M. El-Saba, M. S. Alam, W. Sakla, Univ. of South Alabama [6245-14]

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

Distortion Invariant Pattern Recognition Filters

✓ **Pattern recognition correlator based on digital photo camera**, S. N. Starikov, N. N. Balan, V. G. Rodin, I. V. Solyakin, E. A. Shapkarina, Moscow Engineering Physics Institute (Russia) [6245-21]

✓ **Confuser rejection performance of EMACH filters for MSTAR ATR**, D. P. Casasent, A. Nehemiah, Carnegie Mellon Univ. [6245-22]

Pattern Recognition and Image Processing Applications

✓ **Performance of non-identical cameras for facial biometrics systems (Presentation Only)**, A. C. Lin, C. L. Woods, Air Force Research Lab. [6245-23]

✓ **Land-cover mapping from remote sensing data**, C. J. Wong, Univ. Sains Malaysia (Malaysia) [6245-25]

✓ **The systems for persons' identification and verification on the basis of face correlation recognition**, V. L. Perju, Technical Univ. of Moldova (Moldova); A. Galben, Free Independent Univ of Moldova (Moldova) . [6245-27]

✓ **Non-conventional joint transform correlation using grating filters and heterodyne scanning techniques for pattern recognition applications**, A. K. Cherri, Kuwait Univ. (Kuwait); M. S. Alam, Univ. of South Alabama [6245-29]

Friday 21 April

SESSION 5

Room: Destin 2 Fri. 8:30 to 10:00 am

Pattern Recognition and Image Processing Applications I

Chairs: Tien-Hsin Chao, Jet Propulsion Lab.;
Don A. Gregory, The Univ. of Alabama in Huntsville

8:30 am: **Optical correlator techniques applied to spacecraft docking**
(Invited Paper), D. A. Gregory, The Univ. of Alabama in Huntsville [6245-15]

9:00 am: **A mapping approach for image correction and processing for bidirectional resonant scanners**, J. Khoury, C. L. Woods, Air Force Research Lab.; B. Haji-Saeed, S. K. Sengupta, Univ. of Massachusetts/Lowell; J. Kierstead, Solid State Scientific Corp. [6245-16]

9:20 am: **Optical design automation: a systematic approach for mapping any digital function to linear optics**, M. I. Kazantzidis, Broadata Communications, Inc. [6245-17]

9:40 am: **Three-dimensional wavelet filtering of computer tomography generated images of the liver for texture analysis**, B. Ganeshan, R. C. D. Young, K. Miles, C. R. Chatwin, Univ. of Sussex at Brighton (United Kingdom). [6245-18]

Coffee Break 10:00 to 10:30 am

SESSION 6

Room: Destin 2 Fri. 10:30 to 11:10 am

Pattern Recognition and Image Processing Applications II

Chair: Rupert C. D. Young,
Univ. of Sussex at Brighton (United Kingdom)

10:30 am: **A high-resolution and high-speed 3D imaging system and its application on ATR**, T. T. Lu, T. Chao, Jet Propulsion Lab. [6245-19]

10:50 am: **Efficient image preprocessing for topological or syntactical pattern recognition**, C. J. Hu, Southern Illinois Univ. Carbondale [6245-20]



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SC189 **Image Recognition Using Statistical Filtering Techniques, Wavelets and Neural Networks** (*Javidi*) Wednesday 8:30 am to 5:30 pm

SC766 **Information Processing for Video Surveillance** (*Ebrahimi, Dufaux*) Wednesday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Visual Information Processing XV

Conference Chairs: **Zia-ur Rahman**, College of William & Mary; **Stephen E. Reichenbach**, Univ. of Nebraska/Lincoln; **Mark A. Neifeld**, The Univ. of Arizona

Program Committee: **Gary W. Euliss**, The MITRE Corp.; **Richard D. Juday**, NASA Johnson Space Ctr.; **Joseph N. Mait**, Army Research Lab.; **Ram M. Narayanan**, The Pennsylvania State Univ.; **John M. Pellegrino**, Army Research Lab.; **Robert A. Schowengerdt**, The Univ. of Arizona; **Joseph van der Gracht**, HoloSpex, Inc.

Monday 17 April

Track Plenary Presentation
Room: **Osceola Ballroom D** Mon. 8:55 to 10:00 am
Quantum computing using linear optics and hybrid approaches
(Invited Paper, Presentation Only)
Speaker: **Prof. James Franson**, Johns Hopkins Univ.

Tuesday 18 April

Welcome

Room: Tampa 2 Tues. 8:25 am
Chair: **Zia-ur Rahman**, College of William & Mary

SESSION 1

Room: Tampa 2 Tues. 8:30 to 9:50 am
Image Understanding, Restoration, and Reconstruction I
Chair: **Zia-ur Rahman**, College of William & Mary

- 8:30 am: **A comparison of visual statistics for the image enhancement of FORESITE aerial images with those of major image classes**, D. J. Jobson, NASA Langley Research Ctr.; Z. Rahman, College of William & Mary; G. A. Woodell, G. D. Hines, NASA Langley Research Ctr. [6246-02]
- 8:50 am: **Novel method of tensor representation for reconstruction of 3D PET images from projections**, S. Alla, A. M. Grigoryan, J. M. Moreno, The Univ. of Texas at San Antonio [6246-03]
- 9:10 am: **Processing of visual information in the visual and object buffers of scene understanding system based on network-symbolic models**, G. Kuvich, Smart Computer Vision Systems [6246-04]
- 9:30 am: **Multiscale self-similarity features of terrain surface**, X. Li, H. Cao, G. Zhu, S. Yi, Huazhong Univ. of Science and Technology (China) [6246-05]
- Coffee Break 9:50 to 10:30 am

SESSION 2

Room: Tampa 2 Tues. 10:30 to 11:30 am
Video, Coding, and Compression
Chair: **Gary W. Euliss**, The MITRE Corp.

- 10:30 am: **User evaluation of differential compression for motion imagery**, L. D. Gibson, J. M. Irvine, G. O'Brien, S. R. Schroeder, A. P. Bozell, S. A. Israel, L. R. Jaeger, Science Applications International Corp. [6246-06]
- 10:50 am: **Automatic network-adaptive ultra-low bit-rate video coding**, W. Chien, T. Lam, Arizona State Univ.; G. P. Abouseleman, General Dynamics C4 Systems; L. J. Karam, Arizona State Univ. [6246-07]
- 11:10 am: **Human face detection in video using dynamic programming**, A. E. Cetin, M. Turkan, Bilkent Univ. (Turkey) [6246-08]
- Lunch/Exhibition Break 11:30 am to 1:00 pm

SESSION 3

Room: Tampa 2 Tues. 1:00 to 2:40 pm
Image Understanding, Restoration, and Reconstruction II
Chair: **Mark A. Neifeld**, The Univ. of Arizona

- 1:00 pm: **New high-dynamic-range camera architecture**, A. Cernasov, Honeywell Defense and Space Electronic Systems [6246-13]
- 1:20 pm: **Past success and future challenges in computational imaging** *(Invited Paper, Presentation Only)*, E. R. Dowski, Jr., CDM Optics, Inc. [6246-11]
- 1:50 pm: **Compressive imaging spectrometers using coded apertures** *(Invited Paper)*, D. J. Brady, M. E. Gehm, Duke Univ. [6246-12]
- 2:20 pm: **Superresolution restoration based on motion estimation error and edge-adaptive constraints**, M. Liu, H. Cao, S. Yi, X. Li, Huazhong Univ. of Science and Technology (China) [6246-10]

SESSION 4

Room: Tampa 2 Tues. 2:40 to 4:00 pm
Applications of Image Processing I
Chair: **Stephen E. Reichenbach**, Univ. of Nebraska/Lincoln

- 2:40 pm: **Improved stego-sensitivity measure for +/-A steganalysis**, S. S. Agaian, The Univ. of Texas at San Antonio; B. M. Rodriguez II, Air Force Institute of Technology [6246-17]
- 3:00 pm: **Quantitative confirmation of visual improvements to micro-CT bone density images**, J. S. DaPonte, M. Clark, T. J. Sadowski, E. Wood, Southern Connecticut State Univ. [6246-15]
- 3:20 pm: **Advanced image processing of aerial imagery**, G. A. Woodell, D. J. Jobson, NASA Langley Research Ctr.; Z. Rahman, College of William & Mary; G. D. Hines, NASA Langley Research Ctr. [6246-16]
- 3:40 pm: **Adaptive image processing for low radiation x-ray inspection**, S. M. Sheraizin, VLSCOM LTD. (Israel) [6246-14]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Moving traffic object retrieval in H.264/AVC compressed video**, X. Shi, Shanghai Univ. (China); G. Xiao, Shanghai Municipal Educational Examinations Authority (China) [6246-26]
- ✓ **Application of DSP in the image transmission system**, G. Feng, Huaqiao Univ. (China) [6246-30]
- ✓ **Object-oriented digital imaging technology**, S. Nishida, Fourie, Inc. (Japan) [6246-31]
- ✓ **A new error resilience method for FGS video enhancement bitstream**, M. Ran, Z. Zhang, Shanghai Univ. (China) [6246-32]
- ✓ **A fast context-based adaptive binary arithmetic coding algorithm in H.264/AVC**, G. Xiao, Shanghai Municipal Educational Examinations Authority (China); X. Shi, Shanghai Univ. (China) [6246-33]
- ✓ **Secure multimedia browser over network**, S. Lian, France Telecom R&D Beijing (China) [6246-34]

- ✓ **A new approach of edge detection based on pyramid-structure wavelet transform**, S. Yi, H. Cao, M. Liu, X. Li, Huazhong Univ. of Science and Technology (China) [6246-35]
- ✓ **Characterization of ultraresolution method**, E. N. Terentiev, M.V. Lomonosov Moscow State Univ. (Russia); N. E. Terentiev, PointBreak.ru (Russia) . [6246-36]
- ✓ **Arithmetic for color image morphological transform**, W. Q. Lin, Huaqiao Univ. (China) [6246-37]
- ✓ **A new texture representation with multiscale wavelet feature**, S. Yi, H. Cao, M. Liu, X. Li, Huazhong Univ. of Science and Technology (China) [6246-38]

Wednesday 19 April

SESSION 5

Room: Tampa 2 Wed. 8:50 am to 12:00 pm

Applications of Image Processing II

Chair: Robert A. Schowengerdt, The Univ. of Arizona

- 8:50 am: **Evaluation of sharpness measures and search algorithms for the auto-focus of high-magnification images**, Y. Yao, B. R. Abidi, The Univ. of Tennessee; N. Doggaz, Univ. de Tunis (Tunisia); M. A. Abidi, The Univ. of Tennessee [6246-18]
- 9:10 am: **A system for behavior analysis and threat detection**, W. Badawy, Smart Camera Technologies (Canada) [6246-19]
- 9:30 am: **Value mapping for gradient-based colorization of two-dimensional fields**, A. Visvanathan, S. E. Reichenbach, Univ. of Nebraska/Lincoln .. [6246-20]
- 9:50 am: **Automated onboard terrain analysis for precision landings**, Z. Rahman, College of William & Mary; D. J. Jobson, G. A. Woodell, G. D. Hines, NASA Langley Research Ctr. [6246-21]
- Coffee Break 10:10 to 10:40 am
- 10:40 am: **Paired directional transform-based methods of image enhancement**, F. T. Arslan, J. M. Moreno, A. M. Grigoryan, The Univ. of Texas at San Antonio [6246-22]
- 11:00 am: **VQ-based robust image watermarking**, D. Charalampidis, Univ. of New Orleans [6246-23]
- 11:20 am: **Animating climate model data**, J. S. DaPonte, T. J. Sadowski, P. Thomas, Southern Connecticut State Univ. [6246-24]
- 11:40 am: **A system for tracking and recognizing pedestrian faces using a network of loosely coupled cameras**, L. Gagnon, F. Laliberté, CRIM (Canada); D. Laurendeau, Univ. Laval (Canada) [6246-25]

Related Courses

- SC174 **Multispectral Image Processing** (*Schowengerdt*) Friday 8:30 am to 5:30 pm
- SC197 **Fundamentals of Digital Signal/Image Processing** (*Dianat*) Wednesday 8:30 am to 5:30 pm
- SC536 **Image Based Motion Analysis** (*Sanders-Reed*) Thursday 8:30 am to 12:30 pm
- SC717 **3D Visualization Techniques for Laser Radar** (*Roth*) Friday 8:30 am to 12:30 pm
- SC766 **Information Processing for Video Surveillance** (*Ebrahimi, Dufaux*) Wednesday 8:30 am to 5:30 pm

See *SPIE Cashier to Register*.

Independent Component Analyses, Wavelets, Unsupervised Smart Sensors, and Neural Networks IV

Conference Chair: **Harold H. Szu**, Office of Naval Research and The George Washington Univ.

Cochairs: **Andrzej S. Cichocki**, RIKEN-The Institute of Physical and Chemical Research (Japan); **Erkki Oja**, Helsinki Univ. of Technology (Finland); **Mark J. T. Smith**, Purdue Univ.

Program Committee: **Shun-ichi Amari**, The Institute of Physical and Chemical Research (RIKEN) (Japan); **William J. Campbell**, NASA Goddard Space Flight Ctr.; **Victor C. Chen**, Naval Research Lab.; **Milos Doroslovacki**, George Washington Univ.; **Walter J. Freeman**, Univ. of California/Berkeley; **Thomas Hopper**, Federal Bureau of Investigation; **Charles C. Hsu**, Trident Systems Inc.; **Phillip Q. Hwang**, National Imagery and Mapping Agency; **Lynn M. Keuthan**, The George Washington Univ.; **Ivica Kopriva**, George Washington Univ.; **Joseph Landa**, BriarTek Inc.; **Jacqueline Le Moigne**, NASA Goddard Space Flight Ctr.; **Jasper Lupo**, Applied Research Associates, Inc.; **Henrique S. Malvar**, Microsoft Corp.; **Anke Meyer-Bäse**, **Uwe H. Meyer-Bäse**, Florida State Univ.; **Francesco C. Morabito**, Univ. degli Studi di Reggio Calabria (Italy); **Wim Sweldens**, Lucent Technologies/Bell Labs.; **Paul J. Werbos**, National Science Foundation; **Mladen V. Wickerhauser**, Washington Univ. in St. Louis; **Bernard Widrow**, Stanford Univ.; **Donald C. Wunsch II**, Univ. of Missouri/Rolla; **Lotfi A. Zadeh**, Univ. of California/Berkeley

Monday 17 April

Track Plenary Presentation

Room: **Osceola Ballroom D** Mon. 8:55 to 10:00 am

Quantum computing using linear optics and hybrid approaches

(Invited Paper, Presentation Only)

Speaker: **Prof. James Franson**, Johns Hopkins Univ.

Wednesday 19 April

2006 Wavelet Pioneer Award

Room: **Sarasota 3** Wed. 8:30 to 9:10 am

Presented to: **Prof. Sid Burrus**, Rice Univ.

Previous Recipients Pioneers 1997-2005: **Ingrid Daubechies**,

Princeton Univ.; **Stephane Mallat**, École Polytechnique;

Martin Vetterli, École Polytechnique Fédérale de Lausanne;

David Donoho, Stanford Univ.; **Patrick Flandrin**, École Normale Supérieure de Lyon; **Mladen Wickerhauser**, Washington Univ. in St. Louis; **Wim Sweldens**, Lucent Technologies/Bell Labs.;

Henrique Malvar, Microsoft Corp.; **Mark Smith**, Purdue Univ.

Panel Discussion on

Modern Wavelets

Wednesday 9:10 to 9:50 am • Sarasota 3

Coffee Break 9:50 to 10:20 am

SESSION 1

Room: **Sarasota 3** Wed. 10:20 am to 12:20 pm

Wavelet Pioneer Award

Chair: **Mark J. T. Smith**, Purdue Univ.

10:20 am: **Discrete wavelet transform FPGA design using MatLab/Simulink**, U. H. Meyer-Bäse, Florida State Univ.; A. Vera, M. S. Pattichis, The Univ. of New Mexico; A. Meyer-Bäse, R. J. Perry, Florida State Univ. [6247-01]

10:40 am: **Nonrectangular wavelets for multiresolution mesh analysis and compression**, A. E. Cetin, Bilkent Univ. (Turkey) [6247-02]

11:00 am: **Sensor and system health management simulation**, A. M. Amini, Southern Univ. [6247-03]

11:20 am: **Invariant lattice variational principles for image compression and denoising with wavelets**, R. C. Venkatesan, Systems Research Corp. (India) [6247-04]

11:40 am: **Cross-sensor fusion of imagery for improved information extraction**, S. P. Kozaitis, M. Ouendeno, Florida Institute of Technology [6247-05]

12:00 pm: **Implementation of an adaptive wavelet system for distortion correction in smart interferometric sensors**, K. J. Jones, Rice Univ. . [6247-06]

Lunch/Exhibition Break 12:20 to 1:30 pm

Unsupervised Learning ICA Pioneer Award

Wednesday 1:30 to 2:10 pm • Sarasota 3

Presented to: **Shoji Makino**, Nippon Telegraph and Telephone Corp. Communication Science Lab (Japan)

Award speech: **Blind source separation of convolutive mixtures** (Invited Paper, Presentation Only), **S. Makino**, Nippon Telegraph and Telephone Corp. Communication Science Lab. (Japan) [6247-07]

Award Panel Discussion

Wednesday 2:10 to 2:50 pm • Sarasota 3

Panel chair: **Erkki Oja**, Helsinki Univ. of Technology (Finland)

Theme: Challenges of Real World Time-Frequency Applications

Panel co-chairs: **Andrzej Cichocki**, RIKEN,

Shoji Makino, NTT Communication Science Laboratories

Panelists: **Sid Burrus**, Rice Univ.; **Harold Szu**, Office of Naval Research; **Mark Smith**, Purdue Univ.; **Rico Malvar**, Microsoft Corp.

Coffee Break 2:50 to 3:30 pm

SESSION 2

Room: **Sarasota 3** Wed. 3:30 to 4:50 pm

Real World Applications

Chair: **Quangen Du**, Univ. of Nebraska/Lincoln

3:30 pm: **Interference and noise-adjusted principal components analysis for hyperspectral remote sensing image compression** (Invited Paper), Q. Du, Mississippi State Univ.; H. H. Szu, The George Washington Univ. [6247-08]

4:10 pm: **Unsupervised unmixing of hyperspectral imagery using the constrained positive matrix factorization**, Y. M. Masalmah, M. Véléz-Reyes, Univ. de Puerto Rico Mayagüez [6247-09]

4:30 pm: **A priori ICA as a fisher game**, R. C. Venkatesan, Systems Research Corp. (India) [6247-10]

Poster PopUp Oral Presentation

Wed. 4:50 to 5:50 pm

Chair: **Harold H. Szu**, The George Washington Univ.

Thursday 20 April

SESSION 4

Room: Sarasota 3 Thurs. 8:30 to 11:50 am

Biomimetics

Chair: **Anke Meyer-Bäse**, Florida State Univ.

8:30 am: **Detecting low-frequency functional connectivity in fMRI using self-organized algorithms** (*Invited Paper*), A. Meyer-Bäse, Florida State Univ. [6247-11]

9:10 am: **A biologically inspired neural oscillator network for geospatial analysis**, R. S. Rand, U.S. Army Engineer Research and Development Ctr.; D. Wang, The Ohio State Univ. [6247-12]

9:30 am: **Unsupervised polarization sensors fusion of polarization signals produced by scattering by reflection from the air/water interface**, M. Kurum, H. H. Szu, The George Washington Univ. [6247-14]

Coffee Break 9:50 to 10:30 am

10:30 am: **Thermodynamic energy minimization approach to breast cancer detection** (*Invited Paper*), L. Miao, H. Qi, The Univ. of Tennessee; H. H. Szu, Office of Naval Research [6247-15]

11:10 am: **Simplifying Hill-based muscle models through generalized, extensible fuzzy heuristic implementation** (*Invited Paper*), A. J. O'Brien, Strategic Analysis, Inc. [6247-16]

Lunch/Exhibition Break 11:50 am to 1:00 pm

SESSION 5

Room: Sarasota 3 Thurs. 1:00 to 4:50 pm

Neural Network Classifier

Chair: **Hairong Qi**, The Univ. of Tennessee

1:00 pm: **Classifying launch/impact events of mortar and artillery rounds utilizing DWT-derived features and feedforward neural networks**, M. E. Hohil, S. V. Desai, A. Morcos, U.S. Army Research, Development and Engineering Command [6247-17]

1:20 pm: **Global constrained optimization by simulated annealing using parallel**, B. Noaman, H. H. Szu, The George Washington Univ. [6247-18]

1:40 pm: **Chaotic associative memory and private V-mails** (*Invited Paper*), P. D. Baier, H. H. Szu, M. Hsu, The George Washington Univ. [6247-19]

2:20 pm: **A bio-nanorobot design for Drosophila therapeutic cloning**, H. H. Szu, C. Chang, The George Washington Univ. [6247-43]

2:40 pm: **Wavelet application in hearing process and development of intelligent unsupervised hearing-aid sensors**, M. Raed, The George Washington Univ. [6247-21]

Coffee Break 3:00 to 3:30 pm

3:30 pm: **Smart internet search engine through 6-W representation unsupervised learning neural networks** (*Invited Paper*), S. Goehler, The George Washington Univ. and BriarTek Inc.; H. H. Szu, The George Washington Univ. [6247-22]

4:10 pm: **Multimedia data authentication based on wavelet-domain codec** (*Invited Paper*), S. Lian, Z. Liu, France Telecom R&D Beijing (China) [6247-23]

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

✓ **The joint time-frequency spectrogram structure of heptanes boilover noise**, Q. Xu, Nanjing Univ. of Science & Technology (China) [6247-35]

✓ **An application of unsupervised learning artificial neural networks and dual-color spectrograms to predict the staging and recurrence rates of prostate cancer**, K. A. Byrd, Howard Univ. and The George Washington Univ.; H. H. Szu, The George Washington Univ. [6247-36]

✓ **Smart photon detector**, H. Ou, M. E. Zaghoul, H. H. Szu, The George Washington Univ. [6247-37]

✓ **Smart hearing aid**, N. Azizian, H. H. Szu, The George Washington Univ. [6247-38]

✓ **Reducing blocking artifacts in JPEG with Mill's cross technique**, D. Schneider, Consultant [6247-40]

✓ **Biomimetic electronic prosthesis**, C. R. Nwabuebo, H. H. Szu, The George Washington Univ. [6247-41]

✓ **Jet noise analysis by Gabor spectrogram**, Q. Xu, Nanjing Univ. of Science & Technology (China) [6247-20]

✓ **Pairs of EFID's for secured applications**, A. Mehmood, H. H. Szu, The George Washington Univ. [6247-44]

✓ **Authenticated, private, and secured smart cards**, H. H. Szu, A. Mehmood, The George Washington Univ. [6247-45]

Friday 21 April

SESSION 6

Room: Sarasota 3 Fri. 8:00 to 11:50 am

Invited Session Smart Firmwares

Chair: **Uwe H. Meyer-Bäse**, Florida State Univ.

8:00 am: **Turbo LMS algorithm: supercharger meets adaptive filter** (*Invited Paper*), U. H. Meyer-Bäse, Florida State Univ. [6247-24]

8:40 am: **Spectroscopic modeling of nitro group in explosives** (*Invited Paper*), S. P. Hernández-Rivera, D. Nuñez, L. C. Pacheco-Londoño, Univ. de Puerto Rico Mayagüez [6247-25]

9:20 am: **PCNN preprocessor stage for the optical broadcast neural network processor** (*Invited Paper*), H. Lamela, M. Ruiz-Llata, M. Jiménez, M. González, Univ. Carlos III de Madrid (Spain); C. Warde, Massachusetts Institute of Technology [6247-26]

Coffee Break 10:00 to 10:30 am

10:30 am: **Lightweight encryption for platforms with resource constraints** (*Invited Paper*), P. D. Baier, H. H. Szu, M. Hsu, The George Washington Univ.; J. M. Willey, Naval Research Lab. [6247-27]

11:10 am: **Parallel distributed RSOM tree for pattern classification**, S. Xia, W. Hu, W. Yu, National Univ. of Defense Technology (China) [6247-29]

11:30 am: **A novel multi-strategy watermark embedding technique**, G. Feng, Huaqiao Univ. (China) [6247-30]

Lunch Break 11:50 am to 1:00 pm

SESSION 7

Room: Sarasota 3 Fri. 1:00 to 2:00 pm

Smart Firmwares II

Chair: **Jenny Q. Du**, Mississippi State Univ.

1:00 pm: **Performance evaluation based on cluster validity indices in medical imaging**, A. Meyer-Bäse, Florida State Univ. [6247-31]

1:20 pm: **Classification of infrasound events using hermite polynomial preprocessing and radial basis function neural networks**, C. G. Lowrie, F. M. Ham, Florida Institute of Technology [6247-32]

1:40 pm: **A zero-watermarking algorithm based on DWT and chaotic modulation**, H. Cao, Huazhong Univ. of Science and Technology (China) [6247-33]

Related Courses

SC189 **Image Recognition Using Statistical Filtering Techniques, Wavelets and Neural Networks** (*Javid*) Wednesday 8:30 am to 5:30 pm

SC640 **Introduction to Sensor Networks** (*Rao*) Monday 8:30 am to 5:30 pm

SC714 **From FFTs to Wavelets for Image & Signal Processing** (*Smith, Burrus*) Tuesday 8:30 am to 12:30 pm

SC715 **Real World Solutions by Blind Sources Separations & ICA** (*Szu, Makino*) Tuesday 1:30 pm to 5:30 pm

SC766 **Information Processing for Video Surveillance** (*Ebrahimi, Dufaux*) Wednesday 8:30 am to 5:30 pm

See SPIE Cashier to Register.

Wireless Sensing and Processing

Conference Chairs: **Raghuveer M. Rao**, Rochester Institute of Technology; **Sohail A. Dianat**, Rochester Institute of Technology; **Michael D. Zoltowski**, Purdue Univ.

Program Committee: **Moeness G. Amin**, Villanova Univ.; **Braham Himed**, Air Force Research Lab.; **C.C. J. Kuo**, Univ. of Southern California; **Sirisha R. Medidi**, Washington State Univ.; **Nasser M. Nasrabadi**, Army Research Lab.; **Pramod K. Varshney**, Syracuse Univ.

Monday 17 April

SESSION 1

Room: Tallahassee 2 Mon. 8:30 to 10:10 am

Mobile Networked MIMO

Chairs: **Ananthram Swami**, Army Research Lab.; **Steven P. Griggs**, Defense Advanced Research Projects Agency

8:30 am: **Design and implementation of a MIMO MAC protocol for ad hoc networking**, J. Redi, W. Watson, R. Ramanathan, P. Basu, F. Tchakountio, BBN Technologies; M. Girone, Lucent Technologies [6248-01]

8:50 am: **Implementation and field demonstration of PacketBLAST system for tactical communications**, A. Pidwerbetsky, M. J. Beacken, Lucent Technologies [6248-02]

9:10 am: **MNM channel characterization**, J. Ling, D. Chizhik, Bell Labs. [6248-03]

9:30 am: **Mobile MIMO testbeds and demonstration**, A. Gummalla, H. Lee, San Diego Research Ctr., Inc. [6248-04]

9:50 am: **Link scheduling media access protocol for mobile MIMO ad hoc networks**, A. Gummalla, G. Nallamothu, San Diego Research Ctr., Inc. . [6248-05]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: Tallahassee 2 Mon. 10:40 to 11:40 am

Radio Frequency Identification (RFID)

Chair: **Moeness G. Amin**, Villanova Univ.

10:40 am: **On the estimation of the movement direction of RF tagged items**, M. G. Amin, J. Wang, Villanova Univ. [6248-06]

11:00 am: **Theory and experiments on Peano and Hilbert curve RFID tags**, J. McVay, A. Hoorfar, Villanova Univ.; N. Engheta, Univ. of Pennsylvania [6248-07]

11:20 am: **RFID-assisted localization and tracking**, Y. Zhang, M. G. Amin, Villanova Univ. [6248-08]

SESSION 3

Room: Tallahassee 2 Mon. 11:40 am to 12:20 pm

Modulation and Coding

Chair: **Sohail A. Dianat**, Rochester Institute of Technology

11:40 am: **Multirate RZ communications for dispersive wireless optical channels**, B. Y. Hamzeh, M. Kavehrad, The Pennsylvania State Univ. . . [6248-09]

12:00 pm: **Space-time-frequency block codes for LPD applications**, H. Lee, A. Gummalla, San Diego Research Ctr., Inc. [6248-10]

Lunch Break 12:20 to 1:20 pm

Track Plenary Presentation

Room: **Sun Ballroom C** Mon. 1:20 to 2:20 pm

Optimal polarized waveform design for low-grazing-angle targets in compound-Gaussian clutter

(Invited Paper)

Speaker: **Prof. Arye Nehorai**, Washington Univ. in St. Louis

SESSION 4

Room: Tallahassee 2 Mon. 2:30 to 5:20 pm

Sensor Networks

Chair: **Lisa A. Osadciw**, Syracuse Univ.

2:30 pm: **Wireless LAN signal strength in a 3-story cinderblock building**, B. B. Luu, R. D. Gopaul, Army Research Lab. [6248-11]

2:50 pm: **Energy-efficient false data detection in wireless sensor networks**, S. Ozdemir, Arizona State Univ. [6248-13]

3:10 pm: **Mesh networked unattended ground sensors**, W. Calcutt, B. Jones, R. S. Fish, M. A. Winston, McQ Associates, Inc.; J. G. Houser, Army Research Lab. [6248-14]

Coffee Break 3:30 to 4:40 pm

4:00 pm: **Jamming attack detection and countermeasures in wireless sensor network**, R. S. Muraleedharan-Sreekumaridevi, L. A. Osadciw, Syracuse Univ. [6248-15]

4:20 pm: **Toward in-band self-organization in energy efficient MAC protocols for sensor networks**, S. Biswas, F. Yu, Michigan State Univ. [6248-16]

4:40 pm: **Performance analysis of four routing protocols in sensor networks**, A. Bellaachia, N. Weerasinghe, The George Washington Univ. [6248-17]

5:00 pm: **Clustering-based localization for wireless sensor networks**, M. Medidi, R. Slaaen, S. R. Medidi, Washington State Univ. [6248-18]

Tuesday 18 April

SESSION 5

Room: Tallahassee 2 Tues. 8:30 to 10:10 am

Diversity and Multicarrier Techniques

Chair: **Fred C. Kellerman**, Harris Corp.

8:30 am: **Effects of code rate, data rate, and channel estimation on OFDM and OFDM-CDMA waveforms**, J. W. Nieto, Harris Corp. [6248-19]

8:50 am: **Performance of asynchronous multi-user MIMO OFDM systems**, H. Jung, M. D. Zoltowski, Purdue Univ. [6248-20]

9:10 am: **Mobile infostation network technology**, G. S. Rajappan, Mayflower Communications Company, Inc; J. Acharya, H. Liu, N. Mandayam, I. Seskar, R. Yates, Rutgers Univ.; R. Ulman, U.S. Army Research Office [6248-21]

9:30 am: **Distributed MIMO-OFDM in imperfectly synchronized cooperative network**, Y. Zhang, G. Wang, M. G. Amin, Villanova Univ. [6248-22]

9:50 am: **OFDM custom instruction set NIOS-based processor for FPGAs**, U. H. Meyer-Bäse, D. Sunkara, Florida State Univ.; E. Castillo, A. Garcia, Univ. de Granada (Spain) [6248-23]

Coffee Break 10:10 to 10:40 am

SESSION 6

Room: Tallahassee 2 Tues. 10:40 am to 12:20 pm

Wireless Networking

Chair: Michael D. Zoltowski, Purdue Univ.

10:40 am: **New technique to combat multipath fading in wireless networks**, G. W. Webb, Univ. of California/San Diego; I. V. Minin, O. V. Minin, Novosibirsk State Technical Univ. (Russia) [6248-24]

11:00 am: **Seamless and drastic internet optimization for wireless ad hoc and satellite links**, M. I. Kazantzidis, Broaddata Communications, Inc. [6248-25]

11:20 am: **Intelligent routing protocol for ad hoc wireless network**, C. Peng, C. W. Chen, Florida Institute of Technology [6248-26]

11:40 am: **Extended smart utilization medium access control (E-SUMAC) protocol for ad hoc wireless networks**, J. Vashishtha, Colorado School of Mines; A. K. Sinha, PerceptTek, Inc. and Carnegie Mellon Univ. [6248-27]

12:00 pm: **Communications protocol for RF-based indoor wireless localization systems**, T. Kasza, M. M. Shahsavari, V. Kepuska, M. Pinzone, Florida Institute of Technology [6248-28]

Lunch/Exhibition Break 12:20 to 2:00 pm

SESSION 7

Room: Tallahassee 2 Tues. 2:00 to 2:40 pm

Network Traffic

Chair: John W. Nicto, Harris Corp.

2:00 pm: **Evaluation of packet latency in single and multihop WiFi wireless networks**, K. B. Anna, M. Bassiouni, Univ. of Central Florida [6248-29]

2:20 pm: **Estimating degree of mixing in statistically multiplexed data**, R. Narasimha, Georgia Institute of Technology; R. M. Rao, S. A. Dianat, Rochester Institute of Technology [6248-30]

SESSION 8

Room: Tallahassee 2 Tues. 2:40 to 3:40 pm

Localization and Multipath

Chair: Raghuvveer M. Rao, Rochester Institute of Technology

2:40 pm: **GPS noncoherent early-minus-late power discriminator tracking performance in multipath environment**, L. Liu, M. G. Amin, Villanova Univ. [6248-31]

3:00 pm: **Indoor wireless source localization based on area constraints**, F. Ahmad, M. G. Amin, M. Shoeb, Villanova Univ. [6248-32]

3:20 pm: **IDMR beamforming in the presence of direction-independent array manifold mismatch**, E. L. Santos, M. D. Zoltowski, Purdue Univ. [6248-33]

Coffee Break 3:40 to 4:10 pm

SESSION 9

Room: Tallahassee 2 Tues. 4:10 to 4:50 pm

Implementation and Application

Chair: Sohail A. Dianat, Rochester Institute of Technology

4:10 pm: **Study of wireless communication between MEMS sensor nodes**, J. I. Rivera, Univ. of Central Florida and Alabama A&M Univ.; K. Heidary, M. Saafi, Alabama A&M Univ. [6248-34]

4:30 pm: **Near-Earth propagation of distributed sensors: problems and solutions**, R. Wert, A. K. Goroch, E. Worthington, K. Chan, D. Tremper, L. Schuette, Naval Research Lab. [6248-35]

✓ Posters-Tuesday

The following posters will be displayed during the poster session Tuesday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Tuesday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

✓ Functional compression for search and rescue robots and multiple sensor networks, C. Williams, R. R. Murphy, Univ. of South Florida [6248-36]

Defense Transformation and Network-Centric Systems

Conference Chair: **Raja Suresh**, General Dynamics Advanced Information Systems

Program Committee: **John S. Eicke**, Army Research Lab.; **Paul S. Gaertner**, Defence Science and Technology Organisation (Australia); **John W. Gowens II**, Army Research Lab.; **Gayle D. Grant**, U.S. Army Communications-Electronics Command; **Robert G. Hillman**, Air Force Research Lab.; **Michael A. Kolodny**, **John M. Pellegrino**, **Brian M. Sadler**, Army Research Lab.; **Larry B. Stotts**, Defense Advanced Research Projects Agency; **Robert S. Walker**, Defence R&D Canada/Suffield (Canada); **James Wood**, Defence Science and Technology Lab. (United Kingdom)

Monday 17 April

Track Plenary Presentation
Room: Sun Ballroom C Mon. 1:20 to 2:20 pm
Optimal polarized waveform design for low-grazing-angle targets in compound-Gaussian clutter
(Invited Paper, Presentation Only)
Speaker: Prof. Arye Nehorai, Washington Univ. in St. Louis

SESSION 1

Room: Miami 1 Mon. 2:30 to 4:40 pm

C2 Systems

Chairs: Robert G. Hillman, Air Force Research Lab.;
Michael A. Kolodny, Army Research Lab.

2:30 pm: **CBRN planning and response: collecting, analyzing, and using actionable knowledge**, D. G. Angeley, M. D. Lockhart, General Dynamics Corp. [6249-01]

2:50 pm: **Hybrid evolutionary algorithms for network-centric command and control**, D. Khosla, HRL Labs., LLC; T. E. Nichols, ThalesRaytheonSystems [6249-02]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Open modular embedded instrumentation architecture for test and evaluation**, R. Zhou, P. C. Sanza, M. R. Durling, P. M. Szczesny, K. F. Yim, GE Global Research [6249-03]

4:00 pm: **Development of an embedded instrumentation system architecture and its comparison to the test and training enabling architecture**, H. E. Michel, P. J. Fortier, Univ. of Massachusetts [6249-04]

4:20 pm: **Mathematical defense method of networked servers with controlled remote backups**, S. Kim, SAMSUNG Electronics Co., Ltd. (South Korea) [6249-05]

10:30 am: **Distributed Kalman filter tracking algorithms for ad hoc acoustic sensor network** (*Presentation Only*), T. Pham, Army Research Lab. [6249-11]

10:50 am: **Powered low-cost autonomous attack system: a network-centric munition concept demonstration**, J. C. Savage, J. K. O'Neal, R. A. Brown, Air Force Research Lab. [6249-12]

11:10 am: **Aircraft voice intercommunications system design for Project Oculus**, J. Wilhelm, West Virginia Univ. [6249-13]

Lunch/Exhibition Break 11:30 am to 1:00 pm

SESSION 3

Room: Sun Ballroom C Tues. 1:00 to 3:20 pm

Joint Session with conference 6220

Chairs: Raja Suresh, General Dynamics Advanced Information Systems; **Peter Tchoryk, Jr.**, Michigan Aerospace Corp.

1:00 pm: **Near space: a new frontier** (*Invited Paper*), J. R. Guerci, Defense Advanced Research Projects Agency [6249-14]

1:30 pm: **A network-centric approach to space situational awareness** (*Invited Paper*), D. A. Whelan, A. Galasso, A. Adler, The Boeing Co. [6249-15]

2:00 pm: **High-altitude balloon-based wind LIDAR demonstration: from near space to space**, M. T. Dehring, P. Tchoryk, Jr., Michigan Aerospace Corp. [6220-25]

2:20 pm: **Test and operations: one tool, one team**, C. J. Finley, Air Force Research Lab. [6220-26]

2:40 pm: **How autonomy is taking the people out of TacSat-2**, C. J. Finley, Air Force Research Lab. [6220-27]

3:00 pm: **Modular architectures for responsive Space missions: examples from TacSat-2 and TacSat-3**, S. D. Straight, B. Stargardt, Air Force Research Lab. [6220-29]

Coffee Break 3:20 to 4:00 pm

Tuesday 18 April

SESSION 2

Room: Miami 1 Tues. 8:20 to 11:30 am

Netted ISR Systems

Chairs: John S. Eicke, Army Research Lab.; **James Wood**, Defence Science and Technology Lab. (United Kingdom)

8:20 am: **Broad-area maritime surveillance unmanned aircraft system (BAMS UAS): a network centric system** (*Invited Paper*), R. Dishman, Naval Air Systems Command [6249-06]

8:50 am: **Networked sensors for the future force ATD** (*Invited Paper*), G. A. Klager, U.S. Army Night Vision & Electronic Sensors Directorate . . . [6249-07]

9:20 am: **Summary of the first network-centric sensing community workshop, 'Netted sensors: A government, industry and academia dialogue'**, L. D. Tromp, G. M. Jacyna, The MITRE Corp. [6249-09]

9:40 am: **Tactical optical systems for network-centric environment**, P. G. Tomlinson, Solers, Inc.; J. C. Ricklin, Defense Advanced Research Projects Agency [6249-10]

Coffee Break 10:00 to 10:30 am

Panel Discussion
Room: Sun Ballroom C Tues. 4:00 to 5:00 pm
Responsive Space
Chairs: Raja Suresh, General Dynamics Advanced Information Systems; **Peter Tchoryk, Jr.**, Michigan Aerospace Corp.; **Joseph R. Guerci**, Defense Advanced Research Projects Agency; **David A. Whelan**, The Boeing Co.; **Jeffrey J. Puschell**, Raytheon Space and Airborne Systems, **Ronald Graves**, General Dynamics C4 Systems

Wednesday 19 April

SESSION 4

Room: Miami 1 **Wed. 8:00 am to 12:20 pm**

Joint Session with conference 6230

Self Organizing Collaborative ISR Robotic Team 1

Chair: Ken Augustyn, General Dynamics Advanced Information Systems; *Nahid N. Sidki*, Science Applications International Corp.

8:00 am: **Demonstrating tactical information services from coordinated UAV operations** (*Invited Paper*), J. S. Bay, Air Force Research Lab. [6249-17]

8:30 am: **Cooperative operations in urban terrain**, D. C. Gross, General Dynamics Advanced Information Systems; J. Casey, Air Force Research Lab.; S. J. Rasmussen, General Dynamics Advanced Information Systems . . . [6249-18]

8:50 am: **An information-based approach to decentralized multiplatform sensor management**, C. M. Kreucher, K. D. Kastella, J. W. Wegryzn, B. Rickenbach, General Dynamics Advanced Information Systems [6249-19]

9:10 am: **A tracking approach to localization and synchronization in mobile ad hoc sensor networks**, P. Bidigare, C. M. Kreucher, R. Conti, General Dynamics Advanced Information Systems [6249-20]

9:30 am: **Considering dendritic networks: a perspective approach to network-enabled information**, D. W. Prior, General Dynamics United Kingdom Ltd. (United Kingdom) [6249-21]

9:50 am: **Reliable service discovery for network-centric systems**, R. M. Bradford, G. W. Daugherty, K. Ghoshdastidar, Rockwell Collins, Inc. [6249-22]

10:10 am: **Autonomous collaborative behaviors for multi-UAV missions**, Y. Chen, M. A. Peot, J. Lee, V. Sundareswaran, T. W. Altshuler, Rockwell Scientific Co., LLC [6249-23]

Coffee Break 10:30 to 11:00 am

11:00 am: **Coordination rule design for constrained optimization using mobile sensor/actuator nodes**, K. L. Moore, Colorado School of Mines [6230-59]

11:20 am: **Smart Cruise Control: UAV sensor operator intent estimation and its application**, H. Cheng, D. Butler, R. Kumar, Sarnoff Corp. [6230-60]

11:40 am: **Using unattended sensors with unmanned vehicles**, G. T. Kogut, H. Nguyen, L. Drymon, B. Stratton, Space and Naval Warfare Systems Ctr., San Diego [6230-61]

12:00 pm: **A reconfigurable computing platform for plume detection with mobile sensor networks**, R. M. Voyles, Univ. of Minnesota; C. D'Souza, J. A. Hesck, S. I. Roumeliotis, Univ. of Minnesota [6230-62]

Lunch/Exhibition Break 12:20 to 1:30 pm

SESSION 4 (cont)

Room: Miami 1 **Wed. 1:30 to 4:40 pm**

Joint Session with conference 6230

Self Organizing Collaborative ISR Robotic Team 1

Chair: Nahid N. Sidki, Science Applications International Corp.

1:30 pm: **Acoustic sensor payload for small robots**, S. H. Young, M. V. Scanlon, Army Research Lab. [6230-63]

1:50 pm: **Robot/sensor webs with self-regulating bandwidth**, R. R. Murphy, S. Stover, W. D. Armitage, M. A. Labrador, Safety Security Rescue Research Ctr. [6230-64]

2:10 pm: **Visually estimated motion of vehicle-mounted cameras with global uncertainty**, D. Nister, C. Engels, Univ. of Kentucky [6230-65]

2:30 pm: **A semi-autonomous unmanned ground vehicle control system**, J. D. Anderson, D. Lee, Z. Wei, J. Archibald, Brigham Young Univ. [6230-66]

2:50 pm: **The multi-robot operator control unit (MOCU)**, M. H. Bruch, Space and Naval Warfare Systems Ctr., San Diego [6230-67]

Coffee Break 3:10 to 3:40 pm

3:40 pm: **Integration of robotic resources to FORCENet**, C. Nguyen, H. G. Nguyen, R. Samuel, D. Carroll, Space and Naval Warfare Systems Ctr., San Diego [6230-69]

4:00 pm: **Multi-unmanned vehicle systems (nUxV) at Defence R&D Canada**, S. R. Verret, Defence Research and Development Canada (Canada) . . . [6230-70]

Thursday 20 April

SESSION 5

Room: Miami 1 **Thurs. 8:00 to 9:00 am**

Special Session on Defense Experimentation

Chair: Robert S. Walker,

Defence Research and Development Canada (Canada)

8:00 am: **A field investigation of radio network usage at the dismounted infantry section level**, J. Frim, Defence Research and Development Canada (Canada); D. W. Tack, Humansystems Inc. (Canada); L. L. M. Bossi, Defence Research and Development Canada (Canada) [6249-26]

8:20 am: **Investigation of alternative organizational structures**, D. W. Tack, Humansystems Inc. (Canada); L. L. M. Bossi, J. Frim, Defence Research and Development Canada (Canada) [6249-27]

8:40 am: **A mathematical approach for mission planning and rehearsal**, E. Gelenbe, Y. Wang, Imperial College London (United Kingdom) [6249-28]

SESSION 6

Room: Miami 1 **Thurs. 9:00 to 10:20 am**

Communications, Networks and Information Assurance I

Chairs: Larry B. Stotts, Defense Advanced Research Projects Agency; *John W. Gowens II*, Army Research Lab.

9:00 am: **Autonomous mobile mesh networks and applications for defense network-centric operations**, A. R. Sastry, PacketHop, Inc. [6249-29]

9:20 am: **Net-centric optical communications for the global information grid**, A. Dwivedi, Johns Hopkins Univ. [6249-30]

9:40 am: **A survey and comparison of distributed systems for group communications suitable for network-centric warfare**, J. L. Hester, National Ctr. for Supercomputing Applications and Univ. of Illinois at Urbana-Champaign; W. J. Yurcik, National Ctr. for Supercomputing Applications; R. H. Campbell, Univ. of Illinois at Urbana-Champaign [6249-31]

10:00 am: **Framework for visualization of battlefield network behavior**, Y. A. Perzov, W. J. Yurcik, Univ. of Illinois at Urbana-Champaign [6249-32]

Coffee Break 10:20 to 10:50 am

SESSION 7

Room: Miami 1 **Thurs. 10:50 am to 12:30 pm**

Communications, Networks and Information Assurance II

Chairs: Gayle D. Grant, U.S. Army Communications-Electronics Command; *Brian M. Sadler*, Army Research Lab.

10:50 am: **Node link stability in wireless mobile networks**, I. Hokelek, M. U. Uyar, City College/CUNY; M. A. Fecko, Telcordia Technologies, Inc. [6249-33]

11:10 am: **The impact of COTS technologies on the military and how to ensure security across the GIG**, D. H. Minton, World Wide Consortium for the Grid [6249-34]

11:30 am: **Simulation of mobile ad hoc networks with free-space optical capabilities**, P. Yan, J. J. Sluss, Jr., H. H. Refai, Univ. of Oklahoma; P. G. LoPresti, Univ. of Tulsa [6249-35]

11:50 am: **Traffic forecaster for MPLS multimedia data streams**, B. E. Ambrose, F. S. Lin, Broaddata Communications, Inc. [6249-36]

12:10 pm: **Universal Autosophy data formats for network-centric systems**, K. E. Holtz, Autosophy [6249-37]

✓ **Posters-Thursday**

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

Authors may set-up their posters between 10:00 am and 5:30 pm on Thursday. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. All posters must be removed no later than 8:30 pm.

- ✓ **Transmission of object-based fine-granular scalability video over wireless networks**, X. Shi, Shanghai Univ. (China); G. Xiao, Shanghai Municipal Educational Examinations Authority (China); Z. Zhang, L. Shen, Z. Li, Shanghai Univ. (China) [6249-38]

Related Courses

- SC640 **Introduction to Sensor Networks** (Rao) Monday 8:30 am to 5:30 pm
SC728 **Network Centric Target Tracking and Classification** (Drummond)
Friday 8:30 am to 5:30 pm

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Mobile Multimedia/Image Processing for Military and Security Applications

Conference Chairs: **Sos S. Agaian**, The Univ. of Texas at San Antonio; **Sabah A. Jassim**, Univ. of Buckingham (United Kingdom)

Program Committee: **Chris Adams**, Univ. of Buckingham (United Kingdom); **David Akopian**, The Univ. of Texas at San Antonio; **Chang Wen Chen**, Florida Institute of Technology; **Reiner Creutzburg**, Fachhochschule Brandenburg (Germany); **Martin Dietze**, 4G Systeme GmbH Hamburg (Germany); **Erlan H. Feria**, College of Staten Island/CUNY; **Jacques Koreman**, Univ. des Saarlandes (Germany); **Maryline Maknavicius**, Institut National des Télécommunications (France); **Chafic Mokbel**, Univ. of Balamand (Lebanon); **Alessandro Neri**, Univ. degli Studi di Roma Tre (Italy); **Gilbert L. Peterson**, Air Force Institute of Technology; **Sonia Salicetti**, GET-INT (France); **Xiyu Shi**, Univ. of Buckingham (United Kingdom); **Pedro Soria-Rodriguez**, CISSP (Spain); **Claus Vielhauer**, Otto-von-Guericke-Univ. Magdeburg (Germany); **Gregory B. White**, CIAS/The Univ. of Texas at San Antonio

Monday 17 April

Track Plenary Presentation

Room: **Sun Ballroom C** Mon. 1:20 to 2:20 pm

Optimal polarized waveform design for low-grazing-angle targets in compound-Gaussian clutter

(Invited Paper)

Speaker: **Prof. Arye Nehorai**, Washington Univ. in St. Louis

Thursday 20 April

SESSION 1

Room: **Sun Breakout 1-2** Thurs. 8:30 to 10:10 am

Secure Multimedia Processing Algorithms & Systems

Chair: **Chang Wen Chen**, Florida Institute of Technology

8:30 am: **Reduced memory JPEG decompression for mobile devices**, E. Z. Ioup, H. Mesick, J. T. Sample, F. P. McCreedy, Naval Research Lab. [6250-01]

8:50 am: **An efficient real-time video compression algorithm with high-feature preserving capability**, N. Al-Jawad, J. H. Ehlers, S. A. Jassim, Univ. of Buckingham (United Kingdom) [6250-02]

9:10 am: **Compression-designs for efficient intelligent systems**, E. H. Feria, College of Staten Island/CUNY [6250-03]

9:30 am: **A lossless predictive-transform signal coding algorithm for compression-designs-based intelligent systems**, E. H. Feria, D. Licul, College of Staten Island/CUNY [6250-04]

9:50 am: **Multiple masks-based pixel comparison steganalysis method for mobile imaging**, S. S. Agaian, The Univ. of Texas at San Antonio; G. L. Peterson, B. M. Rodriguez II, Air Force Institute of Technology [6250-05]

Coffee Break 10:10 to 10:40 am

SESSION 2

Room: **Sun Breakout 1-2** Thurs. 10:40 am to 12:20 pm

Biometric Authentication for Mobile Devices

Chair: **Jacques Koreman**, Univ. des Saarlandes (Germany)

10:40 am: **SecurePhone: a mobile phone with biometric authentication and e-signature support for dealing secure transactions on the fly**, R. Ricci, Informa Contract Research Organization (Italy); G. Chollet, Ctr. National de la Recherche Scientifique (France) and Ecole Nationale Supérieure des Télécommunications (France); M. V. Crispino, Nergal (Italy); S. Garcia-Salicetti, Institut National des Télécommunications (France); S. A. Jassim, Univ. of Buckingham (United Kingdom); J. Koreman, Univ. des Saarlandes (Germany); M. Olivar-Dimas, Telefonica Moviles Espana S.A.U. (Spain); P. Soria-Rodriguez, Atos Origin S.A. (Spain) [6250-06]

11:00 am: **Performance evaluation of wavelet-based face verification on a PDA-recorded database**, J. H. Ehlers, H. Sellahewa, S. A. Jassim, F. Stumpf, Univ. of Buckingham (United Kingdom) [6250-07]

11:20 am: **On the use of AAM and a linear regression speaker transformation to break a GMM-based A/V speaker verification system**, W. P. Karam, C. Mokbel, Univ. of Balamand (Lebanon); G. Chollet, Ctr. National de la Recherche Scientifique (France) [6250-08]

11:40 am: **Comparison of weighting strategies in early and late fusion approaches to audio-visual person authentication**, H. Sellahewa, N. Al-Jawad, Univ. of Buckingham (United Kingdom); A. C. Morris, D. Wu, J. Koreman, Univ. des Saarlandes (Germany); S. A. Jassim, Univ. of Buckingham (United Kingdom) [6250-09]

12:00 pm: **Multimodal person authentication on a smartphone under realistic conditions**, A. C. Morris, Univ. des Saarlandes (Germany); S. A. Jassim, H. Sellahewa, Univ. of Buckingham (United Kingdom); L. Allano, Institut National des Télécommunications (France); D. Wu, J. Koreman, Univ. des Saarlandes (Germany); S. Garcia-Salicetti, B. Ly-Van, B. Dorizzi, Institut National des Télécommunications (France) [6250-10]

Lunch/Exhibition Break 12:20 to 1:20 pm

SESSION 3

Room: **Sun Breakout 1-2** Thurs. 1:20 to 3:00 pm

Secure Communication, Mobile, and Wireless Network Issues

Chair: **Pedro Soria-Rodriguez**, CISSP (Spain)

1:20 pm: **Secure steganography designed for mobile platforms**, S. S. Agaian, R. C. Cherukuri, R. R. Sifuentes, Jr., The Univ. of Texas at San Antonio [6250-11]

1:40 pm: **A new JPEG-based steganographic algorithm for mobile devices**, S. S. Agaian, R. C. Cherukuri, E. C. Schneider, G. B. White, The Univ. of Texas at San Antonio [6250-12]

2:00 pm: **On mobile wireless ad hoc IP video transports**, M. I. Kazantzidis, Broaddata Communications, Inc. [6250-13]

2:20 pm: **Enhancement of node connectivity for a secure mobile wireless network**, X. Shi, F. Li, C. R. Adams, Univ. of Buckingham (United Kingdom) [6250-14]

2:40 pm: **Robust image transmission over MIMO space-time coded wireless systems**, D. Song, C. W. Chen, Florida Institute of Technology [6250-15]

Coffee Break 3:00 to 3:30 pm

SESSION 4

Room: **Sun Breakout 1-2** Thurs. 3:30 to 5:30 pm

Security, Privacy, and Forensic Issues

Chairs: **Erlan H. Feria**, College of Staten Island/CUNY; **Oscar Moreira-Tamayo**, The Univ. of Texas at San Antonio

3:30 pm: **Privacy enabling technology for video surveillance**, F. Dufaux, M. Ouaret, Y. Abdeljaoued, École Polytechnique Fédérale de Lausanne (Switzerland) and Emitall Surveillance SA (Switzerland); A. Navarro, Emitall S.A. (Switzerland); T. Ebrahimi, École Polytechnique Fédérale de Lausanne (Switzerland) and Emitall Surveillance SA (Switzerland) [6250-16]

3:50 pm: **Object segmentation by fusion of multicues in stereo sequences**, P. An, Shanghai Univ. (China); Z. Zhang, Shanghai Univ. (China) and Key Lab. of Advanced Displays and System Application, Ministry of Education (China) [6250-17]

4:10 pm: **Forensic analysis of signals processed by CODECs in mobile applications for hardware identification**, O. Moreira-Tamayo, The Univ. of Texas at San Antonio [6250-18]

4:30 pm: **A logarithmic measure of image enhancement**, E. J. Wharton, Tufts Univ.; S. S. Agaian, The Univ. of Texas at San Antonio; K. A. Panetta, Tufts Univ. [6250-24]

4:50 pm: **Content-based video indexing and searching with wavelet transformation**, F. Stumpf, N. Al-Jawad, H. Du, S. A. Jassim, Univ. of Buckingham (United Kingdom) [6250-20]

5:10 pm: **Wireless just-in-time training of mobile first responders**, C. Bandera, BanDeMar Networks [6250-27]

✓ Posters-Thursday

The following posters will be displayed during the poster session Thursday evening in the Osceola Ballroom C. Authors will be present for discussion during the poster session between 6:00 and 7:30 pm.

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✓ **An imaging toolbox for smart phone applications**, A. Panchul, D. Bhupathiraju, S. S. Agaian, D. Akopian, The Univ. of Texas at San Antonio [6250-22]

✓ **Secure image communication for network applications**, S. Lian, France Telecom R&D Beijing (China) [6250-25]

✓ **Directional edge detection using the logical transform for binary and grayscale images**, E. E. Danahy, Tufts Univ.; S. S. Agaian, The Univ. of Texas at San Antonio; K. A. Panetta, Tufts Univ. [6250-26]

✓ **The effects of malicious nodes on performance of mobile ad hoc networks**, F. Li, X. Shi, S. A. Jassim, C. R. Adams, Univ. of Buckingham (United Kingdom) [6250-21]

✓ **On a symmetry principle for information processing**, E. H. Ferial, College of Staten Island/CUNY [6250-19]



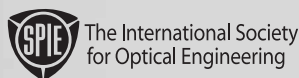
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Participants List

Bold = SPIE Member

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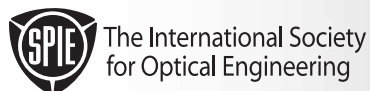
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DEFENSE & SECURITY SYMPOSIUM

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Gaylord Palms Resort and Convention Center
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Hotel Tel: 409 586 0000
Hotel Fax: 407 586 1799

Onsite Registration and Information Hours

Gaylord Palms Resort and Convention Center
Exhibition Hall Level, Hall B

Sunday 16 April	5:00 pm to 8:00 pm
Monday 17 April	7:00 am to 4:00 pm
Tuesday 18 April	7:15 am to 5:00 pm
Wednesday 19 April	7:30 am to 5:00 pm
Thursday 20 April	7:30 am to 4:00 pm
Friday 21 April	7:30 am to Noon

For Safety and Security reasons, please be prepared to show a picture ID at registration to receive your event badge!

Technical Exhibition

Gaylord Palms Resort and Convention Center,
Exhibition Hall Level, Halls A-E

Tuesday 18 April	10 am to 5 pm
Wednesday 19 April	10 am to 5 pm
Thursday 20 April	10 am to 2 pm

Course Materials Desk

Located near the SPIE Registration Area
Open during registration hours

If you have registered to attend a short course, please stop by the Course Materials Desk to pick up your course notes and to find out where the class will be located. You may also get a copy of the latest Education Services catalog to see the many courses SPIE has available at symposia, on video and cd-rom, and to discover the opportunities of customized In-Company courses.

Speakers Audiovisual Desk

Gaylord Palms Resort and Convention Center,
in Sun Ballroom Pre-function

Monday through Friday 7:30 am to 5 pm
All Conference rooms will have a LCD projector (for IBM compatible and Macintosh computers), an overhead projector, screen, lapel microphone, and laser pointer. Speakers using a laptop are requested to come to the Audiovisual Desk to confirm display compatibility with LCD projectors prior to their presentation.

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In the Exhibition Hall: For security and courtesy reasons, photographing or videotaping individual booths and displays in the exhibit hall is allowed ONLY with explicit permission from on-site company representatives. Individuals not complying with this policy will be asked to surrender their film and to leave the exhibition hall.

Poster Sessions

Osceola Ballroom C

Tuesday & Thursday 6:00 to 7:30 pm

Conference attendees are invited to attend the poster sessions on Tuesday and Thursday evenings. Each evening will represent a different set of conferences. Come view the posters, ask questions, and enjoy the refreshments. Authors of poster papers will be present to answer questions concerning their papers. Attendees are requested to wear their conference registration badges to the poster sessions.

Poster Set-Up

Poster presenters may set up between 10:00 am and 5:30 pm on their scheduled presentation day in Osceola Ballroom C. Posters that are not set-up by the 5:30 pm cut-off time will be considered no-show and their manuscript will not be published. Poster presenters must remove their posters immediately after the Poster Session. Posters not removed will be considered unwanted and will be discarded. SPIE assumes no responsibility for any posters left up after 8:30 pm.

SPIE Message Center

To leave messages for attendees call the Gaylord Palms Resort at (407) 586-0000. When you call you will hear a recording, press 3 and ask for the SPIE Message Center located in the hotel Convention Center. Messages will be taken during registration hours Monday through Friday.

SPIE Copy Center

Located near registration

Monday through Thursday

During registration hours San Diego Copy will provide a copy service during the week for symposium attendees. The discounted rates are:

5 cents/copy and \$1 per transparency

Other services are available.

Internet Pavilion

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Located near Registration. At no charge attendees can browse the web and check and send e-mail. There will be a 10-minute time limit per each person's internet session.

Monday	7:00 am to 4:00 pm
Tuesday	7:15 am to 5:00 pm
Wednesday	7:30 am to 5:00 pm
Thursday	7:30 am to 4:00 pm

Complimentary Internet Wireless Access

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SPIE and OCTEC Ltd. are pleased to provide complimentary wireless access to the Internet for all conference attendees bringing 802.11b wireless-enabled laptops or PDAs. Properly secure your computer before accessing the public wireless network. Failure to do so may allow unauthorized access to your laptop.

Coverage locations (Gaylord Palms Convention Center).

Lunch Area, Hall E
Sun Ballroom Foyer
Osceola Ballroom Foyer

Connection Settings: Please configure your wireless settings as follows:

- SSID: OCTEC (case-sensitive — all capital letters)
- WEP: Disabled
- Network Card Settings: DHCP

If you unfamiliar with configuring wireless access or for any reason cannot connect using these settings, you can instead use the computers at the Internet Pavilion in Registration.

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Special 2-Day Event!

SPIEWorks Career Fair

Located near registration, front of 100 aisle

Tuesday 18 April 10:00 am to 5:00 pm
Wednesday 19 April 10:00 am to 5:00 pm

Begin or advance your career with a visit to the SPIEWorks Career Fair. Meet face to face with recruiters from companies actively hiring and come prepared to discuss your skills and experience, network with technical staff and human resource recruiters; learn more about employment opportunities and interview for positions. Don't forget to post your resume and search job listings on SPIEWorks.com.

NOTE: Many of the positions listed at this career event require an active security clearance or the ability to acquire one. Membership in SPIE is not required.

Free Services for Employers

Stop by the SPIEWorks booth in the Career Fair and gain access to our proprietary resume database at no charge during this event.

Post jobs for free. That's right, there's no charge to post jobs to the Defense & Security Career Fair. Go to spieworks.com, create an account and sign-in to post jobs online. Your free job(s) will be live 17 - 21 April.

For information on future recruiting events contact Robert Dentel or Dave Baggenstos at +1 360 715 3705 or email sales@spieworks.com

Media Center

The on-site Media Center provides press conference facilities, refreshments, and convenient one-stop-shopping for press releases. Credentialed media are invited to communicate news via the provided phone, and modem hook-up. Registration and exhibition fees are waived for media representatives. You are encouraged to pre-register by e-mailing: name, organization, title, address, e-mail, and phone number to media@spie.org. For more information about SPIE media services, see <http://spie.org/info/media>.

General Information

Breakfast Breads

Breakfast breads and coffee will be served from 7:30 to 8:30 am Monday through Friday for Symposium attendees, while supplies last.

Cash Lunches

Cash lunch service will be available Monday from 11:30 to 1:30 pm in the City Hall Lobby, located on the Ballroom level of the Convention Center. To allow attendees time to visit the exhibitions during lunch breaks Tuesday through Thursday, cash lunch service will be located in the Exhibition Hall (Florida E) from 11:30 am to 2:00 pm.

Attendees will need to access hotel restaurants for lunch on Friday.

Coffee Breaks

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Coffee will be served at the following times:

Monday through Friday 10:00 to 11:00 am,
3:00 to 4:00 pm

Check individual conference listings for actual break times.

Desserts

Tuesday Afternoon Sponsored by



Wednesday Afternoon Sponsored by



Dessert snacks will be served in the Exhibition Hall, (Halls A-D) Tuesday & Wednesday from 3:00 to 3:30 pm during the coffee break. Complimentary dessert tickets will be included in attendee registration packets.

SPIE Defense & Security Banquet

Wednesday, 19 April

\$80.00 per person. Please see the registration desk to sign up.

See page 5 for details.

Guest Hospitality Suite

Gaylord Hotel, Suite 4301

Tuesday through Friday 8:30 to 10:00 am

Guests of attendees are invited to meet, relax, and enjoy a cup of coffee and breakfast breads in SPIE's Guest Hospitality Suite at the Gaylord Palms Resort. The Suite will be open Tuesday through Thursday from 8:30 to 10:00 am. This event is for guests of Defense and Security Symposium attendees only. A representative from Convention Planning Services, Inc. (CPS) will be available to answer travel, shopping, and tourist questions and to sell discount tickets for the major attractions. This hospitality suite is sponsored by SPIE.

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Guest child care is available in-house at the Gaylord Palms Resort's La Petite Academy Kids Station, a 4,000-sq.-ft. facility designed to delight kids ages 3-14. Kids can stay and play for one to four hours or make a day of it. Kids Station offers a variety of themed activities including Construction Station (blocks, trucks and building toys), Creation Station (art studio and crafts), Kidz Space (Sega, PlayStation and Nintendo), Imagination Station (karaoke stage, dress up, singing, dancing), Relaxation Station (reading, watching videos, or napping), and Soft Play Zone (climbing, scaling, exploring). The Gaylord Palms also offers in-room child care for guests with younger children. 24 hour advance reservations are required for in-room care. For further information call the hotel at (407) 586-2505, or 1.866.KIDS-STATION.

All About Kids Professional Child Care, (407) 812-9300, www.All-About-Kids.com, or email AAboutKids@aol.com

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Convention Planning Services, Inc., CPS, will have a fully staffed guest relations booth near SPIE registration to assist Defense and Security Symposium attendees with attraction tickets at discounted rates. All international attendees who ordered tickets on-line can pick-up their tickets at the CPS booth near Registration during the conference. On-line ticket orders received after the deadline date will still be processed but not mailed out.



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