Signal Recovery & Synthesis (SRS)

10 July - 14 July 2011, The Westin Harbour Castle, Toronto, Ontario, Canada

The Signal Recovery and Synthesis Topical Meeting is an interdisciplinary forum where the latest theoretical and application research results in all aspects of image/signal reconstruction and restoration theory are welcome.

Signal recovery and synthesis is concerned with methods for obtaining optimal estimates of signals and images from the data and constraints at hand. The topical area is important to many fields of optics, as well as a broader constituency due to its interdisciplinary nature; examples include image reconstruction from Fourier intensity measurements, superresolution, tomographic reconstruction, blind spectral unmixing, and blind deconvolution. This topical meeting is concerned with theory, algorithms, computations, and applications of signal recovery and synthesis in optics and other disciplines.

The conference chairs invite you to share your latest work with colleagues and network with leaders in the field including distinguished invited speakers and the program committee.

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Check out the Housing and Travel Page to find out how to Experience Toronto from the Water and get discounts on Toronto Bus and Walking Tours!

View the conference program and plan your itinerary for the conference

- Browse speakers and the agenda of sessions
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- Search by author, title, OCIS code and more.
- Plan and print your personal itinerary before coming to the conference

This event is part of the Imaging and Applied Optics Congress, allowing attendees to access to all meetings within the Congress for the price of one and to collaborate on topics of mutual interest.

Imaging and Applied Optics

- Adaptive Optics: Methods, Analysis and Applications (AO)
- Application of Lasers for Sensing & Free Space Communication (LS&C)
- Applied Industrial Optics: Spectroscopy, Imaging, & Metrology (AIO)
- Computational Optical Sensing and Imaging (COSI)
- Fourier Transform Spectroscopy (FTS)
- Hyperspectral Imaging and Sounding of the Environment (HISE)
- Imaging Systems Applications (IS)
- Signal Recovery & Synthesis (SRS)

Chairs:

Charles Matson, Air Force Res. Lab, USA, General Chair
Edmund Lam, Univ. of Hong Kong, Hong Kong, Program Chair
Chris Dainty, Natl. Univ. of Ireland Galway, Ireland, Program Chair

Sponsor:
Imaging and Applied Optics: OSA Optics and Photonics Congress

July 10-14, 2011, The Westin Harbour Castle, Toronto, Canada

The Imaging and Applied Optics Congress – exploring the growing need for optical imaging technologies.

Optical imaging technologies and its wide adaption for commercial, military and medical applications are progressing rapidly. Additionally, optical techniques applied to sensing, process control, metrology, and laser remote sensing are impacting and enabling many applications. This Optics and Photonics Congress explores the latest advances in imaging technologies as well as the development and use of other optical sensing and data transfer techniques and reports on new implementations that exploit these advances. Numerous advances in optical technologies have enabled new applications and these too will be presented at this Congress. Novel computational and conventional imaging theory, component developments, and demonstrations will be discussed in five of the meetings (AO, COSI, FTS, IS, SRS) while the application of imaging techniques will represent the important themes in three of the meetings (HISE, IS, AIO). Optical measurement and sensing applications also form an important component to this Congress and are covered in IS, AIO, LS&C, and HISE.

- Adaptive Optics: Methods, Analysis and Applications (AO)
- Application of Lasers for Sensing & Free Space Communication (LS&C)
- Applied Industrial Optics: Spectroscopy, Imaging, & Metrology (AIO)
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- Imaging Systems Applications (IS)
- Signal Recovery & Synthesis (SRS)

OSA Congresses are intimate, medium sized meetings where 300-500 industry experts and top researchers and developers share their latest research and collaborate on new and future applications. Exhibiting at The OSA Imaging and Applied Optics Congress offers you an extremely targeted opportunity to display your company’s products. Previous exhibitors include representatives from companies involved in nanotechnology. Precision optics, optical thin film coatings, optoelectronics and imaging, fabrication and testing and scientific instruments.

Reserve exhibit space today by calling +1 202.416.1474 or email rpickett@osa.org. Several sponsorship options, ranging from coffee breaks to lanyards, are also available – call 1-202-416-1474 or email rpickett@osa.org to learn more. Sign up early to receive the best location.

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Special Events
AIO Plenary Session
Monday, 11 July, 08:00-10:00
Pier 3
Atle Honne
Senior Research Scientist, SINTEF, Oslo, Norway
Atle Honne is the project manager for ANITA at SINTEF, the largest independent research organization in Scandinavia. His responsibilities include calibration, measurement, testing and data evaluation for ANITA with special interests in FTIR-based multi-gas analyses, optical measurements, and measurement technology in general. He holds a Master of Science in Applied Physics, and has recently been awarded the 2009 Wright Brothers Award for one of his background research papers on this subject.

Networking for Lunch
Tuesday, 12 July 12:30 – 14:00
Sponsored by the OSA Information Acquisition, Processing and Display Technical Division
David Brady, Division Chair, and Chris Dainty, OSA President, invite you to join them over lunch for some lively networking with your colleagues. OSA is pleased to offer complimentary sandwiches and beverages to all who attend.

Joint Conference Reception
Tuesday, 11 July, 19:00-20:30
Metro West Ballroom, 2nd Floor Conference Room
The reception will feature light fare and is open to all registrants

Poster Presentations
Poster presentations offer an effective way to communicate new research findings and provide an opportunity for lively and detailed discussion between presenters and interested viewers.

Joint IS/AIO/LS&C Poster Session
Tuesday, 12 July, 10:30-12:30
Salon B

Joint FTS/HISE/AO/COSI Poster Session
Wednesday, 13 July, 10:30-12:30
Salon B

Postdeadline Paper Presentations
The program committees of AO/COSI/FTS/HISE accepted postdeadline papers for presentation. The purpose of postdeadline sessions is to give participants the opportunity to hear new and significant materials in rapidly advancing areas. Only those papers judged to be truly excellent and compelling in their timelines were accepted.

For more information, including the schedule and locations see the Postdeadline papers appended to the back of the program book.

AO Postdeadline Paper Session
Tuesday, 12 July 16:30-18:30
Pier 5

COSI Postdeadline Paper Session
Wednesday, 13 July 10:30-12:30
Salon C

Joint FTS/HISE Postdeadline Paper Session
Wednesday, 13 July 16:30-18:30
Pier 7/8

Sponsors:
Signal Recovery & Synthesis (SRS)

10 July - 14 July 2011, The Westin Harbour Castle, Toronto, Ontario, Canada

Program

The Signal Recovery and Synthesis Topical Meeting is an interdisciplinary forum where the latest theoretical and application research results in all aspects of image/signal reconstruction and restoration theory are welcome.

If you would like to be considered as a presenter, please review the topic categories below and the author/presenter information for submission guidelines.

A number of distinguished invited speakers have been invited to present at the meeting. In addition, the organizers have planned a number of special events to make your meeting experience more enjoyable!

View the conference program and plan your itinerary for the conference

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- Browse sessions by type or day.
- Search by author, title, OCIS code and more.
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Meeting-at-a-Glance

A tentative general schedule of the meeting (as well as all meetings in the Congress) is listed below. Please check back frequently for updates.

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**Invited Speakers**

**Monday 11 July**

SMA1, *Inverse Optical Design and Its Applications*, Julia Sakamoto, Univ. of Arizona, USA

SMB1, *Promises and Challenges of Ghost Imaging*, Robert Boyd, Univ. of Rochester, USA
SMC1, Applications of Shannon information and statistical estimation theory to inverse problems in imaging. S. Prasad, S. Narravula, Physics and Astronomy, Univ. of New Mexico, USA

SMD1, Optical signal processing: Holography, speckle and algorithms. John Sheridan, Univ. College, Ireland

Tuesday 12 July

JTuA1, Optical turbulence profiling and applications for astronomy. R.W. Wilson, T. Butterley, J. Osborn, H. Shepherd, Physics, Durham Univ., UK

JTuC1, Image Reconstruction in Optical Interferometry. E. Thiébaut, AiRi, Ctr. de Recherche Astrophysique de Lyon, France

Special Events

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Call for Papers

View the SRS Call for Papers PDF in December 2010.
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10-14 July 2011
The Westin Harbour Castle, Toronto, Ontario, Canada

OSA continues the tradition of outstanding conferences and focused meetings with the 2011 Optics and Photonics Congress on Imaging and Applied Optics in beautiful Toronto, Ontario. Like last year’s meeting in Tucson, this year’s meeting promises to be very exciting. The Congress has co-located eight topical meetings (listed above) in order for attendees to benefit from exposure to a diverse collection of optical technologies. The Program includes scientific leaders from around the globe in each topical area which should facilitate networking and the cross-pollination of ideas between attendees. Please join us on Tuesday evening for the joint Welcome Reception on the 2nd floor of the conference center in the Metro West Ballroom.

The Applied Industrial Optics (AIO) meeting was an unprecedented success last year, and promises to be very exciting this year. The conference begins on the International Space Station thanks to our plenary speaker Atle Honne. The remaining 28 invited speakers, spanning the full three days of the conference cover a wide range of applied optical technologies and a very diverse set of application areas including security, forensics, environmental monitoring, and Smart Grid technology. In addition, our invited speakers and contributors include industrial, governmental, and academic scientist at the forefront of applied optics from around the globe. Join us for an exciting meeting and volunteer to join the team to help make next year’s meeting even better.

The Adaptive Optics meeting brings together technologies which have enabled significant performance improvements in different applications of adaptive optics such as astronomy, free space communications, optometry/ophthalmology, microscopy, laser microfabrication, lithography, laser fusion, fiber optics, and x-ray optics. This meeting represents a forum in which many of the latest advances and challenges will be presented by well-known experts in this discipline. The topics to be presented include discussions of various systems that use adaptive optics techniques, control systems, wavefront sensing and correcting, system and component modeling, imaging techniques through distorting or scattering media, and achievable performance improvements.

This meeting will also include two special joint sessions. The first is with the Signal Recovery and Analysis meeting and the second with the Application of Lasers for Sensing & Free Space Communication meeting covering common topics. Invited speakers will present talks on the application of complex Adaptive Optic systems for two very different applications in the fields of ophthalmology and astronomy.

The Computational Optical Sensing and Imaging (COSI) meeting covers subject matter in fundamental physics, numerical methods and physical hardware that has led to significant improvements in the fields of imaging and sensing including applications in medical, defense, homeland security, inspection, testing, etc. Topics in this meeting include wave-front coding, light field sensing, compressive optical sensing, tomographic imaging, structured illumination imaging, digital holography, SAR, lensless imaging, point spread function engineering, digital/optical super-resolution, unusual form-factor cameras, synthetic aperture optical systems, etc. Computational Optical Sensing and Imaging is an important discipline being applied to solve numerous problems in modern optics and the techniques developed in this field have been incorporated in to numerous commercial products.

Benefiting from innovative techniques and mature instrumentation, Fourier-transform spectrometers push forward the limits of sensing in a growing number of fields. Inheriting from its predecessors, the 2011 Fourier Transform Spectroscopy (FTS) meeting welcomes you to inspiring and stimulating conferences. In-depth invited talks and up-to-date contributions will cover the vast FTS field. Attendees will hear about atmospheric science, astronomy, planetary science, and advanced laboratory spectroscopy. The meeting will exhibit expanding applications of imaging, static, and spatial heterodyne spectrometers. Novel developments like polarimetric and comb techniques will also be highlighted.
The Hyperspectral Imaging and Sounding of the Environment (HISE) meeting will cover many important research results in cloud monitoring, surface and atmospheric research, advances in sensors and measurement approaches, atmospheric profiling and gas sensing, radiometric and spectral remote sensing, and new applications arising from merged imager and sounder data. Invited papers delivered by widely recognized experts in this area will present a picture of the state of the art in environmental sensing. Remote sensing data from passive and active measurement technologies provide unprecedented monitoring capabilities and are leading to a more refined understanding of our planet. The uniqueness of the data obtained from these hyperspectral sensors requires new approaches for managing, processing and using the data, including the integration of observations from different sensor constellations to better assess the information that these new measurements provide.

The Imaging Systems (IS) meeting is an “all-encompassing” conference on imaging that covers topics in imaging optics, sensors, computational imaging and 3-D imaging. Invited speakers from the military, academic, and commercial imaging sectors will address the current status and future of imaging in their organizations. The conference includes 16 invited, 17 contributed oral presentations, and 6 poster presentations that describe recent developments in lens design (including aperture masks and wavefront coding), pixel optics, novel imaging sensors (including curved focal plane arrays, superresolution systems, and MEMs deformable mirrors), compressive sensing, image processing, computational photography and human vision.

The Application of Lasers for Sensing & Free Space Communication meeting (LS&C) is designed to report on many of the important advances realized in the last few years to make FSO more robust, increase data rate capabilities, and demonstrate its usefulness in numerous field applications. Adaptive optics (AO) is an important component to addressing the limiting effects encountered when propagating in the atmospheric and in water. To be reported at this meeting will be diversity techniques including MIMO as well as AO are used to combat fading channels, coherent communications, hybrid laser/RF technologies, and networking with FSO. The latest research results on information assurance in quantum communications will be discussed along with advances in LADAR system and technology development. Important applications in standoff bio-detection, uses of lasers in Naval environments involving blue-green communications, and lunar laser communications will be described. Also included in the meeting is a joint session with the Adaptive Optics topical meeting on the latest advances in wave front control and turbulence. Laser systems are being used in numerous free space communications and remote sensing applications. Free space optical (FSO) communications has become a viable competitor to RF systems for many special applications; however, there still are several issues that need to be addressed to make FSO more robust relative to propagation impairments.

The Signal Recovery & Synthesis (SRS) meeting consists of topics that range from theoretical to experimental, but all with a common theme of signal processing to achieve desired ends. You will hear the latest research results in the areas of ghost imaging, blind deconvolution, optical turbulence characterization, optical signal processing, and more. In addition, the SRS meeting has two joint sessions with the AO meeting, with topics that involve signal processing and adaptive optics. There are 6 invited and 22 contributed presentations as part of this exciting meeting.

AIO
Sean Christian, Optrology, Inc., USA, General Chair
Jess Ford, Weatherford Int., USA, General Chair
Joe Dallas, Avo Photonics Inc., USA, Program Chair
Bertrand Lanher, Process Analytical Chemistry Services, USA, Program Chair

AO
Julian Christou, Gemini Observatory, USA, Chair
Donald T. Miller, Indiana Univ., USA, Chair

COSI
Michael Gehm, Univ. of Arizona, USA, Chair
Rafael Piestun, Univ. of Colorado at Boulder, USA, Chair

FTS
Pierre Tremblay, Univ. Laval, Canada, General Chair
Felix Friedl-Vallon, Karlsruhe Inst. of Technology, Germany, Program Chair

HISE
Bryan Baum, Space Science and Engineering Ctr., Univ. of Wisconsin-Madison, USA, General Chair
Ping Yang, Texas A&M Univ., USA, General Chair

IS
Gisele Bennett, Georgia Tech, USA, General Chair
Joyce Farrell, Stanford Univ., USA, General Chair
Boyd Fowler, Fairchild Imaging, USA, General Chair
Peter Catrysse, Stanford Univ., USA, Program Chair
Joseph N. Mait, ARL, USA, Program Chair

LS&C
Paul McManamon, Exciting Technology, LLC, USA, Chair
Larry Stotts, DARPA/STO, USA, Co-Chair
Ed Watson, US Air Force, USA, Co-Chair

SRS
Charles Matson, Air Force Res. Lab, USA, General Chair
Chris Dainty, Natl. Univ. of Ireland Galway, Ireland, Program Chair
Edmund Lam, Univ. of Hong Kong, Hong Kong, Program Chair

General Chair
Ping Yang, Texas A&M Univ., USA,
Bryan Baum, Space Science and Engineering Ctr., Univ. of Wisconsin-Madison, USA,
Imaging and Applied Optics
Program Committee

Adaptive Optics: Methods, Analysis and Applications (AO)

Chairs
Julian Christou, Gemini Observatory, USA
Donald T. Miller, Indiana Univ., USA

Committee Members
Matthew Britton, The Optical Sciences Company (tOSC), USA
Chris Dainty, National Univ. of Ireland Galway, Ireland, liaison with SRS
Nathan Doble, New England College of Optometry, USA
Brent Ellerbroek, Thirty Meter Telescope Project, USA
Simone Esposito, INAF - Osservatorio Astrofisico di Arcetri, Italy
Robert Johnson, AFRL, USA
Caroline Kulcsar, Univ. Paris 13, France
Gordon Love, Univ. of Durham, UK
Lisa Poyneer, LLNL, USA
Sergio Restaino, NRL, USA
Erez Ribak, Technion Israel Inst. of Technology, Israel
Michael Vorontsov, Univ. of Maryland, USA
Tony Wilson, Univ. of Oxford, UK

Application of Lasers for Sensing & Free Space Communication (LS&C)

General Chairs
Paul McManamon, Exciting Technology, LLC, USA, Chair
Larry Stotts, DARPA/STO, USA, Co-Chair
Ed Watson, US Air Force, USA, Co-Chair

Committee Members
Larry Andrews, CREOL, Univ. of Central Florida, USA
Tim Carrig, Lockheed Martin Coherent Technologies, USA
Rick Heinrich, MIT Lincoln Lab, USA
Sammy Henderson, Lockheed Martin Coherent Technologies, USA
David Hughes, Air Force Research Lab
Juan Juarez, Johns Hopkins APL, USA
Mike Lovern, SPAWAR, USA
Brian Miles, FastMetrix, Inc., USA
Malcom Northcott, Aoptix Technologies, Inc., USA
Ron Phillips, Univ. of Central Florida, USA
Pete Poirier, SPAWAR, USA
Troy Rhoadarmer, SAIC, USA
Jason Schmidt, Air Force Inst. of Technology, USA
Brian Stadler, US Air Force Res. Lab, USA
Linda Thomas, Office of Naval Res., USA
Bob Tyson, Univ. of North Carolina at Charlotte, USA

Applied Industrial Optics: Spectroscopy, Imaging, & Metrology (AIO)

General Chairs
Sean Christian, Optrology, Inc., USA
Jess Ford, Weatherford Intl., USA

Program Chairs
Joe Dallas, Ava Photonics Inc., USA
Bertrand Lanher, Process Analytical Chemistry Services, USA

Committee Members
Haji-saeed Bahareh, Air Force Res. Lab, USA, Young Professional
Steve Buckley, Photon Machines, Inc., USA
Chun-Hung (Frank) Kuo, Newport Corp., USA, Young Professional
Bin (Bill) Li, Coherix, Inc., USA, Young Professional
Fred Long, Spectroscopic Solutions, USA
Marion O’Farrell, SINTEF ICT, Norway
Prasanna Pavani, Ricoh Innovations, USA, Young Professional
Dominick Polizzi, Optics Technology Inc., USA
Milan Poudel, US Southwestern Medical School, USA, Young Professional
Arel Weisberg, Energy Research Co., USA

Computational Optical Sensing and Imaging (COSI)

Program Chairs
Michael Gehm, Univ. of Arizona, USA
Rafael Piestun, Univ. of Colorado at Boulder, USA

Committee Members
Saeed Bagheri, IBM TJ Watson Res. Ctr., USA
George Barbastathis, MIT, USA
Scott A Basinger, JPL, USA
David Brady, Duke Univ., USA
Chris Dainty, Natl. Univ. of Ireland, Ireland
Aristide Dogariu, Univ. of Central Florida, CREOL, USA
Fredo Durand, MIT, USA
Michael Fiddy, Univ. of North Carolina at Charlotte, USA
Jason W. Fleischer, Princeton Univ., USA
François Goudail, Inst. d’Optique, France
Gerd Haeusler, Univ. of Erlangen-Nuremberg, Germany
Kenny Kubala, FiveFocal, USA
Kyros Kutulakos, Univ. of Toronto, Canada
Abhijit Mahalanobis, Lockheed Martin Corp., USA
Joseph Mait, US ARL, USA
Wolfgang Osten, Inst. für Technische Optik, Univ. Stuttgart, Germany
Joseph O’Sullivan, Washington Univ. in St Louis, USA
Chrysanthe Preza, Univ. of Memphis, USA
Demetri Psaltis, EPFL, Switzerland
Ramesh Raskar, MIT, USA
Joseph Rosen, Ben Gurion Univ., of the Negev, Israel
Michael Stenner, MITRE Corp., USA
Jun Tanida, Osaka Univ., Japan
Peter Török, Imperial College London, UK

Fourier Transform Spectroscopy (FTS)

General Chair
Pierre Tremblay, Univ. Laval, Canada

Program Chair
Felix Friedl-Vallon, Karlsruhe Inst. of Technology, Germany

Committee Members
Peter F. Bernath, Univ. of York, UK
Jérôme Genest, Univ. Laval, Canada
John Harlander, St. Cloud State Univ., USA
Donald E. Jennings, NASA/Goddard Space Flight Ctr., USA
Akihiko Kuzu, Japan Aerospace Exploration Agency, Japan
Jean-Pierre Maillard, Inst. d' Astrophysique de Paris, France
Johannes Orphal, Karlsruhe Inst.of Technology, Germany
Luca Palchetti, Istituto di Fisica Applicata “Nello Carrara” IFAC-CNR, Italy
Juliette Pickering, Imperial College London, UK
Nathalie Picqué, Max-Planck-Inst. fuer Quantenoptik, Germany
Joe Taylor, Space Science and Engineering Ctr., Univ. of Wisconsin-Madison, USA
Geoffrey C. Toon, Jet Propulsion Lab, USA

Hyperspectral Imaging and Sounding of the Environment (HISE)

General Chairs
Bryan Baum, Space Science and Engineering Ctr., Univ. of Wisconsin-Madison, USA
Ping Yang, Texas A&M Univ., USA

Committee Members
Chris Barnet, NOAA, USA
Caroline Cox, Rutherford Appleton Lab, UK
John Dykema, Harvard Univ., USA
Joanna Joiner, NASA Goddard Space Flight Ctr., USA
Margaret Kalacska, McGill Univ., Canada
Jhoon Kim, Yonsei Univ., Republic of Korea
Allen M. Larar, NASA Langley Res. Ctr., USA
Betsy Middleton, NASA Goddard Space Flight Ctr., USA
Marty Mlynczak, NASA Langley Res. Ctr., USA
Shaima Nasiri, Texas A&M Univ., USA
Peter Pilewskie, Lab for Atmospheric and Space Physics (LASP), Univ. of Colorado-Boulder, USA
Heli Wei, Lab of Atmospheric Composition and Optical Radiation, Chinese Acad. of Sciences, China
Elisabeth Weisz, Space Science and Engineering Ctr., Univ. of Wisconsin-Madison, USA

Imaging Systems and Applications (IS)

General Chairs
Gisele Bennett, Georgia Tech, USA
Joyce Farrell, Stanford Univ., USA
Boyd Fowler, Fairchild Imaging, USA

Program Chairs
Peter Catrysse, Stanford Univ., USA
Joseph N. Mait, ARL, USA

Committee Members
Ken Barnard, AFRL, USA
Glenn Boreman, Univ. of Central Florida, USA
David Brady, Duke Univ., USA
Ed Dowski, Ascent Imaging, USA
Ronald Driggers, NRL, USA
Michael Eismann, AFRL, USA
Michael Fiddy, Univ. of North Carolina at Charlotte, USA
Jim Fienup, Univ. of Rochester, USA
Patti Gillespie, ARL, USA
Francisco Imai, Canon USA, Inc., USA
Eddie Jacobs, Univ. of Memphis, USA
Keith Krapels, Army Night Vision Lab, USA
Michael Kriss, MAK Consultants, USA
Matt Kupinski, Univ. of Arizona, USA
Dale Linne von Berg, NRL, USA
Pierre Magnan, Supérieur de l'Aéronautique et de l'Éspace, France
Ricardo Motta, Attom Res., USA
David Pope, Aptina, USA
Dennis Prather, Univ. of Delaware, USA
Jennifer Ricklin, Lockheed Martin, USA
John Sheridan, Univ. College Dublin, Ireland

Signal Recovery & Synthesis (SRS)

General Chair
Charles Matson, Air Force Res. Lab, USA

Program Chairs
Chris Dainty, Natl. Univ. of Ireland Galway, Ireland
Edmund Lam, Univ. of Hong Kong, Hong Kong

Program Committee
Philip Bones, Univ. of Canterbury, New Zealand
Jun Cheng, Shenzhen Inst. of Advanced Technology, Chinese Acad. of Sciences, China
Christy Fernandez Call, MIT Lincoln Lab, USA
David Gerwe, Boeing Corp., USA
Andrew Lambert, Australian Defense Force Acad., Univ. of New South Wales, Australia
Vincent Michau, ONERA, France
Rick Millane, Univ. of Canterbury, New Zealand
Jannick Rolland, Inst. of Optics, Univ. of Rochester, USA
Markus Testorf, Dartmouth College, USA
Peter Tsang, City Univ. of Hong Kong, Hong Kong
Special Events

AIO Plenary Session
Monday, 11 July, 08:00-10:00
Pier 3

Atle Honne
Senior Research Scientist, SINTEF, Oslo, Norway

Atle Honne is the project manager for ANITA at SINTEF, the largest independent research organization in Scandinavia. His responsibilities include calibration, measurement, testing and data evaluation for ANITA with special interests in FTIR-based multi-gas analyses, optical measurements, and measurement technology in general. He holds a Master of Science in Applied Physics, and has recently been awarded the 2009 Wright Brothers Award for one of his background research papers on this subject.

Joint Conference Reception
Tuesday, 11 July, 19:00-20:30
Metro West Ballroom, 2nd Floor Conference Room

The reception will feature light fare and is open to all registrants

Poster Presentations
Poster presentations offer an effective way to communicate new research findings and provide an opportunity for lively and detailed discussion between presenters and interested viewers.

Joint IS/AIO/LS&C Poster Session
Tuesday, 12 July, 10:30-12:30
Salon B

Joint FTS/HISE/AO/COSI Poster Session
Wednesday, 13 July, 10:30-12:30
Salon B

Postdeadline Paper Presentations
The program committees of AO/COSI/FTS/HISE accepted postdeadline papers for presentation. The purpose of postdeadline sessions is to give participants the opportunity to hear new and significant materials in rapidly advancing areas. Only those papers judged to be truly excellent and compelling in their timelines were accepted.

For more information, including the schedule and locations see the Postdeadline papers appended to the back of this program book.

AO Postdeadline Paper Session
Tuesday, 12 July 16:30-18:30
Pier 5

COSI Postdeadline Paper Session
Wednesday, 13 July 10:30-12:30
Salon C

Joint FTS/HISE Postdeadline Paper Session
Wednesday, 13 July 16:30-18:30
Pier 7/8
# Agenda of Sessions — Sunday, 10 July

<table>
<thead>
<tr>
<th>Time</th>
<th>Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:00–18:00</td>
<td>Registration Open, Ballroom Foyer, Convention Level</td>
</tr>
</tbody>
</table>

— Monday, 11 July

<table>
<thead>
<tr>
<th>Pier 4</th>
<th>Pier 2</th>
<th>Pier 3</th>
<th>Pier 9</th>
<th>Salon A</th>
<th>Pier 7/8</th>
<th>Pier 5</th>
<th>Salon C</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS&amp;C</td>
<td>IS</td>
<td>AIO</td>
<td>SRS</td>
<td>FTS</td>
<td>HISE</td>
<td>AO</td>
<td>COSI</td>
</tr>
</tbody>
</table>

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<tr>
<th>Time</th>
<th>Sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td>07:00–18:00</td>
<td>Registration Open, Ballroom Foyer, Convention Level</td>
</tr>
<tr>
<td>07:45–08:00</td>
<td>Opening Remarks</td>
</tr>
<tr>
<td>08:00–10:00</td>
<td>Opening Remarks (8:20)</td>
</tr>
<tr>
<td></td>
<td>LMA • Hybrid Laser/RF Communications</td>
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<td></td>
<td>IMA • Image Sensors</td>
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<td></td>
<td>AIMA • Space Applications</td>
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<td></td>
<td>SMA • Optical System Design, Analysis &amp; Optimization</td>
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<td></td>
<td>JMA • Joint FTS/HISE Session, Salon A</td>
</tr>
<tr>
<td></td>
<td>AMA • Systems I</td>
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<tr>
<td></td>
<td>CMA • Seeing the Future: A Symposium in Memory of Dennis Healy I</td>
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<tr>
<td>10:00–10:30</td>
<td>Coffee Break/ Exhibits Open, Ballroom Foyer, Convention Level</td>
</tr>
<tr>
<td>10:30–12:30</td>
<td>LMB • Adaptive Optics I (Ends at 12:10)</td>
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<td></td>
<td>IMB • Emerging Technologies for Imaging Systems</td>
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<td>AIMB • Fiber Optic Sensors</td>
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<td>SMB • Ghost Imaging, Superresolution &amp; Blind Deconvolution</td>
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<td></td>
<td>FMA • Atmospheric Science from Space I</td>
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<td></td>
<td>HMA • Upcoming Missions</td>
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<tr>
<td></td>
<td>AMB • Control Systems</td>
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<tr>
<td></td>
<td>CMB • Seeing the Future: A Symposium in Memory of Dennis Healy II</td>
</tr>
<tr>
<td>12:30–14:00</td>
<td>Lunch (On Your Own)</td>
</tr>
<tr>
<td>14:00–16:00</td>
<td>LMC • Adaptive Optics II</td>
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<td></td>
<td>IMC • Image Processing</td>
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<td>AIMC • Industrial Monitoring</td>
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<td>SMC • Information Theory &amp; Processing Time Considerations</td>
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<tr>
<td></td>
<td>FMB • Atmospheric Science from Space II</td>
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<td></td>
<td>HMB • Advances in Sensors and Measurements</td>
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<td>AMC • Wavefront Control</td>
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<tr>
<td></td>
<td>CMC • Phase-based Techniques</td>
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<tr>
<td>16:00–16:30</td>
<td>Coffee Break/ Exhibits Open, Ballroom Foyer, Convention Level</td>
</tr>
<tr>
<td>16:30–18:30</td>
<td>See Joint AO/LS&amp;C session in Pier 5</td>
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<tr>
<td></td>
<td>IMD • Human Vision and Imaging Systems</td>
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<tr>
<td></td>
<td>AIMD • Healthcare and Pharma</td>
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<td></td>
<td>SMOD • Optical Processing &amp; Algorithms (Ends at 17:30)</td>
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<td></td>
<td>FMC • Atmospheric Science with Ground Based Instrumentation</td>
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<td>HMC • Radiative Transfer</td>
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<td></td>
<td>JMB • Joint AO/LS&amp;C Session: Waterfront Control Turbulence</td>
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<td></td>
<td>CMD • Computational Spectroscopy and Spectral Imaging</td>
</tr>
</tbody>
</table>

Key to Conference Abbreviations

AIO     Applied Industrial Optics: Spectroscopy, Imaging, & Metrology
AO      Adaptive Optics: Methods, Analysis and Applications
COSI    Computational Optical Sensing and Imaging
FTS     Fourier Transform Spectroscopy
IS      Imaging Systems and Applications
HISE    Hyperspectral Imaging and Sounding of the Environment
LS&C    Application of Lasers for Sensing & Free Space Communication
SRS     Signal Recovery & Synthesis
# Agenda of Sessions — Tuesday, 12 July

<table>
<thead>
<tr>
<th>Pier 4</th>
<th>Pier 2</th>
<th>Pier 3</th>
<th>Salon A</th>
<th>Pier 7/8</th>
<th>Pier 5</th>
<th>Salon C</th>
</tr>
</thead>
<tbody>
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<td>LS&amp;C</td>
<td>IS</td>
<td>AIO</td>
<td>FTS</td>
<td>HISE</td>
<td>AO/SRS</td>
<td>COSI</td>
</tr>
</tbody>
</table>

## 07:00–18:00
- **Registration Open**, Ballroom Foyer, Convention Level

## 08:00–10:00
- LTuA • Information Assurance in Quantum Communications I
- ITuA • Coded Optical Imaging
- AItuA • LIBS (08:40–9:20)
- FTuA • Astronomy and Planetary Science
- HTuA • Merged Imager and Sounder
- JTuA • Joint AO/SRS Session I: Atmospheric Turbulence; Adaptive Optics Systems; Image Analysis
- CtuA • Imaging with Scattering and Aberrations (Begins at 08:20)

## 10:00–10:30
- Coffee Break/Exhibits Open, Ballroom Foyer, Convention Level

## 10:30–12:30
- LTuB • Network Technologies (Ends at 12:10)
- JTuB • Joint IS/AIO/LS&C Poster Session, Salon B
- FTuB • IFTS in Astronomy (Ends at 12:10)
- HTuB • MODIS
- AtuA • Wavefront Sensing (Begins at 10:50)
- CtuB • PSF Engineering and Pupil Encoding

## 12:30–14:00
- Lunch (On Your Own)

## 14:00–16:00
- LTuC • Information Assurance in Quantum Communications II (Ends at 16:20)
- See Joint COSI/IS session in Salon C
- AItuC • Optical Metrology
- FTuC • IFTS in Atmospheric Research and Air Quality Control
- HTuC • Surface and Atmosphere
- JTuC • Joint AO/SRS Session II: Wavefront Estimation and Image Analysis
- JTuD • Joint COSI/IS Session I: Computational Photography

## 16:00–16:30
- Coffee Break/Exhibits Open, Ballroom Foyer, Convention Level

## 16:30–18:30
- LTuD • Laser Propagation
- See Joint COSI/IS session in Salon C
- AItuC • Semiconductor Applications
- FTuD • IFTS for Other Applications
- HTuD • Atmospheric Profiles and Trace Gases (Ends at 18:10)
- AO Post deadline Session
- JTuD • Joint COSI/IS Session II: Wide Field of View and Large Format Imaging

## 18:30–19:00
- 30 Minute Break

## 19:00–20:30
- Welcome Reception, Metro West Ballroom, Conference Center, 2nd floor

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**Key to Conference Abbreviations**
- AIO Applied Industrial Optics: Spectroscopy, Imaging, & Metrology
- AO Adaptive Optics: Methods, Analysis and Applications
- COSI Computational Optical Sensing and Imaging
- FTS Fourier Transform Spectroscopy
- IS Imaging Systems and Applications
- HISE Hyperspectral Imaging and Sounding of the Environment
- LS&C Application of Lasers for Sensing & Free Space Communication
- SRS Signal Recovery & Synthesis
Agenda of Sessions — Wednesday, 13 July

<table>
<thead>
<tr>
<th>Pier 4</th>
<th>Pier 2</th>
<th>Pier 3</th>
<th>Salon A</th>
<th>Pier 7/8</th>
<th>Pier 5</th>
<th>Salon C</th>
</tr>
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<td>FTS</td>
<td>HISE</td>
<td>AO</td>
<td>COSI</td>
</tr>
</tbody>
</table>

07:30–18:00 Registration Open, Ballroom Foyer, Convention Level

08:00–10:00  
- LWA • Naval Applications I  
- IWA • Military Applications I  
- AIWA • Spectroscopy  
- FWA • Static Spectrometers and New Developments I  
- HWA • Clouds  
- AWA • Systems II (Ends at 9:40)  
- CWA • Superresolution

10:00–10:30 Coffee Break/ Exhibits Open, Ballroom Foyer, Convention Level

10:30–12:30  
- LWB • Naval Applications II  
- IWB • Military Applications II  
- AIWB • Laser Applications  
- JWA • Joint FTS/HISE/AO/COSI Poster Session, Salon B  
- COSI Postdeadline Session

12:00–14:00 Lunch (On Your Own)

14:00–16:00  
- LWC • Laser Communication/Atmosphere I (Ends at 15:40)  
- JWB • Joint AIO/IS Session I: Biophotonics, Pier 2 (Ends at 15:40)  
- FWB • Static Spectrometers and New Developments II  
- HWB • Spectral Analyses  
- CWB • Computational Holography

16:00–16:30 Coffee Break/Exhibits Open, Ballroom Foyer, Convention Level

16:30–18:30  
- LWD • Laser Communication/Atmosphere II  
- JWCB • Joint AIO/IS Session II: 3D Imaging, Pier 2  
- Joint FTS/HISE Postdeadline Session, Salon A  
- CWC • Other Sensing Modalities (Ends at 18:10)

— Thursday, 14 July

<table>
<thead>
<tr>
<th>Pier 4</th>
<th>Salon A</th>
</tr>
</thead>
<tbody>
<tr>
<td>LS&amp;C</td>
<td>FTS</td>
</tr>
</tbody>
</table>

07:30–12:00 Registration Open, Ballroom Foyer, Convention Level

08:00–10:00  
- LThA • Ladar I  
- FThA • Laboratory Spectroscopy (Begin at 08:20)  

10:00–10:30 Coffee Break/ Exhibits Open, Ballroom Foyer, Convention Level

10:30–12:30  
- LThB • Ladar II (Ends at 12:15)  
- FThB • Comb Techniques

Key to Conference Abbreviations

AIO    Applied Industrial Optics: Spectroscopy, Imaging, & Metrology  
AO     Adaptive Optics: Methods, Analysis and Applications  
COSI   Computational Optical Sensing and Imaging  
FTS    Fourier Transform Spectroscopy  
IS     Imaging Systems and Applications  
HISE   Hyperspectral Imaging and Sounding of the Environment  
LS&C   Application of Lasers for Sensing & Free Space Communication  
SRS    Signal Recovery & Synthesis
In this paper, we study multi-mode optical fibers, discuss their operationally relevant environments. This paper looks at both ground and flight tests of extended range methods have been recently demonstrated during eliminating data loss even in a fading link. These events, which can lead to errors in, or complete loss of data being transmitted over the link. This creates a challenge in communication (FSOC) optical terminal, is a critical equipment and the free space optical communication (FSOC) system design. It is possible in case of photon number <3.

In this paper, we develop an optical modem design for long range terrestrial FSOC Communications, David W. Young1, Applied Physics Laboratory, John Hopkins University, USA. The optical modem, which provides the interface between the end-user equipment and the free space optical communication (FSOC) optical terminal, is part of the overall FSOC system design. It is important for the overall FSOC system designFSOC links commonly suffer from frequent deep fade events, which can lead to errors in, or complete loss of data being transmitted over the link. This paper will discuss developments in optical modem technology that take a layered approach to eliminating data loss even in a fading link. These methods have been recently demonstrated during both ground and flight tests of extended range (>100 km) FSOC communications systems in operationally relevant environments. This paper will describe optical modem designs for FSOC terminals that couple light into either single-mode or multi-mode optical fibers, discuss their performance, and discuss the impact of this technology on selection of overall system performance, especially as it is linked to optical modem design.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Name</th>
<th>Location</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10:30-12:10</td>
<td>Adaptive Optics I</td>
<td>Pier 4</td>
<td>Malcolm Northcott; Aoptix Technologies, Inc., United States; Troy Rhoadarmer; Science Applications International Corporation, United States, Presiders</td>
</tr>
<tr>
<td>10:30-12:30</td>
<td>Emerging Technologies for Imaging Systems</td>
<td>Pier 2</td>
<td>Peter Catryse; Stanford University, United States, Presider</td>
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<tr>
<td>10:30-13:10</td>
<td>Fiber Optic Sensors</td>
<td>Pier 3</td>
<td>Sean Christian; Optrology, Inc., United States, Presider</td>
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<tr>
<td>10:30-12:30</td>
<td>Ghost Imaging, Superresolution &amp; Blind Deconvolution</td>
<td>Pier 9</td>
<td>Sudhakar Prasad; University of New Mexico, United States, Presider</td>
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</table>

**LMB1 • 10:30**
Self-Referencing Interferometer Adaptive Optics for Improving Free Space Laser Communications, Troy A. Rhoadarmer1; 1Lasers & Imaging Technology Laboratory, Science Applications International Corporation, USA. Self-referencing interferometer adaptive optics (SRI AO) provides innovative technologies for improving performance of free-space laser communications. We provide an overview of the next generation SRI AO system and results from system testing.

**IMB1 • 10:30**
High Efficiency and High Resolution Plasmonic Color Filters for Display Applications, L. Jay Guo1, Ting Xu1, Alex F. Kaplan1, Yi-Kuei Wu1; 1University of Michigan, USA. By selective conversion between the free-space waves and spatially confined modes in plasmonic nanoresonators, frequency-selective transmission and reflection spectra can be engineered and can be used as spectrum filters for display and imaging applications.

**AIMB1 • 10:30**
Fiber Optic Strain Sensors for Chemical and Acoustic Measurements, Hans-Peter Loock1; 1Queend's Univ. College, USA. Single FBGs and FBG Fabry-Perot cavities were used to measure the strain on a fiber optic waveguide. Chemical concentration measurements and audio recordings of an acoustic guitar were obtained from shifts of the transducer spectra.

**SMB1 • 10:30**
Promises and Challenges of Ghost Imaging, Robert Boyd1; 1Department of Physics, University of Ottawa, Ottawa, ON K1N 6N5 Canada and The Institute of Optics and Department of Physics and Astronomy, University of Rochester, NY, USA. In this contribution we review research on the imaging protocol known as ghost (or coincidence) imaging. We also describe some current research directions within this topical area.

**LMB2 • 11:10**
Some Recent Progress on Curvilinear Imagers and Eyeball Cameras, John Rogers1; 1Univ. of Illinois at Urbana-Champaign, USA. We present curvilinear imagers using photodetector arrays on elastomeric membranes, capable of reversible deformation into hemispherical shapes via hydraulics. Combining with tunable, fluidic plano-convex lenses yields hemispherical cameras of adjustable zoom and excellent imaging characteristics.

**IMB2 • 11:10**
Shape Sensing of Multiple Core Optical Fiber, Mark Froggatt1; 1Luna Technologies, USA. The shape of a fused silica fiber having four guiding cores that are configured in a helix is reconstructed using a measurement of the phase shift in the Rayleigh scatter patterns of the four cores.

**AIMB2 • 11:10**
High Precision Object Segmentation and Tracking for use in Super Resolution Video Reconstruction, Torrell N. Mandhenk1, David R. Gerwe1, Yang Chen1; 1SSL, HRL Labs, USA; 1Directed Energy Systems, Boeing, USA. We apply a synthesis of mean-shift kernel density estimation and foreground object motion estimation to find areas of common motion. These are then enhanced using super resolution methods apart from the background enhancement.

**SMB2 • 11:10**
Light Field Superresolution Reconstruction in Computational Photography, Zhimin Xu1, Edmund Lam1; 1Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong. By formulating a general light field acquisition model and incorporating the prior knowledge existing in the observations, we propose a resolution enhancement scheme for the captured light field. Meanwhile, the depth map can be obtained.

**SMB3 • 11:30**
Light Field Superresolution Reconstruction in Computational Photography, Zhimin Xu1, Edmund Lam1; 1Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong. By formulating a general light field acquisition model and incorporating the prior knowledge existing in the observations, we propose a resolution enhancement scheme for the captured light field. Meanwhile, the depth map can be obtained.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

LMB • Adaptive Optics I—Continued

LMB3 • 11:50
Compact Integrated Wavefront Corrector for Lasercom Applications, Allan Wirth1, Thomas Price2, ‘Kinetics, Inc., USA. The design and test results for a compact optic that combines the functionality of a fast steering mirror and a deformable mirror in a single component are presented.

LMB • Adaptive Optics II

LMB3 • 11:50
High Color Accuracy Image Acquisition in Single Capture, Giacomo Langford1, Cesare Buffa1, Antonio Longoni1, Federico Zanega2, ‘Politecnico di Milano, Italy. A tunable sensor enables image acquisition with high color accuracy. A different tuning of alternate rows implements a quasi-colorimetric six-color sensor. Tuning all the pixels identically gives higher resolution with usual color errors.

LMB • Emerging Technologies for Imaging Systems—Continued

IMB3 • 11:50
Picossecond Camera for Time-of-Flight Imaging, Andrea Velten1, Rameek Raskar1, Moungi Bawendi1, ‘MIT Media Lab, USA. We present an ultrafast imaging system capable of capturing images with picosecond time resolution or movies with a frame rate of 3x10^11 frames per second.

IMB • Emerging Technologies for Imaging Systems—Continued

IMB4 • 12:10
Imaging Systems

IMB4 • 12:10
High-Order Statistics for Point Prediction in Natural Images, Wilson S. Geisler1, Jeffrey S. Perry1, ‘Psychology, Univ. of Texas at Austin, USA. Results are presented for a simple conditional-moments method that directly measures high-order statistics of natural images. In four estimation tasks significant increases in performance are obtained in comparison to traditional methods.

AIMEB • Fiber Optic Sensors—Continued

AIMEB3 • 11:50
Strain Measurements Using Embedded Fiber Bragg Sensors, Ken V.T. Guttman1, ‘City Univ. London, United Kingdom. Abstract Not Available

AIMEB • Fiber Optic Sensors—Continued

AIMEB4 • 12:30
Optical Fiber Gas Sensors using UV and MidIR Spectroscopy for Exhaust Gas Monitoring, Elfed Lewar, ‘University of Limerick, Ireland. Results are presented for on-board and on-line sensing of vehicle exhaust gases. The sensor was located downstream of the Diesel Particle Filter of a Fiat Croma and data were simultaneously recorded from reference gas analysis instrumentation.

AIMEB • Fiber Optic Sensors—Continued

AIMEC1 • 14:00
Invited
Strategies for Enhancing the Reliability and Availability of Lasercom, Malcolm Northcott1, Aoptix Technologies, Inc., United States; Troy Rhoadarmer; Science Applications International Corporation, United States, Presiders

IMC • Image Processing

IMC • Image Processing

IMC1 • 14:00
High-Order Statistics for Point Prediction in Natural Images, Wilson S. Geisler1, Jeffrey S. Perry1, ‘Psychology, Univ. of Texas at Austin, USA. Results are presented for a simple conditional-moments method that directly measures high-order statistics of natural images. In four estimation tasks significant increases in performance are obtained in comparison to traditional methods.

AIMEC1 • 14:00
Invited
In-Situ Near- and Mid-Infrared Laser Spectrometers: from Lab to Industry, Peter Kapsen1, ‘Infraspektron, Norway; Peter Geiser1, Axel Bohman1, Dung Do Dang1, ‘E.T.S.I. de Telecomunicación, Universidad Politécnica de Madrid, Spain. We present an ultrafast laser sensor for simultaneous measurement of two arbitrary ultrashort laser pulses.

AIMB • Fiber Optic Sensors—Continued

AIMB3 • 11:50
Invited
An Iterative Blind Deconvolution Algorithm as an Attempt to Search the Global Minimum, Tohru Takahashi1, ‘Oita National College of Technology, Japan. We propose an iterative blind deconvolution algorithm which is an attempt to search the global minimum of a cost function. This algorithm works for small sized images although it needs a lot of iterations.

AIMEC1 • 14:00
Invited
Applications of Shannon Information and Statistical Estimation Theory to Inverse Problems in Imaging, Sudhakar Prasad1, Srikant Narasimha1, ‘Physics and Astronomy, University of New Mexico, USA. We apply statistical information and estimation theories to derive fundamental Bayesian bounds on image recovery from noisy data for two highly simplified imaging problems, namely single-pixel source localization and a two-pixel correlated image.

AIMEC1 • 14:00
Invited
Superresolution & Blind Deconvolution—Continued

AIMEC2 • 12:10
Using Blind Deconvolution to Simultaneously Retrieve Two Ultrashort Laser Pulses, Vibrant Chauhan1, Peter Vaughan1, Jacob Cohen1, Tic-Chun Wong1, Justin Ratter1, Lima Xie1, Antonio Consoli2, Rick Trebino1, ‘Physics, Georgia Tech, USA; 1E.T.S.I. de Telecomunicación, Universidad Politécnica de Madrid, Spain. We present a simple method, based on blind deconvolution, for simultaneously measuring two arbitrary ultrashort laser pulses.

AIMB • Fiber Optic Sensors—Continued

AIMB4 • 12:30
Invited
Optical Fiber Gas Sensors using UV and MidIR Spectroscopy for Exhaust Gas Monitoring, Elfed Lewar, ‘University of Limerick, Ireland. Results are presented for on-board and on-line sensing of vehicle exhaust gases. The sensor was located downstream of the Diesel Particle Filter of a Fiat Croma and data were simultaneously recorded from reference gas analysis instrumentation.

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Superresolution & Blind Deconvolution—Continued

AIMEC2 • 12:10
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**FMA • Atmospheric Science from Space I—Continued**

**FMA4 • 11:50**
Wideband Far Infrared FTS For The FORUM Explorer Mission, Luca Palchetti¹; Istituto di Fisica Applicata “Nello Carrara” - IFAC-CNR, Italy. The FTS designed for the FORUM space mission is presented. The instrument covers 100 to 1800 cm⁻¹ spectral range of the Earth emission to space with spatial resolution optimized for the characterization of the atmospheric processes affecting the ERB.

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**HMA • Upcoming Missions—Continued**

**HMA4 • 11:50**
Invited
NASAs Aerosol-Cloud-Ecosystems (ACE) Mission, David O'C Starr¹; NASA Goddard Space Flight Center, USA. Plans for NASAs Aerosol-Cloud-Ecosystem (ACE) mission is described. Recommended by Earth Science Decadal Survey in 2007, ACE is nominally planned for a 2021 launch. ACE is comprised of passive and active sensors (tandar and lidar).

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**AMB • Control Systems—Continued**

**AMB5 • 11:50**
Computation-free Adaptive Optics for High-Contrast Imaging and Other Applications, Feiling Wang¹; Alethus LLC, USA. This paper describes an AO control method that can be implemented using analog circuits. The simple relationships between the cost functions and the modal perturbations provide reliable convergences for phase-conjugation and high-contrast imaging.

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**CMB • Seeing the Future: A Symposium in Memory of Dennis Healy II—Continued**

**CMB4 • 11:50**
Withdrawn

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12:30–14:00 Lunch (On Your Own)

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14:00–16:00
**FMB • Atmospheric Science from Space II**
Joe Taylor; University of Wisconsin-Madison, United States, Presider

**FMB1 • 14:00**
Panchromatic Fourier Transform Spectrometer (PanFTS) for Geostationary Measurements of Atmospheric Composition, Stanley P. Sander¹; NASA/JPL, Caltech, USA. The Panchromatic Fourier Transform Spectrometer (PanFTS) instrument is being developed, to meet the science demands of measuring a wide range of trace gases with unprecedented vertical resolution, by sensing the UV, visible, and IR in one instrument.

**HMB • Advances in Sensors and Measurements**
Steven Platnick; NASA/GSFC, United States, Presider

**HMB1 • 14:00**
Invited
Scientific Results from the FIRST Instrument Deployment to Cerro Toco, Chile and from the Flight of the INFLAME Instrument, Martin Mlynarcik¹; NASA Langley Res. Ctr., USA. Transform Spectrometers are presented. These are comprehensive measurements of the far-IR spectrum (FIRST) and the net infrared fluxes within the atmosphere (INFLAME).

**HMB2 • 14:00**
Adaptive Grazing Incidence X-Ray Optics, Alan Weir¹; David Pearson¹; Xinetics, Inc., USA. Active figure control will be necessary to meet the challenging requirements of the Gen-X optics. In this paper we present our adaptive grazing incidence mirror design and the results from laboratory tests of a prototype mirror.

**AMC • Wavefront Control**
Caroline Kulcsar; Univ. Paris 13, France, Presider

**AMC1 • 14:00**
Adaptive Grazing Incidence X-Ray Optics, Alan Weir¹; David Pearson¹; Xinetics, Inc., USA. Active figure control will be necessary to meet the challenging requirements of the Gen-X optics. In this paper we present our adaptive grazing incidence mirror design and the results from laboratory tests of a prototype mirror.

**CMC • Phase-based Techniques**
Marc Christensen, Southern Methodist University, United States, Presider

**CMC1 • 14:00**
Invited
Compressive Phase Retrieval, George Barbarastathis¹; Justin W. Lee¹; Lei Tian¹; Se Baek Oh¹; MIT, USA. We discuss and provide experimental results on the application of compressive sampling to the problem of quantitative tomographic phase reconstruction.
Optimal Image-based Defocus Estimates from Individual Natural Images, Johannes Borge, Wilson S. Geisler, "Center for Perceptual Systems, University of Texas at Austin, USA. We present a general method for estimating defocus blur from first principles, given a set of natural scenes and properties of the vision system. Local, high-precision, signed estimates are obtained for a model human visual system.

Towards Experimental Validation of Full-Wave Precompensation for Laser Telecommunications, Richard Aburen, Maria-Thérèse Vallier, Vincent Michaux, Nicolas Violon, Laurent M. Magnier, DOTRAHA, ONERA, France. We designed an optical bench to demonstrate full-wave precompensation for laser telecommunications. This technique requires a device performing time reversed waves. We propose and characterize a solution to realize such a function.

Local Linear Learned Image Processing Pipeline, Steven Lanctol, Brian Wandell, Stanford Univ., USA. The local linear learned (L3) algorithm is presented that simultaneously performs the demosaicking, denoising, and color transform calculations of an image processing pipeline for a digital camera with any color filter array.

Optical Measurements in Recycling Operations, Andreas Nordbryn, Tomra Systems ASA, Norway. Recycling of post-consumer package materials requires proper materials sorting. Different operation regimes have individual requirements on the measurements needed. An overview will be given on imaging and spectroscopic solutions developed for this.

A Fast Approximation Method for Broadband Phase Retrieval, Aiden S. Harling, James Fienup, Institute of Optics, University of Rochester, USA. We introduce a new approximation method for broadband phase retrieval. We show that it yields results of comparable quality to the traditional broadband phase retrieval algorithms with a large improvement in speed.

Invited: Fast PSF Reconstruction using the Frozen Flow Hypothesis, James Nagy, Qing Chu, Sarah Keppert, Stuart Jeffries, Math and CS, Emory University, USA. Using a Taylor frozen flow hypothesis, correlations in multiple wavefront sensor measurements are exploited to obtain accurate PSF estimates. The approach requires solving a large and sparse least square problem.

A Fast Algorithm for Optical Transfer Function Estimation Using a Siemens Star Target, Samuel T. Thurman, Lockheed Martin Coherent Technologies, USA. We test the usefulness of including a Kalman filter to restore warped images from dynamic scenery. We consider a variant of the FRTAAS algorithm to restore warped images from dynamic scenery. We test the usefulness of including a Kalman filter to compensate the loss of statistical data after each scenery change.

A Fast Approximation Method for Broadband Phase Retrieval, Murat Tahtali, Andrew J. Lambert, School of Engineering and IT, USN@ADFA, Australia. We introduce a new approximation method for broadband phase retrieval. We show that it yields results of comparable quality to the traditional broadband phase retrieval algorithms with a large improvement in speed.

A Fast Algorithm for Optical Transfer Function Estimation Using a Siemens Star Target, Samuel T. Thurman, Lockheed Martin Coherent Technologies, USA. We test the usefulness of including a Kalman filter to restore warped images from dynamic scenery. We consider a variant of the FRTAAS algorithm to restore warped images from dynamic scenery. We test the usefulness of including a Kalman filter to compensate the loss of statistical data after each scenery change.
FMB 4:00
Atmospheric Chemistry Experiment (ACE): Latest Results, Peter Bernath; Chemistry, University of York, United Kingdom. An overview of some of the latest results from the ACE satellite Fourier transform spectrometer will be presented.

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16:30–18:30
IMD • Human Vision and Imaging Systems
Joyce Farrell; Stanford University, United States, Presider

16:30–18:30
AIMD • Healthcare and Pharma
Jess Ford; Weatherford Intl., United States, Presider

16:30–17:50
SMD • Optical Processing & Algorithms
Julia Sakamoto; University of Arizona, United States, Presider

IMD1 • 16:30
Invited
Learning the Mosaic: Unsupervised Identification of Sensor Spectral Types, David Brainard1; 1Univ. of Pennsylvania, USA. Accurate processing of color information requires knowledge of the spectral class of each light-sensitive receptor. Unsupervised learning algorithms can identify the class of individual sensors in a mosaic from the sensor responses to natural images.

AIMD1 • 16:30
Invited
Process Analytical Technology: Bringing Solutions to the Plant Floor, Katherine A. Baker1; 1CAMO Software Inc., USA. Process analytical technology using spectroscopic tools for real-time monitoring will be presented. PAT provides fuller process understanding and contributes to process control. Challenges in implementation of PAT in manufacturing will be discussed.

SMD1 • 16:30
Invited
Optical Signal Processing: Holography, Speckle and Algorithms, John Sheridan1; 1Univ. of Pennsylvania, USA. Modeling the propagation of light through free space and simple paraxial systems continues to be enduring, and practically important topics in optics. Is there anything new or interesting that remains to be said? Given the pervasive use of digital cameras and numerical algorithms, examples are given indicating that the answer is yes. Satisfactory modeling requires the interactions of the whole optical information processing system (optics, optoelectronics and software) be included.

IMD2 • 17:10
Invited
Simulating Imaging Systems: Photons, Parts and People, Brian Wandell1; 1Stanford Univ., USA. The interest in the spatial statistics of the signal encoded by the eye motivated us to assemble and distribute software for calculating the retinal irradiance and cone absorptions of scene radiance. We hope that this simulation will provide a more realistic approximation of the statistical properties encoded by the nervous system. The statistics of the retinal irradiance image is significantly different from the scene radiance, and the cone absorption properties add further complexity. By making it simple to account for optical and retinal factors, we hope to enable new experimentation and insights.

AIMG2 • 17:10
Invited
How to Measure The Size of Tumors: The RECIST Standard vs. Volumetrics, Zachary H. Levine1; 1Optical Technology Division, NIST, USA. Response Evaluation Criteria for Solid Tumors (RECIST) proposed 1D criteria for determining if 3D tumors are growing malignantly. Here, the error introduced is quantified using physical ellipsoids and fitting to clinical data on liver malignoma.

SMD2 • 17:10
Invited
Image Reconstruction from Nonuniform Samples in Spectral Domain Optical Coherence Tomography, Jun Ke1, Rui Zhu1, Edmund Y. Lam1; 1Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong. We cast the signal reconstruction in spectral domain optical coherence tomography as a minimization problem with total variation regularization. A cross-sectional image in SD-OCT is estimated directly from non-uniformly spaced frequency samples.
6:30–18:30

FMC • Atmospheric Science with Ground Based Instrumentation
Luca Palchetti; Instituto di Fisica Applicata Nello Carrara, Italy, Presider

FMC1 • 16:30
Invited
NDACC IRWG: Evolution of Ground-Based Global Trace Gas Infrared Remote Sensing, James W. Hannigan1, Atmospheric Chemistry Division, NCAR, USA. Review and current state of the global IRWG FTS atmospheric observational network.

FMC2 • 17:10
The NOy budget above Eureka, Nunavut from ground-based FTIR measurements, space-based ACE-FTS measurements, and the CMAM-DAS, GEM-BACH, and SLIMCAT models, Rodica Lindenmaier1, R. L. Batchelor2, Kimberly Strong3, S. Bagley1, J. Monard1, A. I. Jansson1, M. Nesbitt1, S. Chabrillat4, M. P. Chipperfield5, G. L. Manney6, W. H. Daffer7, S. Polavengoo2, T. G. Shepherd1, P. E. Bernath2, Kaley Walker1; Physics, University of Toronto, Canada; Atmospheric Chemistry Division, NCAR, USA; Earth and Space Science and Engineering, York University, Canada; Atmospheric and Space Science and Technology Directorate, Environment Canada, Canada; Belgium Institute for Space Aeronomy, Belgium; Institute for Atmospheric Science, School of Earth and Environment, University of Leeds, United Kingdom; Jet Propulsion Laboratory, California Institute of Technology, USA; New Mexico Institute of Mining and Technology, USA; Chemistry, University of York, United Kingdom. Reactive nitrogen species, NOy, play an important role in stratospheric chemistry. Using a Bruker 12HR FTIR installed at Eureka, Nunavut, ACE-FTS satellite data, and model simulations, we study the NOy budget for this Arctic site.

FMC3 • 17:10
Water Vapor Continuum Results in the Far IR from the CAVIAR And RHUBC Field Measurement Campaigns, Paul Green1, Ralph Beek1, Alan E. Larar1, Juliet C. Pickering1, John E. Harries1, Stuart Newman2, David Turner3; Physics, University of Toronto, Canada; Imperial College, United Kingdom; Imperial College, United Kingdom; Imperial College, United Kingdom; Imperial College, United Kingdom. Here we present examples of recent updates in the far- and mid-infrared.

HMC • Radiative Transfer
Allen M. Larar; NASA Langley Research Center, United States, Presider

HMC1 • 16:30
Invited
Radiative Transfer Modeling for Hyperspectral Applications: Status and Validation of LIBERTM, Vivienne Payne1, Jennifer Delamere2, Eli Miliner3, Jean-Luc Moncret1; Atmospheric and Environmental Res. (AER), USA. LIBERTM, its associated spectroscopic databases and continua are subject to ongoing validation against measurements spanning submillimeter to visible wavelengths. Here we present examples of recent updates in the far- and mid-infrared.

HMC2 • 17:10
Water Vapor Continuum Results in the Far IR from the CAVIAR And RHUBC Field Measurement Campaigns, Paul Green1, Ralph Beek1, Alan E. Larar1, Juliet C. Pickering1, John E. Harries1, Stuart Newman2, David Turner3; Physics, University of Toronto, Canada; Imperial College, United Kingdom; Imperial College, United Kingdom; Imperial College, United Kingdom; Imperial College, United Kingdom. Here we present examples of recent updates in the far- and mid-infrared.

HMC3 • 17:10
Simulating Wide-Field Optical Wavefront Propagation through Single Layer Turbulence, Stephen J. Weddell1, Russell Y. Webb1, Philip Borer1; Electrical & Computer Engineering, University of Canterbury, New Zealand. Optical wavefront propagation over a wide field-of-view (FOV) was modeled on empirical data representing a single, dominant layer of atmosphere turbulence. We found the Taylor hypothesis is not appropriate for wide-field application.

JMB • AO/LSC Joint Session: Wavefront Control and Turbulence
Matthew Britton; The Optical Sciences Company (tOSC), United States, Presider

JMB1 • 16:30 Withdrawn

JMB2 • 17:10
Simulating Wide-Field Optical Wavefront Propagation through Single Layer Turbulence, Stephen J. Weddell1, Russell Y. Webb1, Philip Borer1; Electrical & Computer Engineering, University of Canterbury, New Zealand. Optical wavefront propagation over a wide field-of-view (FOV) was modeled on empirical data representing a single, dominant layer of atmosphere turbulence. We found the Taylor hypothesis is not appropriate for wide-field application.

CMD • Computational Spectroscopy and Spectral Imaging
David Brady; Duke University, United States, Presider

CMD1 • 16:30
Joint Segmentation and Reconstruction of Coded Aperture Hyperspectral Data, David S. Kittle1, David L. Brady2, Siddharth Pradhan1, Qiang Zhang1, Robert Plummer2; ECE, Duke University, USA; Biostatistics Sciences, Wake Forest University, USA; Computer Science and Mathematics, Wake Forest University, USA; Physics and Astronomy, University of New Mexico, USA. This work presents experimental verification of a joint segmentation reconstruction algorithm on real data from a snapshot hyperspectral image. Accurate spectra can be computed for any pixel location in the data cube.

CMD2 • 16:30
Information-Optimal Adaptive Feature-Specific Spectroscopy for Rapid Chemical Classification, Ivan Rodriguez1, Peter A. Jansen1, Dinesh Dinakarababu4, Michael E. Gehm1,2; Electrical and Computer Engineering, University of Arizona, USA; College of Optical Science, University of Arizona, USA. An information-optimal version of Adaptive Feature-Specific Spectrometry (AFSS) is presented. The system achieves dramatically shorter time-to-classification than traditional architectures in low SNR scenarios.

CMD3 • 17:10
Adaptive, Feature-Specific Spectral Imaging Classifier, Matthew J. Dunlap1, Peter A. Jansen1, Michael E. Gehm1,2; Electrical and Computer Engineering, University of Arizona, USA; College of Optical Science, University of Arizona, USA. We describe our design for an adaptive, feature-specific spectral imaging classifier. The system utilizes adaptive spectral codes to spectrally-classify multiple spectral locations in parallel.

Imaging and Applied Optics: OSA Optics & Photonics Congress • July 10–14, 2011 19
Monday, 11 July

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

IMD • Human Vision and Imaging Systems—Continued

AIMD • Healthcare and Pharma—Continued

SMD • Optical Processing & Algorithms—Continued

IMD3 • 17:50 Invited

Video Acuity: A Metric to Quantify the Effective Performance of Video Systems, Andrew Watson1; 1NASA Ames Res. Ctr., USA.

There is a widely acknowledged need for metrics to quantify the performance of video systems.

AIMD3 • 17:50 Invited

Glucose and Other Measurements, Joe Chaiken 1,3, Bin Deng 2, Jerry Goodisman1, George Shaheen 3, Rebecca Bussjager3; 1Chemistry, Syracuse University, USA; 2Biomedical Engineering, Syracuse University, USA; 3600 East Genesee Street, LightTouch Medical, Inc., USA.

Simultaneous measurement of elastic and inelastic remitted light from tissues being irradiated with a single near infrared laser wavelength can be used to calculate the plasma and red blood cell volumes of the included blood.

SMD3 • 17:30

Three-dimensional Surface Recovery with a Regularized Multi-frame Phase Shift Algorithm, Fuqin Deng1, Edmund Y. Lam1; 1University of Hong Kong, Hong Kong.

We develop a modified four-frame phase shift algorithm that incorporates a smoothness constraint. This is applied to a high-precision full-profile reconstruction and measurement for integrated circuit packages.
The University of Wisconsin-Madison Space Science and Engineering Center (UW-SSEC) is certifying the calibration performance of a new generation of instruments for the measurement of the downwelling atmospheric infrared spectrum at the surface.

A Combined Atmospheric Radiative Transfer Model (CART) has been developed to rapidly calculate atmospheric spectral transmittance and background radiance. The algorithms and the applications of CART are presented in the paper.

A novel scheme to correct superimposition of each beam from the front-end to target point in TIL is presented.

We demonstrate and characterize an effective, statistically repeatable atmospheric turbulence generator with the aim of testing a 2m class telescope adaptive optics system in a cost effective manner.

The mean liquid fraction at -20°C was ~10%, strongly affecting cloud optical properties.

NOTE: The layout of a spectral filter mask inserted into the aperture of a penta-chromatic camera. The optimization merit function evaluates spectral crosstalk at the sensor caused by lens aberrations.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

Pier 2

Imaging Systems and Applications

Pier 3

Applied Industrial Optics: Spectroscopy, Imaging, & Metrology

08:00–10:00
LTuA • Information Assurance in Quantum Communications I
David Hughes; Air Force Research Lab, United States, Presider

08:00–10:00
LTuA • Coded Optical Imaging
Gisele Bennett; Georgia Tech, United States, Presider

08:40–09:20
AITuA • LIBS
Arel Weisberg; Energy Research Co., United States, Presider

08:00–10:00
LTuA1 • 08:00
Invited
Addressing Security Issues in Quantum Key Distribution using Seed Keys and Entangled Sources, Oleg Varven'nyi, Yu-Ping Huang, Prem Kumar; ‘NuCrypt LLC, USA, ‘Center for Photonic Communication and Computing, Northwestern University, USA. After years of analysis, security issues still remain in theory and practice of traditional quantum key distribution. A modified method offers alternate analysis paths and fewer hacking points. We consider entangled sources in this method.

08:00–10:00
LTuA1 • 08:00
Invited
Recent Advances in Diffraction and Geometry Related Super Resolution Approaches, Zee Zalevsky, Ohad Fixler, Aviram Gur; ‘School of engineering, Bar-Ilan Univ., Israel; ‘Departamento de Optica, Univ. Valencia, Spain. In this paper we present two recently developed approaches while one is aiming to overcome diffraction limitation and the other the geometrical bounds while using a unified spatial light modulator (SLM) based configuration.

08:00–10:00
LTuA1 • 08:00
Invited
Invited
Laser-Induced Breakdown Spectroscopy (LIBS) for On-line Control in Mining Industry, Michael Gaft; ‘Laser Distance Spectrometry, Israel. We manufacture industrial on-line analyzers based on LIBS. The main installations are: (a) phosphate industry in USA and Russia; (b) metallurgical plant in Russia; (c) successful test for ash analysis of coal in South Africa.

08:00–10:00
LTuA2 • 08:40
Invited
Novel Protocols for Free-Space Quantum Key Distribution, Ulvi Yurtsever; ‘MathSense Analytics, USA. We discuss alternative technologies to the decoy-state protocol based on the use of entangled light randomly mixed with weak laser pulses.

08:00–10:00
LTuA2 • 08:40
Invited
Spatially Selective Mask for Single Pixel Video Rate Imaging, Orges Furxhi, Eddie Jacobs; ‘Electrical and Computer Engineering, University of Memphis, USA. We present a spatially selective mask that is used with a single pixel detector to reconstruct images in real-time. Reconstructed image sizes are variable; the mask works in multiple electromagnetic regimes. Experimental results are shown.

08:00–10:00
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Stochastic Electromagnetic Beams for Sensing and Free-Space Communications, Olga Korotkova; ‘University of Miami, USA. Stochastic and vectorial (electromagnetic) nature of the optical beams can improve communication links and can be effectively used for sensing of objects when the propagation channels involve atmospheric turbulence.

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LTuA3 • 09:20
Invited
What Would You Do With Precision in Optics If You Had It?, Edward Dowdell; ‘Ascentia Imaging, Inc, USA. With increasing precision a number of important changes in imaging could become possible and practical, such as new configurations, separating design from manufacture and seamless merging of optics and electronics.

08:00–10:00
ITuA • Coded Optical Imaging
Gisele Bennett; Georgia Tech, United States, Presider

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The Mars Atmosphere Trace Molecule Occultation Spectrometer,
The Canadian contribution to the MATMOS
Fourier Transform Spectroscopy

08:00–10:00 FTuA • Astronomy and Planetary Science
David Naylor; University of Lethbridge, Canada, Presider

FluA1 • 08:00 Invited Measurements at NIST in Support of the Search for Exoplanets, Gillian M. Nacev; National Institute of Standards and Technology, USA. I shall summarize work at NIST to measure reference spectra for the detection of exoplanets using Fourier transform spectroscopy.

FluA2 • 08:40 The Mars Atmosphere Trace Molecule Occultation Spectrometer, Geoffrey C. Toon; Paul O. Wennberg; Victoria Hapin; James Drummond; Jet Propulsion Laboratory, USA; California Institute of Technology, USA; Canadian Space Agency, Canada; Dalhousie University, Canada. The Mars Atmosphere Trace Molecule Occultation Spectrometer (MATMOS) FTS is described, with emphasis on the data acquisition and on-board data processing.

FluA3 • 09:00 The Canadian contribution to the MATMOS instrument, Louis Merceur; James Velleca; fortress; Philippe Breault; Marc-Antoine Soucy; ABB Bomem, Canada. MATMOS is a solar occultation FTS part of the Exomars mission. It will measure the transmissivity of the Martian atmosphere to characterize its chemical composition. We present an overview of the Canadian hardware contribution to MATMOS.

FluA4 • 09:20 Six-field Spectral Resolution Boosting with an Interferometer upon the Mt. Palomar Near-infrared Spectrograph, David J. Erkine; Jerry Edelstein; Philip S. Mauch; Kevin R. Coyle; James P. Lloyd; Matthew W. Matranga; Lawrence Livermore Nat. Lab., USA; Space Sciences Lab., Univ. of California, USA; Astronomy, Cornell University, USA; Research Sponsored Programs, Tennessee State Univ., USA. An interferometric method for increasing a dispersive spectrograph’s resolution by large factors beyond classical limits at full simultaneous bandwidth is demonstrated on Mt. Palomar Triplespec near-infrared spectrograph. A 6-field boost is achieved.

FluA1 • 08:00 Invited Hyperspectral Imaging and Soundings of the Environment
Hyperspectral Imaging and Sounding at full simultaneous bandwidth is demonstrated with emphasis on the data acquisition and on-board data processing.

FluA2 • 08:40 Combining AIRS and MODIS: High Resolution Radiance and Atmospheric Profiles in the Presence of Different Cloud Types, Matthias Schreier1,2; Brian Kahn, Steve Ono, Qing Yue; University of Wisconsin-Madison, United States; 2Joint Institute for Regional Earth System Science and Engineering, UCL, USA; Department of Atmospheric Sciences, Texas A&M University, USA. We use a combination of AIRS and MODIS to analyze atmospheric profiles and high-resolution infrared spectra for different cloud types. By using simulated spectra we can test the influence of parameters on the high-resolution spectra.

FluA3 • 09:00 Improved Soundings Using Collocated Imaging and Sounder Data From MetOp-A, Eric Maddy1, Tom King1, Hailin Sun1, Antonio Gambacorta2; Walter Wolf, Christopher Barner, Andrew Heiligen2; Mitchell D. Goldberg, Kevin Zhang1; Chen Zhang1; Del, Inc. USA; NDOA/NESDIS/STAR, USA. We present an analysis of the uncertainties in a candidate operational MetOp-A IASI/AHRR/AMSU cloud-clearing and geophysical state retrieval system. Strategies for improving the system will also be described.

FluA4 • 08:20 Invited Optical Turbulence Profiling and Applications for Astronomy, Richard W. Wilson1, Timothy Butler1; James Osborne2, Harry Shepherd3; Physics, Durham University, United Kingdom. Recovery of the vertical profile of atmospheric turbulence from optical crossed-beam measurements is reviewed with particular reference to the effects of deviations from the commonly assumed Kolmogorov turbulence spectrum.

FluA1 • 08:00 Optimal Turbulence Profiling and Applications for Astronomy
FluA3 • 09:00 Exact Theory of Adaptive Optics Speckle and Its Applications, Natalija Yatirkina1, Szymon Gladysz2, Ruo Guo1, Rafael Yaitskova1; European Organisation for Astronomical Research in the Southern Hemisphere, Germany; Technion - Israel Institute of Technology, Israel; Air Force Research Laboratory, USA. We derive the first order statistical moments of intensity of AO corrected images. We show that applicability of one or another distribution law depends not only on the level of correction, but also on the observation point in the focal plane.

FluA2 • 08:40 Wide Field Adaptive Optics Microscopy Using Both Closed Loop Correction and Image Sharpness Optimization, Gordon D. Love1, Cyril Bourgoin1, Christopher D. Gautier1, John M. Girkin2; Department of Physics, Durham University, United Kingdom. We report on results from a wide field microscope fitted with adaptive optics. We describe results based on both image optimization (wavefront sensorless adaptive optics) and full closed loop correction.

FluA4 • 08:20 Cumulative Wavefront Reconstructor for Single Conjugate Adaptive Optics, Mariya Zaitseva1; Innova; JKU Linz, Austria. We present a wavefront reconstructor for the Shack-Hartmann wavefront sensor with linear complexity. This algorithm allows for a simple adaptation to the aperture geometry. We derive theoretical performance estimates and verify them numerically.

FluA4 • 08:20 Cumulative Wavefront Reconstructor for Single Conjugate Adaptive Optics
FluA2 • 08:40 Wide Field Adaptive Optics Microscopy Using Both Closed Loop Correction and Image Sharpness Optimization
FluA1 • 08:00 Measurements at NIST in Support of the Search for Exoplanets
FluA3 • 09:00 Improved Soundings Using Collocated Imaging and Sounder Data From MetOp-A
FluA4 • 09:20 Six-field Spectral Resolution Boosting with an Interferometer upon the Mt. Palomar Near-infrared Spectrograph

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
<table>
<thead>
<tr>
<th>Pier 2</th>
<th>Pier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imaging Systems and Applications</td>
<td>Applied Industrial Optics: Spectroscopy, Imaging, &amp; Metrology</td>
</tr>
</tbody>
</table>

**Pier 4**

Application of Lasers for Sensing & Free Space Communication

**Pier 2**

Imaging Systems and Applications

**Pier 3**

Applied Industrial Optics: Spectroscopy, Imaging, & Metrology

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**Tuesday, 12 July**

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

**ITuA • Information Assurance in Quantum Communications I—Continued**

**ITuA • Coded Optical Imaging—Continued**

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**ITuA4 • 09:40**

Code Aperture Agile Spectral Imaging (CAASI), Henry Arguello1, Gonzalo Arce1; Electrical and Computer Engineering, University of Delaware, USA. This paper shows the mathematical framework for a new architecture, the Code Aperture Agile Spectral Imaging (CAASI), which extends the capabilities of the Code Aperture Spectral Imaging (CASSI) to allow multiple measurements.

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**10:00–10:30 Coffee Break/ Exhibits Open, Ballroom Foyer, Convention Level**

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**NOTES**

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FTuA • Astronomy and Planetary Science—Continued

FTuA5 • 09:40
Pre-Commissioning Status of FTS-2, the SCUBA-2 Imaging Fourier Transform Spectrometer, Brad Giovinazzo, David A. Naylor, Coskun Oba; ‘Physics, University of Lethbridge, Canada. We present the installation and pre-commissioning status of FTS-2, the imaging Fourier transform spectrometer for use with SCUBA-2 at the James Clerk Maxwell Telescope, and discuss synergies with the HERSCHEL SPIRE and SPICA SAFARI instruments.

HTuA • Merged Imager and Sounder—Continued

HTuA5 • 09:40
Sensitivity of Monthly Cloud Statistics to Space and Time Considerations, Nadia Smith, W. Paul Menzel, Elizabeth Weisz, Bryan Baum; ‘Space Science and Engineering Center, University of Wisconsin-Madison, USA. A monthly mean is calculated for MODIS high cloud top pressures (CTP≥440 hPa) at 1.0 degree spatial grid. Results indicate sensitivity to sample size, a function of both time and space. Three threshold methods are compared.

JTuA • Joint AO/SRS Session I: Atmospheric Turbulence; Adaptive Optics Systems; Image Analysis—Continued

JTuA5 • 09:40
Correct Normalization Of Scintillation Autocovariance for Generalized SCIDAR: Theory and Application, Remy Aola1,2; ‘Centro de Física Aplicada y Tecnología Avanzada, Universidad Nacional Autonoma de Mexico, Mexico; ‘Centro de Radioastronomía y Astrofísica, Universidad Nacional Autonoma de Mexico, Mexico. We present the theory for the correct normalization of scintillation autocovariance for the generalized SCIDAR and the application to turbulence profile measurements at San Pedro Martir Astronomical Observatory.

CTuA • Imaging with Scattering and Aberrations—Continued

CTuA4 • 09:40
Mitigation of Optical Aberrations Using Binary-Amplitude Masks and Digital Image Processing, Gonzalo Muyo, Tom Vettenburg, Andy R. Harvey; ‘Electrical Engineering, Heriot-Watt University, United Kingdom. We report the design of binary-amplitude masks that in conjunction with digital restoration enable mitigation of optical aberrations. Essentially, the design process aims to reduce destructive interferences in the optical transfer function.

10:00–10:30 Coffee Break/ Exhibits Open, Ballroom Foyer, Convention Level
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

10:30–12:30
HtuB • MODIS
Mitchell Goldberg, NOAA/NESDIS, United States, President
HtuB1 • 10:30
MODIS Cloud Optical Property Retrieval Uncertainties Derived from Pixel-Level Radiometric Error Estimates, Steven Platnick1, Xiaoxiao Xiong2, Galina Vinuk2; 1NASA/GSFC, USA; 2NOAA
MODIS retrievals of cloud optical properties employ a well-known VNR/SWIR solar reflectance technique. We evaluate the retrieval uncertainty at pixel-level (scene-dependent) radiometric error estimates as well as other tractable error sources.

10:50–12:30
AfuA • Wavefront Sensing
Erez Ribak, Technion Israel Inst. of Technology, Israel, President
AfuA1 • 10:50
Evaluation of the Performance of Centroiding Algorithms with Varying Spot Size: Case of WFS Calibration for the TMT NFIRAOS, Vyas Amoudi1,2, Brent Ellerbroek1, Rospaloo Peth3, David A. Anderson4; 1Rhopoint MeF; 2Laser Lab, CREST, Indian Institute of Astrophysics, India; 3Department of Physics, Indian Institute of Science, India; 4Thirty Meter Telescope, USA; 5NRC-HIA, Canada. In this AO system, a low-bandwidth truth wavefront sensor detects biases in the laser-guide-star-based wavefront measurement, arising from uncertainties in the sodium layer profile. Here, the performance of centroiding algorithms was compared.

AfuA2 • 11:10
Impact of Under-Sampling on Centroiding Methods for Wavefront Sensing on Extended Sources, Damien Gratadour1, Eric Gendron2, Gérard Rousseau3; 1Université Paris Diderot / LIEIA Observatoire de Paris, France. We study the impact of undersampling on various centroiding methods for wavefront sensing on an elongated spot. Because of its robustness against model errors, correlation appears to be the best option for extreme elongations.

AfuA3 • 11:30
Measuring the Stroke Performance of a Ferrofluid-Based Deformable Mirror by Fourier Transforms of Shack-Hartmann Spot Patterns, Denis Brousseau1, Emanuella F. Boras2, Simon Thuburn3; 1Université Laval, Canada. We describe how we measured large actuator strokes, produced by a magnetic liquid deformable mirror, by Fourier demodulation of the Shack-Hartmann spot images using basic MATLAB commands.

AfuA4 • 11:50
Multi-Dither Shack-Hartmann Sensor for Large Telescopes: A Numerical Performance Evaluation, Vyas Amoudi1, 2Rospaloo Peth3; 1Rhopoint MeF; 2Laser Lab, CREST, Indian Institute of Astrophysics, India; 3Department of Physics, Indian Institute of Science, India. Wavefront reconstruction accuracy strongly depends on the way the wavefront distortion points match the wavefront sensing locations. A multi-dither sensor largely improves the wavefront reconstruction accuracy in large telescope AO systems.

AfuA5 • 12:10
Automated ROI Selection and Calibration of a MicroLens Array Using A MEMS CDM, Rospaloo Peth1, Vyas Amoudi2; 1Rhopoint MeF; 2Thirty Meter Telescope, USA. A method of automated selection of region of interest for sensing using a micro-lens array by imposing Zernikes on a 140 actuator deformable mirror is presented. The positional sensitivity and optimal noise removal techniques are investigated.

10:30–12:30
CtuB • PSF Engineering and Pupil Encoding
Michael Stenner, MITRE Corporation, United States, President
CtuB1 • 10:30
Phase Transfer Function of Sampled Imaging Systems, Vibhan R. Bhalke1, Janmanoth Sampanaj2, Marc P. Christensen3; 1EE, Southern Methodist University, USA. We analyze the effects of aliasing and sampling phase on the PTF of sampled imaging systems. We present an image-based PTF estimation method and propose through-focus PTF as a tool for characterizing wavefront coding imagers.

CtuB2 • 10:50
Phase Mask Fabrication for Pupil Encoding in Computational Optical Imaging, Sean Quinn1, Gomi Grover2, Rafael Pietran3; 1Department of Electrical, Computer, and Energy Engineering, University of Colorado, Boulder, USA. Phase masks are used in computational optical imaging for pupil encoding and point spread function (PSF) engineering. Continuous surface relief masks are fabricated by maskless lithography and demonstrated in double-helix PSF systems.

CtuB3 • 11:10
Frequency Content of the Double-Helix PSF for 3D Microscopy in the Presence of Spherical Aberration, Sreya Ghosh1, ChyuanUye Preza2; 1Electrical and Computer Engineering, The University of Memphis, USA. We examine the Fourier content of the double helix point-spread function (DH-PSF) by computing the DH optical transfer function (OTF). DH-OTFs are compared to OTFs of conventional fluorescence microscopy in the presence of spherical aberration.

CtuB4 • 11:30
Weighted Average Auxiliary System for Parallel Optics, Iftach Klipp1, David Mendivos2; 1Physical Electronics, Tel-Aviv University, Israel. Space variant image restoration is often limited by the matrix condition of the optical system. We introduce a new approach to improve matrix condition, by designing a “Rim-ring” phase mask for parallel optics.

CtuB5 • 11:50
Full-Resolution Light-Field Single-Shot Acquisition with Spatial Encoding, Rynoch Horobin1, Jun Tandla2; 1Osaka University, Japan. We show a method for single-shot acquisition of spatially and angularly full-resolution light-field with spatially coded point spread functions. The system was demonstrated by numerical experiments.

CtuB6 • 12:10
Field-of-View Extension Using Code-Division-Multiple-Access Technique: Numerical Analysis, Zahirh Kavehvash1, Khashayar Mehraei1, Saeed Bagheri2; 1Biomedical Engineering Research Center, USA; 2Sharif University of Technology, Islamic Republic of Iran. We discuss the use of code-division-multiple-access technique for enhancing the field-of-view in 3D imaging and display. This approach is numerically analyzed and simulations show measurable improvements in the quality of final 3D image.
active attacks.

immunity, and extend the analysis to minimizing vulnerability to protocol. We report a preliminary experiment to demonstrate that can defeat passive eavesdropping on a two-way communication

Leung1,3, Dominic Mayers3; 1McGill University, Canada; 2University of Waterloo, Canada, 3Caltech, USA. We show that the protocol is universal compositely secure, and most of the required key can be reused with universal compositely secure.

LTuC2 • 14:40

Defeating Eavesdropping with Quantum Illumination, Jeffery Shapiro1; Research Laboratory of Electronics, Massachusetts Institute of Technology, USA. Theory has shown that quantum illumination can defeat passive eavesdropping on a two-way communication protocol. We report a preliminary experiment to demonstrate that immunity, and extend the analysis to minimizing vulnerability to active attacks.

LTuC3 • 15:20

MIMO FSO Communications in Cloud and Turbulence, Mohsen Kavehrad1, Jarir Fadlullah1, Zeinab Hajjarian1; 1Pennsylvania State University, USA. MIMO FSO communications can facilitate secure broadband airborne communications with enormous rates. However, atmospheric phenomena drastically degrade performance. Here, improvements achievable with MIMO FSO systems are presented.

LTuC4 • 15:40

Special Beam Arrays for Scintillation Reduction, Greg Gbur1; 1Univ. of North Carolina at Charlotte, USA. A number of spatial coherence-related strategies are considered for the reduction of optical beam scintillation in turbulence. Among these are Bessel beam arrays, Airy beam arrays, and nonuniform polarization.

AIIIb • Optical Metrology

Optical Current Sensing, Paul Duncan1; 18544 Electric Ave, USA. Abstract Not Available

AIIIb1 • 14:00

Optical Current Sensing, Paul Duncan1; 18544 Electric Ave, USA. Abstract Not Available

AIIIb2 • 14:40

Evolution of a Planar Waveguide Interferometric Sensor, Daniel Campbell, GTRI, USA. Planar waveguides interferometers provide a commercially viable sensor technology for the detection of an array of chemical and biological species. This presentation will follow the progress of one interferometric sensor from its inception to its current status.

AIIIb3 • 15:20

Optical Methods for Sensing Temperature, Rami Reddy Bommaridi1; 1Physics, Alabama A&M University, USA. Temperature sensing is critical in some special cases. Different optical techniques based on interferometry, fluorescence lifetime sensing, fluorescence ratio method and photothermal deflection techniques will be discussed.

AIIIb4 • 15:40

Surface metrology using an elastomeric sensor, Mirah K. Johnsrud, Edward H. Adalstein, 1CAE, MIT, USA. We describe a method for measuring microscopic surface topography using an elastomeric sensor combined with machine vision. The system is fast, low-cost, and offers micron-scale resolution.

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
Cloud Modification, Lidar Observations of Aerosol Composition and Ash-Induced The Eyjafjallajökull Volcanic Ash Plume Over Central Europe: Hyperspectral Detection of Clandestine Graves, Margaret Kalacska; McGill Univ., Canada. Abstract Not Available

Full-Scene Surface Reflectance Retrievals, Jean-Claude Thétot, Stephan Havemann, Jonathan B. Taylor; UK Met Office, United Kingdom. We demonstrate the feasibility of retrieving the reflectance spectra from hyperspectral imagery at speeds comparable to MAC schemes by using a fast scanning radiative transfer code in conjunction with a 1D-Var scheme.

The Eyjafjallajökull Volcanic Ash Plume Over Central Europe: Lidar Observations of Aerosol Composition and Ash-Induced Cloud Modification, Andreas Macke, Albert Ansmann; Leibniz-Institute for Tropospheric Research, Germany. The optically thickest volcanic ash plume ever measured over Germany was monitored with a multiwavelength Raman lidar. Polarized lidar signals reveal occurrence, type, concentration as well as freezing of supercooled droplets.

Improving Retinal Resolution by Multiple Oversampling, Nitzan Meitar, Erez N. Ribak; Physics, Technion, Israel. We developed two automated methods for measuring the hexagon size and the fraction of hexagonally packed cones. Density is mostly set by adjacent cones, decreasing with eccentricity. High frequencies are also being sampled in the periphery.

Adaptive Optics Enabled Wavefront Diversity Sensing, Allan Wirth, Robert Gonsalves, Andrew Jankovics; Xinetics, Inc., USA. We show that the plenoptic camera is optically equivalent to an array of cameras. We compute the parameters that establish that equivalence and show where the plenoptic camera is more useful than the camera array.

Ultra-Spectral Measurements of Surface Emissivity with an Imaging, Interferometer Spectrometer, William Smith, Leanne West, Gary Gimmestad, Sarah E. Lane; Hampton University/U. of Wisconsin, USA; Georgia Tech Research Institute, USA. Surface emissivity and skin temperature measurements were conducted with the Telops Hyper-Cam imaging spectrometer for a scene consisting of wet, dry, and ice covered concrete and a wet, dry, and ice covered non-skid surfaces.

Joint Optimization of Phase-Diversity and Adaptive Optics, Visa Korkiakoski, Christoph Keller, Niek Doelman, Rufus Fraanje; Joint-Optimization of Phase-Diversity and Adaptive Optics, Visa Korkiakoski, Christoph Keller, Niek Doelman, Rufus Fraanje; 1Physics, Technion, Israel. We have developed a sensor made of clear elastomer which is able to resolve single cells outside the fovea.

Elastomeric Sensor, Edward H. Adelson; MIT, USA. We have developed a sensor made of clear elastomer which converts distortion due to a contact with a surface into visual images. Using machine vision techniques, we can quantify the surface properties with great detail.

Plenoptic Principal Planes, Todor Georgiev, Andrew Lumsdaine, Sergio Gama; Digital Imaging, Adobe, USA; Computer Science, Indiana University, USA; QCT multimedia R&D and standards, Qualcomm. We establish that the plenoptic camera is optically equivalent to an array of cameras. We compute the parameters that establish that equivalence and show where the plenoptic camera is more useful than the camera array.

Joint-Optimization of Phase-Diversity and Adaptive Optics, Visa Korkiakoski, Christoph Keller, Niek Doelman, Rufus Fraanje; Joint-Optimization of Phase-Diversity and Adaptive Optics, Visa Korkiakoski, Christoph Keller, Niek Doelman, Rufus Fraanje; 1Physics, Technion, Israel. We demonstrate the potential of joint-optimization of adaptive optics (AO) and phase-diversity (PD). The wavefront sensor information reduces computational costs by a factor of 20, and PD can reconstruct much better the AO corrected images.

16:00–16:30 Coffee Break/Exhibits Open, Ballroom Foyer, Convention Level
Tuesday, 12 July

16:30–18:30

FTuD • IFTS for Other Applications
Felix Friedl-Vallon; Karlsruhe Institut fuer Technologie, Germany, Presider

16:30–18:30

AFTuC • Semiconductor Applications
Sri Rama Prasanna Pavanii; Ricoh Innovations, United States, Presider

16:30–18:30

LiTuD • Laser Propagation
Larry Stotts, DARPA/STO, United States, Presider

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

LiTuD1 • 16:30

Coherent Optical Technologies for Free-Space Optical Communication and Sensing, Guillaume Le; Univ. of Central Florida, USA. Coherent optical detection enabled by digital signal processing (DSP) can be applied to free-space optical communication and sensing. Applications including electronic wavefront correction for communication and diffraction-limited laser energy delivery through turbulent atmosphere will be discussed.

LiTuD2 • 17:10

Far-field Scintillation Reduction Utilizing Gaussian-Schell Model Beams, Michael Roggemann1, Kyle Drexler1; 1Elictrical Engineering Dept., Michigan Technological Univ., USA. A new method for reducing the far-field scintillation of an optical beam utilizes a Gaussian-Schell Model beam to mitigate turbulence effects. Scintillation levels are reduced from those predicted by the atmospheric turbulence theory.

LiTuD3 • 17:50

Observations of Channel Reciprocity in Optical Free-Space Communications Experiments, Ronald B. Parent1, Jeffrey M. Roth2, Jeffrey Shapiro2,1; 1Lincoln Laboratory, USA; 2Advanced Lasercom Systems Technology, MIT Lincoln Laboratory, USA. We present an approach to analyzing receiver sensitivity in a fading channel that is rooted in capacity analysis. The approach supports rapid design trades during the early stages of system design.

LiTuD4 • 18:10

A Capacity-Based Approach to Receiver Sensitivity for Atmospheric Lasercom Systems, Andrew Fletcher1, Todd Ulmer2, Steven Bernstein2, Don Brousseau1, David Caplan1, Scott Hamilton2, Steven Michael2, Bryan Robinson1, Neal Spellmeyer1; Optical Communications Technology, MIT Lincoln Laboratory, USA; Advanced Lasercom Systems & Operations, MIT Lincoln Laboratory, USA. We present an approach to analyzing receiver sensitivity in a fading channel that is rooted in capacity analysis. The approach supports rapid design trades during the early stages of system design.

AFTuC1 • 16:30

Optical Inspection and Metrology in Semiconductor Manufacturing, Mehdi Vaez-Iravani1, Robert R. Parent1; 1KLA-Tencor Corp., USA. This presentation is a short account of the nature of the problem of defect detection on wafers, and the increasing role of physics in evolving techniques to address the problem.

AFTuC2 • 17:10

Improving Yield in Wafer Level Cameras through Specialized Design and Process Monitoring, Kenny Kubala1, Robert R. Parent1; 1KLA-Tencor Corp., USA. This paper describes the wafer level manufacturing process and an in-line process monitoring algorithm that leverages common image test data to estimate the manufacturing errors in camera modules.

AFTuC3 • 17:50

Diffractive Optics for High Throughput Screening, Ethan Schonbrun1, Rowland Institute for Science, Harvard Univ., USA. We demonstrate several fluorescence measurement systems based on the integration of diffractive optical lens arrays with microfluidics. These parallel measurement systems enable quantitative analysis at higher throughput than current systems.

LiTuU1 • 16:30

Invited

Coherent Optical Technologies for Free-Space Optical Communication and Sensing, Guillaume Le; Univ. of Central Florida, USA. Coherent optical detection enabled by digital signal processing (DSP) can be applied to free-space optical communication and sensing. Applications including electronic wavefront correction for communication and diffraction-limited laser energy delivery through turbulent atmosphere will be discussed.

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LiTuU4 • 18:10

Invited

A Capacity-Based Approach to Receiver Sensitivity for Atmospheric Lasercom Systems, Andrew Fletcher1, Todd Ulmer2, Steven Bernstein2, Don Brousseau1, David Caplan1, Scott Hamilton2, Steven Michael2, Bryan Robinson1, Neal Spellmeyer1; Optical Communications Technology, MIT Lincoln Laboratory, USA; Advanced Lasercom Systems & Operations, MIT Lincoln Laboratory, USA. We present an approach to analyzing receiver sensitivity in a fading channel that is rooted in capacity analysis. The approach supports rapid design trades during the early stages of system design.

FTuD1 • 16:30

Invited

IFS for Turbulent Flow Field Diagnostics, Kevin C. Greve1, Pierre Tremblay2; 1University of Texas, 2IAP, France. We report the first measurements for imaging IFS which minimizes scene-change artifacts due to rapid, stochastic temperature variations and enables recovery of temperature fluctuation statistics.

FTuD2 • 17:10

Invited

A New Imaging FTS for LWIR Polarization Sensing: Principle and Application, Jean-Marc Thériault1, Gilles Fortin2, Hugo Lamie2, Francois Boujard1, Paul Lacasse1, Yann Montembouquet1, Alexandre Vallee2, Vincent Ferley1, Martin Chamberland1; 1National Defence, DRDC Valcartier, Canada; 2AEREX Aerosics Inc, Canada. We discuss a new imaging FTS optimized for spectral polarization sensing. Laboratory results demonstrate the capability of the instrument for the remote detection of surface contamination and its potential for probing fluctuating scenes.

FTuD3 • 17:50

MR-i, High Speed Hyperspectral Imaging Spectroradiometer, Florent Prevel, Louis Moreau1, Stephane Lustagno, Christian Vallee, Claude Roy1, Luc Levesque1; ‘ABB Bomem Inc., Canada. MR-i is a high speed hyperspectral imaging spectroradiometer. It generates spectral data cubes in the MWIR and LWIR and is designed to acquire the spectral signature of various scenes with high temporal, spatial and spectral resolution.

FTuD4 • 18:10

Invited

Defining the Specifications of an Imaging Fourier Transform Spectrometer Working in the Far-UV (IFTSUV), Claudia Ruiz de Gaulette Fanjul1, Anne Philippot; 1Institut d'Astrophysique de Paris, France. We present the advancements on the specification and the performance requirements of an imaging Fourier transform spectrometer working in the 1.5- to 1.67-μm band.
Preliminary Results, (TIMS) Demonstration First Deployment on an Airship: Pre-
nASA ESTO IIP Tropospheric Infrared Mapping Spectrometers

E. Lane1, Gary Gimmestad1, William L. Smith2, Edward Burdette1; 1Electro-Optical Systems Laboratory, Georgia Tech Research Insti-
tute, USA; 2Hampton University, USA. We compare preliminary retrieval from data acquired in the IIP demonstration campaign.

NASA ESTO IIP Tropospheric Infrared Mapping Spectrometers (TIMS) Demonstration First Deployment on an Airship: Preliminary Results, John B. Kumer1, Richard Rainder1, Aiden Roch1, Robert Chaffield2. ADNS, Lockheed Martin, ALC, USA. We compare preliminary retrieval from data acquired in airship deployment with ground based data acquired in our IIP demonstration campaign.

Hyperspectral Detection of Aircraft Exhaust, Leanne Wer1, Sarah E. Lane1, Gary Gimmestad2, William L. Smith1, Edward Burdette1, Electro-Optical Systems Laboratory, Georgia Tech Research Institute, USA; 2Hampton University, USA. Hyperspectral datacube of passing aircraft are investigated. Of particular interest is the feasibility of detecting aviation hazards in these data. Sub-pixel processing algorithms are implemented, and aircraft exhaust gases have been identified.

Geologically Emitted Gas Identification Using Hyperspectral Data Processing Algorithms, Edward Burdette1, Leanne Wer1, Sarah E. Lane1, Kevin Carusati1, Georgia Tech Research Institute, USA. Applying gas plume detection algorithms to LWIR hyperspectral data of a mixed gas cloud emitted continuously from thermal features at Yellowstone National Park, the positive identification of carbon dioxide from among the mixture is reported.

The Quanta Image Sensor (QIS): Concepts and Challenges, Eric Fossum1, Dartmouth Univ., USA. New type image sensing paradigm proposed. Based around binary, nano-scale active pixels, called jots, a Quanta Image Sensor (QIS) architecture allows high spatial (>109/sensor) and temporal resolution (>102-103 Hz) of photon strikes on image plane.

The Panchromatic Fourier Transform Spectrometer (PanFTS) instrument is being developed, to meet the science demands of measuring a wide range of trace gases with unprecedented vertical resolution, by sensing the UV, visible, and IR in one instrument.

The Quanta Image Sensor (QIS): Concepts and Challenges, Eric Fossum1, Dartmouth Univ., USA. New type image sensing paradigm proposed. Based around binary, nano-scale active pixels, called jots, a Quanta Image Sensor (QIS) architecture allows high spatial (>109/sensor) and temporal resolution (>102-103 Hz) of photon strikes on image plane.

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An Optical Filter for Underwater Laser Communications, Fred Levinton1; NovaPhotonics, USA. A free space laser communications system operating underwater in the blue-green portion of the electromagnetic spectrum requires a narrow bandwidth, high throughput filter to transmit the laser light and block unwanted background light.

Adaptive Imaging for ISR Applications, David V. Wick1, Brett E. Bagwell1; Grant H. Soethoff1; Sandia National Laboratories, USA. Imaging intelligence is hindered by the diagnostically-opposed needs of high resolution and wide area surveillance. Multi-Gigapixel focal plane arrays are one solution, but we have successfully demonstrated adaptive imaging systems as an alternative.

A Quantitative UV Chemometric Model for the Determination of Zeaxanthin Cis and Trans Isomers, Jim Barren1; 1Kalsec Corp., USA. PLS1 modeling was used for UV/Vis against HPLC data on >300 samples to create a rapid industrial quantification method (correlation R2 > 0.95) for the totality and each of the individual isomers of zeaxanthin.
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.
<table>
<thead>
<tr>
<th>Pier 2</th>
<th>Pier 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imaging Systems and Applications</td>
<td>Applied Industrial Optics: Spectroscopy, Imaging, &amp; Metrology</td>
</tr>
</tbody>
</table>

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

### Wednesday, 13 July

10:00–10:30 Coffee Break/ Exhibits Open, Ballroom Foyer, Convention Level

<table>
<thead>
<tr>
<th>Pier 4</th>
<th>Pier 2</th>
<th>Pier 3</th>
</tr>
</thead>
</table>

LWA • Naval Applications I—Continued

IWA • Military Applications I—Continued

AIWA • Spectroscopy—Continued

**10:00–12:30**

**LWB • Naval Applications II**

**Peter Poitier; SPAWAR Systems Center – Pacific, United States; Mike Lovers; SPAWAR, United States, Presiders**

**LWB1 • 10:30**

*Blue-Green Laser Communications in Support of Undersea Dominance: Connecting with the Undersea Network,* Greg Mooradian1; 1QNA TSG, USA. Considerable progress has been made in Submarine Laser Communications. As Network-Centric operations expand, however, the Navy needs to be a fully integrated part of the Joint Force and communications must be improved to ensure Undersea Dominance.

**LWB2 • 11:10**

*Pulsed Yb Fiber Laser for Underwater Communications,* Andrew R. Grant1, Douglas F. Holcomb1, Thomas H. Wood1; 1LGS Innovations, USA. We propose using an array of high efficiency, frequency-doubled, pulsed Ytterbium fiber lasers for underwater communications. A 1064 nm pulsed Ytterbium laser producing over 1 mJ of energy in a 30μm core fiber is demonstrated.

**IWB • Military Applications II**

**Gisele Bennett; Georgia Tech, United States, Presider**

**IWB1 • 10:30**

*Distributed Aperture Millimeter Wave Imaging,* Christopher A. Schuetz1, Richard D. Martin1, Thomas E. Dillon1, Dennis Prather1; 1Phase Sensitive Innovations, Inc., USA; 2Electrical Engineering, University of Delaware, USA. We present advancements of a distributed aperture technique for the realization of a passive millimeter-wave imager based on optical upconversion. Specific advancements realized by the implementation of aperiodic aperture distribution are discussed.

**IWB2 • 11:10**

*Optical Imaging through Horizontal-Path Turbulence: A New Solution to a Difficult Problem,* William T. Rhodes1; 1Florida Atlantic Univ., USA. Imaging through long path (e.g., several km) turbulence presents difficulties that have until now been largely insurmountable. In this paper we describe a new active-illumination method that we think has good potential for allowing diffraction-limited imaging with large isoplanatic patch size.

**AIWB • Laser Applications**

**Joseph Dallas; Ave Photonics Inc., United States, Presider**

**AIWB1 • 10:30**

*New Laser Developments Approaching Fundamental Limits to Surgery and Biodiagnostics,* R. J. Dwayne Miller1; 1University of Toronto, Canada. The Picosecond IR Laser (PRI) Scalpel has finally achieved the promise of lasers for surgery - and may even surpass this goal by opening up molecular level guidance for surgery and biodiagnostics.

**AIWB2 • 11:10**

*Advances in High Power Fiber Lasers for Defense Applications,* Mike O’Connor1; 1IPG Photonics Corp, USA. Fiber laser development for defense applications falls into two primary areas: spectrally broad, and spectrally narrow fiber lasers. The former are useful for tactical, close-range applications, and are used as single lasers, or as multiple lasers which are incoherently combined. The latter are being developed for long-range applications, and narrow linewidth is required for either coherent or spectral combining of multiple beams. In this paper, we discuss the recent advances in both types of fiber lasers.
Hyperspectral Imaging and Sounding of the Environment

Adaptive Optics: Methods, Analysis and Applications

Computational Optical Sensing and Imaging

These sessions are grouped across two pages. Please review both pages for complete session information.

FWA • Static Spectrometers and New Developments II—Continued

FWA5 • 09:40
Fourier Transform Spectrometry: The SNR Advantage of the Multiplex Architecture, Alessandro Barducci1, Donatella Giazz1, Cinzia Lasri1, Baoa Marcousseau1, Vanni Nardino1, Ivan Pippi1; 1Istituto di Fisica Applicata “Nello Carrara”, Consiglio Nazionale delle Ricerche, Italy. Recent works revealed unexpected theoretical bounds to the radiometric performance of FTS. These findings, regarding the SNR of FTS as assessed in the interferogram and the spectral domain, are summarized and validated by experimental results.

CWA5 • 09:40
Space Variant Optical Super-Resolution using Sinusoidal Illumination, Prasanna Ramaraj1, Vikrant R. Bhutkar1, Indradri Sinha1, Mamunath Soma1, Marc P. Christensen1; 1Southern Methodist University, USA. The present work extends the scope of Optical Super-Resolution to imaging systems with spatially-varying blur by using sinusoidal illumination. It also establishes that knowledge of the space-variant blur is not a pre-requisite for super-resolution.

FWA6 • 09:40
Improved Profile and Cloud Top Height Retrieval by Using Dual Regression on High Spectral Resolution Measurements, Elisabeth Weisz1, William L. Smith1, Jun Li1, W. Paul Mentel2, Nadia Smith3; 1Cooperative Institute for Meteorological Satellite Studies, UW-Madison, USA; 2Hampton University, USA. The dual regression method, which is based on the joint use of clear sky and cloudy sky eigenvector regression relations, simultaneously provides an improved definition of the sounding profiles and of cloud altitude.

JWA5 • 09:40
Withdrawn

HWA • Clouds—Continued

HWA4 • 09:40
Apodization Function Retrieval with an Improved General Expression, Liyong Ren1, Huayin Wei2, Yan Li2; 1Precision Instruments, State Key Laboratory of Precision Measurement Technology and Instruments, China. To obtain unknown apodization function in target spectrometer, an improved general form for apodization function was proposed. Simulation retrievals for some typical apodization functions show the expression is highly efficient.

HWA5 • 09:40
Concepts of Fourier Transform Spectroscopy Using a Sagnac Interferometer, Stephen Lipson1, Kingsley Schwartz1, Physics, Technion, Israel. A common path interferometer has exceptional stability: The problem is how to introduce significant variable path difference between counter-propagating beams. Two concepts will be presented. A proposed application is to observational astronomy.

HWA6 • 09:40
Obliquity Effects in the Herschel/SPIRE Imaging Fourier Transform Spectrometer, Gabriel Mukha1, Lacke D. Spencer1, David A. Napier1, Brad Gom1; 1School of Physics and Astronomy, Cardiff University, United Kingdom; 2Physics and Astronomy, University of Lethbridge, Canada. The Herschel/SPIRE imaging Fourier transform spectrometer employs detector arrays at each output port. The effects of divergence within the spectrometer, known as obliquity effects, are discussed within the context of Herschel/SPIRE.

JWA7 • 09:40
Phase Correction of Fourier Transform Spectrometer Interferograms by Optimization of the Local Oscillator Phase Angle Term, Kathryn J. Conroy1, K. Paul Kirkbride2, Charles C. Harb1; 1School of Engineering and Information Technology, China; 2Xi’an University of Science and Technology, China; 3Academy of Opto-Electronics of Chinese Academy of Sciences, China; 4Academy of Opto-Electronics of Chinese Academy of Sciences, China; 5Electronic Information School, Wuhan University, China. Two open-path Fourier Transform Spectrometer measurement systems based on the Large Aperture Static Imaging Spectrometer (LASIS) are described. Their principles, performances and feasibilities are briefly introduced and discussed.

JWA10 • 09:40
Recovery of Exoplanet Signals in Re-discovered Speckle Chatter, Szymon Gladysz1, Erez N. Ribak1; 1Asher Space Research Institute, Technion, Israel; 2Astronomy and Applied Optics: OSA Optics & Photonics Congress • July 10–14, 2011

JWA11 • 09:40
Kerr-Induced Nonlinear Focal Shift Measurements, Georges Boudre1, Universite d’Angers, France. We report on third order optical nonlinear experimental characterization through focal shift measurements. The focus in the nonlinear regime is related to the nonlinear phase shift. Numerical and experimental results are in very good agreement.
Parameter Estimates For Free Space Optical Communications, H. Alan Pike¹, Larry Stotts², Paul Kolodzy³, Malcolm Northcott⁴; ¹Defense Strategies & Systems Inc., USA; ²Defense Advanced Research Projects Agency, USA; ³Kolodzy Consulting, USA; ⁴AOptix, USA. We have developed a methodology, successful at predicting key parameters in propagating 1.55 micron laser beams over distances from 10 km to 200 km, including estimating the effectiveness of adaptive optics systems at both end of these links.

Optical Turbulence Strength Sensing Using a Video Camera, Omer Y. Porat¹, Joseph Shapira¹; ¹Applied Optics Division, Soreq Nuclear Research Center, Israel. We present a method for remote sensing of the path-average turbulence strength, based on measurement of the angle-of-arrival fluctuations of reflections from a naturally illuminated arbitrary target. Experimental estimation shows reliable results.

Cramer-Rao Lower Bound for Passive and Active Imaging Systems, Jean Dolne¹; ¹Boeing, USA. This paper will present results on the fundamental performance of passive and active systems. In the passive Phase diversity mode (PD), we will show how using diversity other than defocus or a combination of multiple diversity functions can improve the performance of phase diversity systems. In the active mode, we will show the fundamental performance of various LADAR systems operating in the Geiger and linear modes.

New Wide Angle Electro-Optic Laser Scanners Enable Optical Sensors on Previously Inaccessible Platforms, Scott Davis; ¹Vescent Photonics Inc., USA. New wide angle (270 degrees demonstrated), analog, 2-D electro-optic laser scanners will be presented. The low size, weight, and power requirements of these scanners expand the range of platforms that are suitable for optical sensors.

NOTES

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Numerical Simulations of Metamaterial-based Infrared Sensor for Remote Environmental Monitoring, Alexander K. Popov1, Sergey A. Myshket1; 1University of Wisconsin-Stevens Point, USA; 2Instutute of Physics, Siberian Division of the Russian Academy of Sciences, Russian Federation. The possibility of creation of all-optically controlled, remotely actuated, ultra miniature nonlinear-optical sensor which utilizes negative-index metamaterial can be exploited for the environmental sensing is shown and numerically simulated.

Widefield Ultrastable Heterodyne Interferometry Using a Custom CMOS Modeled Light Camera, Rikesh Patel1, Matt Clark1, Samuel Achampong-Veal2; 1Applied Optics Group, Electrical and Computer Engineering Research Division, University of Nottingham, United Kingdom. A method of detecting optical heterodyne interferometry fringes using a custom CMOS modeled light camera array has been developed. Widefield phase images are generated using quadrature demodulation and are kept stable using a feedback system.

Tunable Single Pixel MEMS Fabry-Perot Interferometer, Annette Kovay1, John Kerekes2, Alan Raixen3; 1Imaging Science, Rochester Institute of Technology, USA; 2Topical, MEMS Fabry Perot devices use electrostatic actuation to control mirror spacing and snap in is an issue. A thermally actuated device has been modeled in COMSOL that lifts the mirror through thermal expansion.

Aircraft Measurements of the Aerosol Direct Radiative Effect, Samuel F. LeBlanc1, Sebastian Schmidt2, Peter Pilewskie1; 1ATOC and LASP, University of Colorado, USA; 2Aerosol relative forcing efficiency obtained from multiple field experiments is used to compare the direct radiative effect of various different aerosol types.

Fourier Synthesis in Classical Ghost Imaging, Tomohiro Shirai1, Henri Kellock2, Ari T. Friberg3; 1National Institute of Advanced Industrial Science and Technology (AIST), Japan; 2School of Physics, Shaidel Rehseat University, Tehran, Iran. We describe an optical setup for performing spatial Fourier filtering in ghost imaging with classical incoherent light. It is shown that phase contrast imaging is possible with this setup to visualize a true phase object.
Wednesday, 13 July

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

14:00–15:40
LWC • Laser Communication/Atmosphere I
Linda Thomas; Office of Naval Research, United States, Presider

LWC1 • 14:00 Invited
The Lunar Laser Communications Demonstration, Bryan Robinson1, Don Boroson1, D. A. Buri- anek, D. V. Murphy; Massachusetts Inst of Tech Lincoln Lab, USA. The Lunar Laser Communications Demonstration (LLCD) will demonstrate high-rate duplex lasercom between a lunar spacecraft and a ground terminal. We describe the LLCD system architecture and provide an overview of the space- and ground-terminal designs.

LWC2 • 14:40 Invited
Mobile Lasercom Systems Using Modulating Retro-reflectors, Peter G. Goetz1, William S. Rabinovich1, Rita Mahon1, Mike Ferraro1, James L. Murphy1, Michele R. Suite1, Christopher F. Moore2, Harris R. Bruno2, Walter R. Smith2, Warren W. Schultz1; Optical Sciences Division, Naval Research Laboratory, USA. The use of lasercom on mobile platforms is complicated by the pointing precision required. Modulating retro-reflectors greatly relax pointing requirements, enabling lasercom on a variety of mobile platforms not possible with traditional lasercom.

LWC3 • 15:20
Propagation of a General Multi-Gaussian Schell-Model Beam in Turbulent Atmosphere, Mehdi Sharifi1, Bin Luo1, Yongxiong Ren1, Anhong Dang1, Hong Guo1; Institute of Quantum Electronics, Peking University, China. The investigations on propagation of a multi-Gaussian Schell-model beam in turbulent atmosphere reveal that, under certain condition, initial coherence width can be a knob for changing the average intensity profile at the receiver plane.

14:00–15:40
JWB • Joint AIO/IS Session I: Biophotonics
Sean Christian; Optrology, Inc., United States, Presider

JWB1 • 14:00 Invited
Optofluidic Microscopy: Chip-scale imaging cell cytometry, Changhuei Yang1, Guoan Zheng1, Seung Ah Lee1, Sean Pang1, Lapman Lee1, Changhuei Yang1; Caltech, USA. We will discuss our recent work on chip-scale microscopy, including fluorescence and laser-scanning imaging techniques.

JWB2 • 15:20
A Compact Probe for β+-Emitting Radiotracer Detection in Surgery, Biopsy and Medical Diagnostics based on Silicon Photomultipliers, Christian Mester1, Claudio Bruschini2, Patricia Magro1, Nicolas Demartiner1, Vincent Dumet1, Eugene Grigoriev4, Anatoli Konoplyannikov4, Maurice Matter2, John O. Prior2, Eduardo Chabore1; EPFL, Switzerland; CHUV, Switzerland; TU Delft, Netherlands; Forimtech SA, Switzerland. We present a new probe for radiotracer detection in vivo. The device is based on silicon photomultipliers coupled with a scintillator and wirelessly compensated for supply voltage and temperature variations. The probe is positron sensitive.

16:00–16:30 Coffee Break/ Exhibits Open, Ballroom Foyer, Convention Level
These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

16:30–18:30
LWD • Laser Communication/Atmosphere II
Linda Thomas; Office of Naval Research, United States, Presider

LWD1 • 16:30
Invited
A Transportable Atmospheric Testing Suite, Rita Mahon1, Christopher I. Moore2, Harris R. Burns2, Mike Ferraro1, William S. Batyushov1, Michel R. Suite1; Linda Thomas1; Code 5123, Naval Research Laboratory, USA. A Transportable Atmospheric Testing Suite (TATS) consisting of sensors to monitor atmospheric turbulence and meteorological parameters over both direct and retroreflected free space optical links is described.

LWD2 • 17:10
Invited
Robust Fiber-to-fiber Free-Space Optical Communications under Strong Atmospheric Turbulences, Yoshinori Arimoto1; Space Communication Systems Laboratory, National Institute of Information and Communications Technology, Japan. This paper describes the SMF-coupled FSO terminals which use mutual beacon tracking, diffraction limited signal beam pointing and advanced initial beacon acquisition system to provide robust link operation under strong atmospheric turbulences.

LWD3 • 17:50
Free Space Quantum Communication using Continuous Polarization Variables, Bettina Heim1,2, Christian Feistinger1, Christoph Wittmann1, Christoph Marquardt1, Gerd Leuchs1,2; Max Planck Institute for the Science of Light, Germany; Institute of Optics, Information and Photonics and Erlangen Graduate School in Advanced Optical Technologies (SAOT), University of Erlangen-Nuremberg, Germany; Institute of Optics, Information and Photonics, University of Erlangen-Nuremberg, Germany. We experimentally investigate atmospheric influences on quantum communication using continuous polarization variables. Signal and local oscillator are combined in one spatial mode, which leads to excellent interference at the homodyne detection.

LWD4 • 18:10
Diffraction Attenuation Resistant Beams, Leonardo A. Ambrosio1, Michel Zamboni-Rached1, Hugo E. Hernández-Figueroa1; Department of Microwaves and Optics, DMO, FEEC, Unicamp, Brazil. Diffraction Attenuation Resistant Beams are generated by suitably superposing Bessel beams. We report theoretical results revealing that they can be used not only for short-range applications, but also to overcome atmospheric attenuation in FSO.

16:30–18:30
JWC • Joint AIO/IS Session II: 3D Imaging
Sri Rama Prasanna Pavani; Ricoh Innovations, United States, Presider

JWC1 • 16:30
Invited
SIM and Deflectometry: New Tools to Acquire Beautiful, SEM-like 3D Images, Gerd Haeseler1, Markus Vogel2, Zheng Yang2, Alexander Kasel2, Christian Fähr2; Institute of Optics, Univ. of Erlangen-Nuremberg, Germany. Structured-illumination microscopy and microdeflectometry acquire the shape of microscopic objects with a noise level down to 1 nanometer, a depth of field 100 times larger than the Rayleigh depth, and slope angles up to 80°.

JWC2 • 17:10
Invited
An Algorithm for High-Speed 3-D Profilometry, Benjamin Braker1, Eric Moore1; Chiaro Technologies, USA. Structured light profilometers measure static object shapes but their measurement of moving objects is limited. We present a decoding algorithm which, when used with high-speed hardware, produces high-speed profilometry of general objects.

JWC3 • 17:50
3D Far-field Optical Nanoscopy and Aperiodic Volume Optics, Rafael Piestun1; Univ. Colorado, USA. Abstract Not Available
Wednesday, 13 July

Joint Fourier Transform Spectroscopy/
Hyperspectral Imaging and Sounding of the Environment

Computational Optical Sensing
and Imaging

These concurrent sessions are grouped across two pages. Please review both pages for complete session information.

16:30–18:30
Joint FTS/HISE Postdeadline Session

16:30–18:10
CWC • Other Sensing Modalities
Sapna Shroff, Digital
Optics Research group at Ricoh Innovations Inc., United States,
Presider

CWC1 • 16:30  Invited
Radiometric Consistency in Source Specifications for Photolithography, Alan E. Rosenbluth1, Jaime Tirape Apizures2, Kehan Tian1, David Melville1; 1IBM T.J. Watson Research Center, USA; 2IBM Semiconductor Research and Development Center, USA. Mask simulations are made consistent with the brightness theorem if the source map is rescaled by pixel-solid-angle. Standard radiometry factors preserve consistency during propagation, and are derivable from rigorous vector diffraction integrals.

CWC2 • 17:10  Invited
Reconstruction Strategies for Modulated Polarimeters, Charles F. LaCasse1, Scott Tyo1, Russell A. Chipman1; 1University of Arizona, USA. Modulated polarimeters measure the polarimetric information in an optical field by modulating the intensity in a polarization-dependent way. This modulation creates side bands in Fourier transform space that carry the desired information.

CWC3 • 17:50
Dynamic 3D Measurement for Specular Reflecting Surface with Monoscopic Fringe Reflectometry, Lei Huang1, Chiseng Ng1, Anand Asundi1; 1Nanyang Technological University, Singapore. Dynamic full-field 3D measurement of specular surfaces can be conveniently implemented with fringe reflection technique. An experimental study on measuring water wave variations is carried out to demonstrate the feasibility of the proposed approach.

NOTES

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FWC1 • 16:30
GOSAT/TANSO: Instrument Design and Level 1 Product Processing Algorithms, Jun Yoshida1, Takahiro Kawashima1, Juro Ishida1, Akihiko Kuze2, Hiroshi Suto2, Kei Shiomi2, Masakatsu Nakajima2; 1NEC TOSHIBA Space Systems, Ltd, Japan; 2Japan Aerospace Exploration Agency, Japan. The Greenhouse gases Observing SATellite (GOSAT) has acquired mainly carbon dioxide (CO2) and methane (CH4) absorption spectra globally from space since early 2009. TANSO-FTS (Thermal And Near infrared Sensor for carbon Observation Fourier Transform Spectrometer) is a space-born FTS which has 3 SWIR bands (0.76, 1.6 and 2.0 um) and 1 TIR band (5.5 - 14.3 um) for observation of scattering light and thermal radiation from the earth. In order to improve the GOSAT data quality, the level 1 product processing algorithms has been developed for several years. The instrument design of the GOSAT/TANSO-FTS and the overview of the level 1 product processing algorithms are described.
We present results for negative feedback avalanche diodes (NFADs), which are InP-based SWIR solid-state photomultipliers, using low cost components. Entwistle M. Owens 1, K. Patel 1, X. Jiang 1, K. Slomkowski 1, K. Slomkowski 1, S. Rangwala 1; 1Princeton Lightwave, USA. We describe FPAs based on planar-geometry Geiger-mode avalanche photodiodes designed for single photon 3D LIDAR imaging systems. We compare new 32x32x100μm FPAs for dark count rate, crosstalk performance, and overall pixel yield.

Single Photon Imaging Cameras for 3D Imaging Applications, Bengar Calmousam 1, Ping Yuan 1, Joseph Bouvet 1; Boeing Spectralab, USA. Boeing Spectralab has demonstrated 3D imaging using single photon Geiger-mode cameras operating at 1600 nm wavelength. In this conference we will present status of detector array performance, camera design and control. New 32x32x100μm FPAs for dark count rate, crosstalk performance, and overall pixel yield.

This article discusses remote sensing of atmospheric particles for general monitoring applications which includes detection, mapping, characterization, discrimination, and identification. Details regarding the architecture for real-time information are also included.

We present results for negative feedback avalanche diodes (NFADs), which are InP-based SWIR solid-state photomultipliers with single-photon sensitivity operated with just a DC bias. We demonstrate photon number resolution for a matrix of NFAD elements.
Imaging and Applied Optics:
OSA Optics & Photonics Congress
Postdeadline Papers

Pier 5
AO Postdeadline Session
Tuesday, July 12, 2011 16:30 - 18:30
Gordon Love; University of Durham, UK, Presider

APDP1 • 16:30
Inverse Problem Approach to the detection of Exoplanets in Multi-Wavelength Data, N. Devaney1,2, É. Thiébaut2,
1School of Physics, National University of Ireland, Ireland 2Université de Lyon, France. Images obtained at different
wavelengths may be used to discriminate faint exoplanets from residual speckle in the stellar PSF. We have
developed an inverse problem approach to fit multi-wavelength data which shows improved detection limits.

APDP2 • 16:50
Practical Implementation of Natural Guide Star Adaptive Optics Point Spread Function Reconstruction on
Gemini/Altair & Keck II Systems, Laurent Jolissaint1, Julian Christou2, Chris Neyma3, Peter Wizinowich3, aquilAOptics,
Switzerland; 2Gemini Observatory, USA; 3W.M. Keck Observatory, USA. We present the results of the implementation of
an Adaptive Optics (AO) Point Spread Function Reconstruction (PSF-R) algorithm on the Gemini-North (Altair) and
W.M. Keck systems, for the simplest mode: on-axis bright natural guide star (NGS). We find that unknown telescope,
instrument and non-common path aberrations - that are not accounted for in the current model - are as important as
the residual turbulence aberrations. We discuss these limitations here and describe our plans to measure and include
these unknown aberrations in our model.

APDP3 • 17:10
The Gemini Multi-Conjugate Adaptive System Sees Star Light, F. Rigaut1, B. Neichel1, M. Bec1, M. Bocca1, C.
D’Orgeville1, V. Fesquet1, R. Galvez2, G. Gauschs1, G. Tranch2, C. Trujillo1, M. Edwards3, R. Carrasco1, Gemini Observatory,
Chile. The Gemini Multi-Conjugate Adaptive Optics system (GeMS) has been in commissioning in the first 5 months
of 2011. In this paper we present the first results of this commissioning period and plans for the future.

APDP4 • 17:30
Phase Sensor for Solar Adaptive-Optics, Aglaé Kellerer, Big Bear Solar Observatory, USA. A new wavefront sensor for
solar adaptive optics is presented. The measured quantity is directly proportional to the wavefront phase – no
additional computation is required. The method is now being tested on an optical bench.

APDP5 • 17:50
Wavefront sensing in XUV: HHG beam profile measurement, P. Homer, B. Rus, J. Hrabček, J. Nejdli, Department of
Ultraintense Lasers Physics v.v.i. / PALS Centre, Academy of Sciences of the Czech Republic, Czech Republic. We will present
results of an experiment dedicated to the XUV wavefront profile measurement of the HHG (High-order Harmonic
Generation) beam, carried at the PALS laser center. The wavefront sensing has been achieved by using the PDI (Point
Diffraction Interferometer) technique. The performance of the developed PDI sensor has been tested with 10-Hz XUV
source emitting at the wavelength λ=30nm, generated in Ar gas cell by 300 mJ, 40-fs IR laser pulses. The design and
development of this XUV wavefront sensor will also be discussed, showing advantages and limitations of
applicability of the PDI technique in the XUV and soft-x-ray spectral region.
The Use of Adaptive Optics in Imaging the Eyes of Small Animals, Melanie C. W. Campbell1,2,1, Marsha L. Kisilak1,2, Mark Bird1,2,1, Elizabeth Irving1,2,1, Physics & Astronomy, and 2School of Optometry, University of Waterloo, 3Guelph Waterloo Physics Institute, Waterloo, Ontario, Canada. High resolution imaging of a wide variety of animals is important to understanding their vision and to imaging retinal details in animal models of human disease. We discuss the differing requirements and advantages of AO correction across species.

Salon B
Joint FTS/HISE/AO/COSI Poster Session
Wednesday, July 13, 2011 10:30 -- 12:30

JWA32 Postdeadline Poster - AO
Kalman and H-infinity Controllers for GeMS, I. Rodriguez1, B. Neichel1, A. Guesalaga1, F. Rigaut2, D. Guzman1, 1Center for Astro-Engineering, Department of Electrical Engineering, Pontificia Universidad Catolica, Chile; 2Gemini Observatory, Chile. GeMS is the Gemini Multi-conjugate System. The system includes 5 Laser Guide Stars, 3 Natural Guide Stars, 3 Deformable Mirrors 1 Tip-Tilt Mirror. In this paper we focus on the control of the Tip-Tilt loop. Two new controllers have been implemented and tested, namely Kalman and H-infinity. We demonstrate that these controllers provide the means to efficiently attenuate vibration or certain frequency bands for GeMS.

Salon C
COSI Postdeadline Session
Wednesday, July 13, 2011 10:30 -- 11:30
Micheal Gehm, University of Arizona, USA, Presider

CPDP1 • 10:30
Adaptive Periodic-Correlation Algorithm for Extended Scene Shack-Hartmann Wavefront Sensing, Erkin Sidick, Jet Propulsion Laboratory, California Institute of Technology, USA. We present an adaptive periodic-correlation algorithm for large dynamic range extended-scene Shack-Hartmann wavefront sensing. We show that it accurately measures very fine image shifts over many pixels under a variety of practical imaging conditions.

CPDP2 • 10:50
Lensless Tomographic Microscopy on a Chip, Serhan O. Isikman1, Waheb Bishara1, Sam Mavandadi1, Frank Yu1, Steve Feng1, Randy Lau1, Aydogan Ozcan1,2,3,1Electrical Engineering Department, University of California, USA;2California NanoSystems Institute (CNSI), University of California, USA. A lensless optical tomography platform is demonstrated for use in high throughput 3D imaging applications. Through the use of pixel super-resolution techniques in partially-coherent digital in-line holography and tomographic reconstruction, this computational microscope achieves <1μm × <1μm × <3μm spatial resolution along the x, y and z directions, respectively, over a large imaging volume of ~15mm3.

CPDP3 • 11:10
Field Test of PANOPTES-Based Adaptive Computational Imaging System Prototype, Manjunath Somayajulu1, Marc P. Christensen1, Esmaeil Faramarzi2, Dinesh Rajan1, Juha-Pekka Laine1, Domhlul Granquist-Fraser2,3, Peter Sebelius2, Arthur Zachai1, Murali Chaparala1, Gregory Blasche1, Keith Baldwin1, Babatunde Ogunfemi1,2,1Department of Electrical Engineering, Southern Methodist University, USA;2The Charles Stark Draper Laboratory, USA;3Department of Biomedical Engineering, Worcester Polytechnic Institute, USA;4Department of Electrical and Computer Engineering, Northeastern University, USA. We describe the design and prototype development of a visible-band, multi-resolution, steerable computational imager in a flat profile, based on the PANOPTES architecture. We present this imager’s superresolution capabilities via field test results.
Salon A
Joint FTS/HISE Postdeadline Session
Wednesday, July 13, 2011 16:30 -- 18:10
Felix Friedl-Vallon; Karlsruher Institut fuer Technologie Germany; Pierre Tremblay, University Laval, Canada, Presiders

JPDP1 • 16:30 FTS - INVITED
GOSAT/TANSO: Instrument Design and Level 1 Product Processing Algorithms, Jun Yoshida1, Takahiro Kawashima1, Juro Ishida1, Akihiko Kuzo2, Hiroshi Suto2, Kei Shiomi2, Masakatsu Nakajima2; NEC TOSHIBA Space Systems, Ltd, Japan; 2Japan Aerospace Exploration Agency, Japan. The Greenhouse gases Observing SATellite (GOSAT) has acquired mainly carbon dioxide (CO2) and methane (CH4) absorption spectra globally from space since early 2009. TANSO-FTS (Thermal And Near infrared Sensor for carbon Observation Fourier Transform Spectrometer) is a space-born FTS which has 3 SWIR bands (0.76, 1.6 and 2.0 um) and 1 TIR band (5.5 - 14.3 um) for observation of scattering light and thermal radiation from the earth. In order to improve the GOSAT data quality, the level 1 product processing algorithms has been developed for several years. The instrument design of the GOSAT/TANSO-FTS and the overview of the level 1 product processing algorithms are described.

JPDP2 • 17:10 HISE
Spectrometers for Ocean and Atmospheric Sensing, Tim Valle1, James Leitch1, Chuck Hardesty1, Curtiss O. Davis2 and Nicholas Tufillaro3, Kelly Chance3, Xiong Liu3, Scott Janz3, Ken Pickering4, Jun Wang5; 1Ball Aerospace, USA; 3College of Oceanic and Atmospheric Sciences/ Oregon State University, USA; 1Smithsonian Institution/Smithsonian Astrophysical Observatory, USA; 4NASA/Goddard Space Flight Center, USA; 5University of Nebraska, USA. Describe the motivation, goals, and plans for MOS and GeoTASO, two NASA Instrument Incubator Program sponsored technology development projects directed at supporting the NASA GEO-CAPE ocean and atmospheric science mission.

JPDP3 • 17:30 FTS
On-Orbit Absolute Radiance Standard for Future IR Remote Sensing Instruments – Overview of Recent Technology Advancements, Claire Petterson1, Fred A. Best1, Douglas P. Adler1, Henry E. Revercomb1, P. Jonathan Gero1, Joseph K. Taylor1, Robert O. Knuteson1, and John H. Perepezko2, 1University of Wisconsin, Space Science and Engineering Center, USA, 2University of Wisconsin, Materials Science and Engineering, USA. A summary of the development and recent advancements of the On-Orbit Absolute Radiance Standard at the University of Wisconsin Space Science and Engineering Center. This work is funded under the NASA Instrument Incubator Program.

JPDP4 • 17:50 FTS
Spectroscopic Interferometric Method of Revealing Spectral Features from Extra-Solar Planets, Eyal Schwartz, Stephen G. Lipson, Physics department, Technion – Israel Institute of Technology, Haifa, Israel. The signal contrast in a light source between an Earth-like extra-solar planet and a parent star (typical sun-like) is a difficult obstacle in imaging and spectroscopic analysis of a distant light source observed on earth. We suggest a method of using parts of an interferogram of the combined light sources (both planet and sun) in order to increase the signal to noise ratio and identify the specific spectral features from the planet in the background of the parent star.
The following poster and papers were withdrawn after the program guide went to print: JTuB2; JTuB5; JTuB8; JTuB9; JWA4; JWA18; JWA23. LMA1; LMA2; LMC4; LWC3; JPDP2; LTuA2

**Presider Updates**

Ping Yang will preside over HWB 14:00-16:00 in Pier 7/8.

**Author Updates**

The author block for AIMB4 should read ElfedLewis; 'University of Limerick, Ireland.'

**Networking over Lunch**

Tuesday, 12 July 12:30 – 14:00

Sponsored by the OSA Information Acquisition, Processing and Display Technical Division

David Brady, Division Chair, and Chris Dainty, OSA President, invite you to join them over lunch for some lively networking with your colleagues. OSA is pleased to offer complimentary sandwiches and beverages to all who attend.

**Postdeadline Papers: Key to Authors and Presiders**

Akondi, Vyas-JMB5
Ardekani Baghaei, Hossein-JWA18
Baldwin, Keith B-CPDP3
Bec, Matthieu-APDP3
Bird, Mark-APDP6
Bishara, Waheb-CPDP2
Blasche, Gregory-CPDP3
Bocca, Maxime-APDP3
Britton, Matthew-JMB
Budihala, Raghavendra Prasad-JMB5
Campbell, Melanie-APDP6
Carrasco, Rodrigo-APDP3
Chance, Kelly-JPDP2
Chaparala, Muravy-CPDP3
Christensen, Marc P-CPDP3
Christou, Julian Charles-APDP2
Davis, Curtiss-JPDP2
Devaney, Nicholas-APDP1
d’Orgeville, Celine-APDP3
Edwards, Michelle-APDP3
Faramarzi, Esmaeil-APDP3
Feng, Steve-CPDP2
Fesquet, Vincent-APDP3
Friedl-Vallon, Felix-JPDP
Galvez, Ramon-APDP3
Gausachs, Gaston-APDP3
Granquist-Fraser, Domhnall-CPDP3
Guesalaga, Andres-JWA32
Guzman, Daniel-JWA32
Hardesty, Chuck-JPDP2
Hassan firoozii, Amir-JWA18
Homer, Pavel-APDP5
Hrebicek, Jan-APDP5
Irving, Elizabeth-APDP6
Ishida, Juro-JPDP1
Isikman, Serhan-CPDP2
Janz, Scott-JPDP2
Jolissaint, Laurent-APDP2
Kawahshima, Takahiro-JPDP1
Kellerer, Aglae-APDP4
Kisilak, Marsha-APDP6
Krishnan, Amritha S-JMB5
Kuze, Akihiko-JPDP1
Laine, Juha-Pekka-CPDP3
Lau, Randy-CPDP2
Leech, James-JPDP2
Lipson, Stephen-JPDP4
Liu, Xiong-JPDP2
Love, Gordon-APDP
M b, Roopashree-JMB5
Maddah, Mohammadreza-JWA18
Mavadadi, Sam-CPDP2
Nakajima, Masakatsu-JPDP1
Neichel, Benoit-APDP3, JWA32
Nejdl, Jaroslav-APDP5
Neyman, Chris-APDP2
Ogunfemi, Babatunde-CPDP3
Ozcan, Aydogan-CPDP2
Pettersen, Claire-JPDP3
Pickering, Ken-JPDP2
Rajan, Dinesh-CPDP3
Rigaut, Francois-APDP3, JWA32
Rodriguez, Ignacio-JWA32
Rr, Sriram-JMB5
Rus, Bedrich-APDP5
Schwartz, Eyal-JPDP4
Sebelius, Peter-APDP3
Shankar Sai, Siva-JMB5
Shiomi, Kei-JPDP1
Sidick, Erkin-CPDP1
Somayaji, Manjunath-CPDP3
Suto, Hiroshi-JPDP1
Thiebaut, Éric-APDP1
Tranco, Gelys-APDP3
Tremblay, Pierre-JPDP
Trujillo, Chad-APDP3
Tufillaro, Nicholas-JPDP2
Wang, Jun-JPDP2
Yoshida, Jun-JPDP1
Yu, Frank-CPDP2
Zachai, Arthur-CPDP3

**Student Awards**

Vyas Akondi, Indian Inst. Of Astrophysics, India has been named the recipient of the 2011 Robert S. Hilbert Memorial Student Travel Grant. Please help us congratulate him on this prestige award.

**Postdeadline Papers**

Postdeadline Papers are appended to the back of the program guide. Key to postdeadline authors is below.

**Web Access**

To access the internet in the meeting area use this wireless access code:

SSID: DATAVALET_MR
Login: IMA61
Password: wusyki
Important Program Changes

LS&C

Monday, July 11th, LMA Hybrid Laser/RF Communications
Session from 8:40-10:00 in Pier 4 has been cancelled

The talks have been moved to the Tuesday, July 12th, 10:30-12:10
LTuB - Network Technologies
Juan Juarez, John Hopkins, United States, Presider

LTuB1 10:30
Diversity Rateless Round Robin for Networked FSO Communications
Roger Hammons

LTuB2 11:10
Optical Automatic Gain Controller for High-Bandwidth Free-Space Optical Communication Links
Juan Juarez

LTuB3 11:30
Customized Bit Error Rate (cBERT) Tester for Characterizing Frequent Fade Communications Channels
James Riggins

AIO

AIMD1 at 16:30 has been moved to AIWB at 12:30
Process Analytical Technology: Bringing Solutions to the Plant Floor
Katherine Bakeev