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21–25 August 2011

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San Diego Convention Center
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- Illumination Engineering
- Optomechanics and Optical Manufacturing
- Optical Design
- Advanced Metrology
- Optical Systems Engineering
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- Image and Signal Processing
- X-Ray, Gamma-Ray, and Particle Technologies
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Program Chair: Khan M. Iftekharuddin, The Univ. of Memphis (United States)

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SPIE Optics + Photonics is a leading conference on green photonics technologies such as energy, sustainability, conservation, and environmental monitoring. Watch for this icon next to conferences discussing innovative ways to help our planet.
The Nature of Light: What are Photons? IV (OP301)

**Conference Chairs:** Chandrasekhar Roychoudhuri, Univ. of Connecticut (United States) and Femto Macro Continuum (United States); Andrei Yu. Khrennikov, Växjö Univ (Sweden); Al F. Kracklauer, Consultant (Germany)

**Program Committee:** Shahriar S. Afshar, Rowan Univ. (United States); Benjamin J. Eggleton, The Univ. of Sydney (Australia); Tepper L. Gill, Howard Univ. (United States); Karl Otto Greulich, Fritz Lipmann Institut (Germany); Habib Hamam, Univ. de Moncton (Canada); Margaret H. Hawton, Lakehead Univ. (Canada); Subhash C. Kak, Oklahoma State Univ. (United States); Akhlesh Lakhtakia, The Pennsylvania State Univ. (United States); Carl F. Maes, College of Optical Sciences, The Univ. of Arizona (United States); John M. Myers, Harvard Univ. (United States); Narasinha S. Prasad, NASA Langley Research Ctr. (United States); Chary Rangacharyulu, Univ. of Saskatchewan (Canada); Michael G. Raymer, Univ. of Oregon (United States); Wolfgang P. Schleich, Univ. Ulm (Germany); Marlan O. Scully, Texas A&M Univ. (United States) and Princeton Univ. (United States); Weilong She, Sun Yat-Sen Univ. (China); Ian A. Walmsley, Univ. of Oxford (United Kingdom); Herbert G. Winful, Univ. of Michigan (United States); Ewan M. Wright, College of Optical Sciences, The Univ. of Arizona (United States)

**Conference Co-Sponsor:**

Efficient engineering inventions depend upon our capability to emulate interaction processes that go on in nature. Unfortunately, our systematic neglect towards understanding and visualizing the invisible light-matter interaction processes for centuries, has bottle-necked a deeper understanding of the true nature of light. This conference series has been encouraging publications of experimental, mathematical and conceptual papers that can explicitly address this fundamental issue of light-matter interaction processes. E.g. our photo detectors are quantized and they can register incidence of light only as a sum of many discrete events, whether it is the breakdown of AgBr molecules as in photographic plates or the release of individual discrete electrons from valence to the conduction bands as in our modern photo detectors. Are we applying these intrinsic quantum properties of detectors to light? While photons (as emitted from atoms and molecules) may or may not propagate as indivisible elementary particles, such detectors responses cannot settle the issue irrevocably.

Consider the recent history of rapid technological advances in the fields of nano photonics and plasmonic photonics. They are completely based on propagating Maxwell’s wave equation, which naturally accommodates the Huygens-Fresnel’s diffraction integral. The analyses remain valid for all level of intensity. If the indivisible photon model is the correct one, how can we achieve so many new successes in these fields without using Quantum mechanics (QM)? This is why we are inviting the leaders of nano photonics and plasmonic photonics to extend the debate on the true nature of light. After the conference, selected papers of these fields will be published in a special issue of JNP.

Let us quickly look at the history of the debate on “wave-particle duality.” It has been raging since early 1700, starting with Huygens (wave) and Newton (corpuscle). Newton’s view prevailed till Young in 1802 changed the debate in favor of waves demonstrating superposition effect with two slits, which was validated by Maxwell in 1865 with his wave equation constructed out of experimentally derived laws of electricity and magnetism, and found that the cosmic aether possesses a complex “tension” field characterized by $E_\perp$ and $\mu_\perp$ which generates the perpetual velocity of light waves, $c=\sqrt{\frac{\mu_\perp}{\varepsilon_\perp}}\mu_\perp$, moving between remote corners of the cosmic system, once they are generated due to perturbing energy packets released by atomic and molecular dipoles during their quantum transitions. These perturbations become propagating wave packets because the locally modified complex cosmic tension field ($C^2 TF$) can get back to its preferred state of equilibrium only by handing over the excess energy of modification to the neighboring points of the field (Huygens’ secondary wavelets). With this old field model in mind, and current appreciation by most other theories that the space holds rich properties (vacuum fluctuations, strings, etc.), we are encouraging relativity, quantum-, quantum field-, particle-, and astro-physicists to join us and promote novel solutions to the problem of dark energy as $C^2 TF^\alpha$, space-time twisting as its modification, particles as localized resonant undulations of it, etc., etc.

Such a model was in the minds of Faraday, Maxwell and even Planck. Planck in 1900 discovered the quantumness in the blackbody radiation. He assigned the quantumness to the atoms and molecules. Then, in 1905, Einstein discovered some quantumness in the data on photo electric emissions. But, he chose to assign this quantumness to light, instead of realizing that the electrons are quantized and their energy levels in materials are also quantized. Of course, this was 20 years before quantum mechanics was formulated.

Inspired by Einstein’s hypothesis of wave-particle duality of light, de Broglie extended the concept to particles while studying electron diffraction. Schrodinger leveraged this duality and introduced his famous wave equation for particles where the time varying phase factor for a particle was expressed as $\exp[i2\pi \frac{\hbar}{\hbar} t]$, which being devoid of any spatial coordinates, was interpreted as a “plane wave” representation for a particle. In reality, Schrodinger had discovered the universal internal harmonic undulation of physically tiny particles with non-relativistic kinetic energy $E=mv^2/2\hbar$, $f$ being the internal harmonic frequency. This phase factor, of course, determines the superposition effect of multiple particles on the same detector due to their simultaneous arrival (at once).

By 1930, Dirac’s quantization of the electromagnetic field was hailed as a great success. Practitioners of the new theory realized that photons are non-interacting Bosons, supported...
by Bose-Einstein statistics. It was also found that direct photon-photon scattering cross-section (interaction) in absolute vacuum is negligible. Classical wave theorists also recognized that waves, in the linear domain, do not interact with each other while crossing through each other. They pass through each other unperturbed in their original energy distributions. Thus, it appears that Non-Interaction of Waves or NIW is a generic property of all waves in the linear domains of their respective tension fields, which helps them become a perpetually propagating wave packet. So we request authors to initiate a new debate on whether there are important differences between the concepts, (i) interference of light vs. (ii) superposition effects of multiple light beams on the same detecting dipole? In other words, if the NIW-principle implies that light fields cannot sum themselves, then the detector must carry out the required summation of the simultaneous stimulations implied by the superposition principle. Then the quantumness in the photo detection statistics must be dominantly determined by the quantumness of the detecting dipoles! Could this be the reason why semi-classical model is so successful in explaining most of the light-matter interaction processes, which were originally thought to be the exclusive domain QED? Accordingly, we invite the experts from all branches of classical and quantum optics to join us and promote new break-through concepts and theories for light and light-matter interaction processes.

We strongly encourage potential authors to submit papers that attempt to imagine, visualize and explain the real physical PROCESSES undergoing behind the generation, propagation and detection of light. All papers should be grounded by actual or feasible experiments in preference to pure mathematical formalism, or quantum philosophy, or “Gedanken” experiments.

- papers on experiments with novel theories to elucidate the nature of light and derive better definitions for either indivisible photons or diffractive wave packets, emitted by atoms and molecules
- papers underscoring paradoxes and contradictions in experimental observations if one rigidly adheres to QED definition of a photon
- papers debating the validity of generation, propagation, manipulation and detection, of indivisible single photons for quantum computation, encryption and communication when the emitter is not an isolated single atom (molecule) and/or the detector is not an isolated atom (molecule)
- papers exploring the nature of light leveraging current advances in computational and fabrication technologies in nano photonics
- papers that exploit advances in optical trapping, optical vortices, etc. to elucidate the nature of light
- papers that compare and contrast light as Bosons and leverages advances in the field of Bose-Einstein condensates to better understand the nature of light
- papers that exploit advances in slow and fast light to enhance understanding of light
- papers that use the evolution of spatial coherence out of incoherent source to enhance the propagation model for light
- papers that bring better understanding of the nature of light leveraging its inter-connectedness with all the fields of relativity, quantum field, string theories, etc., through the properties of the vacuum or the complex cosmic tension field (C²TF)
- any other original approaches to better understand the nature of light.
Tribute to Joseph W. Goodman (OP400)

Conference Chairs: H. John Caulfield, Alabama A&M Univ. (United States); Henri H. Arsenault, Univ. Laval (Canada)

In the past few years, SPIE has paid tribute to a few individuals that have helped make research in their fields more productive and more enjoyable. Past honorees have included Adolf Lohmann, Emmett Leith, Yuri Denisyuk, and Emil Wolf. This conference and resulting publication will add Joe Goodman to that list. As in the past conferences, authors should write papers they think he might enjoy. They need not be in his past or even current fields, but they should (in some sense) be inspired by Professor Goodman’s work. In fact the kinds of papers written by or for the previous honorees Adolf Lohmann, Emmett Leith, Yuri Denisyuk, and Emil Wolf would be likely the kinds of papers Dr. Goodman would enjoy. It is appropriate but by no means required that authors explain how their work stems from or is inspired by Joe’s work to date.

Suitable topics might include but are certainly not limited to:

- speckle - analysis and applications
- holography - fundamentals or new uses
- Fourier optics - extensions and applications of Goodman’s analyses. And why use optics when electronics appears to do it more accurately, in a much smaller and cheaper system?
- Fourier filtering - especially applications better done with optics than with electronics
- Coherent optics - new theory, new applications
- optical image processing - How and why?
- optical computers - Why are they now “hot” and what can optics do much better than electronics?
- computer modeling - especially of coherent optical systems
- polarization optical systems
- biologically inspired optical systems emphasizing the subjects listed above

Here is an opportunity to give something back to someone who has given something to make your research more productive and more fun.
Eleventh International Conference on Solid State Lighting (OP220)

Conference Chairs: Matthew H. Kane, The Univ. of Oklahoma (United States); Christian Wetzal, Rensselaer Polytechnic Institute (United States); Jian-Jang Huang, National Taiwan Univ. (Taiwan)

Program Committee: Srinath K. Aanegola, GE Global Research (India); Andrew A. Allerman, Sandia National Labs. (United States); Ian E. Ashdown, byHeart Consultants Ltd. (Canada); Lianghui Chen, Institute of Semiconductors (China); John W. Curran, LED Transformations, LLC (United States); Nikolaus Dietz, Georgia State Univ. (United States); Samuel Graham, Georgia Institute of Technology (United States); Volker K. Härle, OSRAM Opto Semiconductors GmbH (Germany); Christoph Hoelen, Philips Lighting B.V. (Netherlands); Jianzhong Jiao, OSRAM Opto Semiconductors Inc. (United States); Asif M. Khan, Univ. of South Carolina (United States); Michael R. Krames, Soraa, Inc. (United States); Y. S. Liu, National Tsing Hua Univ. (Taiwan); Nadarajah Narendran, Rensselaer Polytechnic Institute (United States); Eun-Hyun Park, Kyung Hee Univ. (Korea, Republic of); Seong-Ju Park, Gwangju Institute of Science and Technology (Korea, Republic of); Jeff Quinlan, Acuity Brands Lighting, Inc. (United States); Robert V. Steele, Strategies Unlimited (United States); Chih-Chung Yang, National Taiwan Univ. (Taiwan)

Founding Chair: Ian Ferguson, The Univ. of North Carolina at Charlotte (United States)

This conference will cover four different areas: application, system level packaging, device level packaging, and standards for SSL. The continued development of high-brightness LEDs based on III-Nitrides has led to revolutionary new approaches for lighting and general illumination. LEDs are now prevalent in public spaces from accent lighting, to electronic applications, and now into the area of general illumination. Advancements in LEDs have led to luminous efficiencies exceeding incandescent light bulbs (40-80 lumens/watt) and much higher than this for monochromatic sources. Continued improvements are still needed in efficiency, color temperature, color rendering, lifetime, and relative cost.

However, the challenge that must now be solved is how best to bring these energy saving LEDs into the market for everyday applications in a systematic way. The implementation of LEDs, and even lasers, in general lighting applications will require new lighting paradigms. Standardization in the lighting market will be necessary to enable the levels of availability and interoperability that are needed for LEDs to be fully accepted by the public. LM-79 and LM-80 are absolute photometry and lifetime measuring methods set by DOE and IES that are currently being used for standardization of all LED fixtures. There is a need for collaboration between engineers and designers to come up with viable packages for LED implementation that show the general public that LED fixtures are viable replacements for conventional lighting methods.

There have also been rapid advances made in the development of organic and polymeric LEDs, which are now exhibiting efficiencies similar to inorganic devices. These devices may also have utility in lighting applications and are more likely to provide area illumination sources than the point sources produced by inorganic devices.

Solid state lighting technology is rapidly advancing and very large markets are waiting for new technologies that can deliver more efficient light sources. The use of LEDs in solid state lighting is the technology of the future for lighting and general illumination. Suggestions for the four areas are listed below:

Applications for solid state lighting:
- outdoor lighting
- residential lighting
- architectural lighting
- energy efficient lighting systems
- integrated solar lighting.

System level packaging for solid state lighting:
- fixture designs
- optical design
- drive electronics for lighting systems
- alternative solid state lighting sources
- reliability of solid state lighting systems.

Device level packaging for solid state lighting:
- LED fabrication improvements
- Light extraction from LEDs
- Thermal management and heat extraction
- light-emitting diodes (growth, fabrication, and optimization)
- UV/pumped phosphors
- lighting phosphor technology (YAG, tricolor, etc.)
- lasers in lighting applications.

Standards for solid state lighting:
- Illumination design for general lighting
- CIE and chromaticity measurements
- LED and SSL testing, modeling, and evaluation
- electronic settings.

Highlights:
- Joint session on Organic Solid State Lighting.
Nonimaging Optics: Efficient Design for Illumination and Solar Concentration VIII (OP221)

Conference Chairs: Roland Winston, Univ. of California, Merced (United States); Jeffrey M. Gordon, Ben-Gurion Univ. of the Negev (Israel)

Program Committee: Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (Spain); William J. Cassarly, Optical Research Associates (United States); Daniel Feuermann, Ben-Gurion Univ. of the Negev (Israel); Philip L. Gleckman, eSolar Inc. (United States); Ralf Leutz, Concentrator Optics GmbH (Germany); Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (Spain); Narkis E. Shatz, SAIC (United States)

Many important optical subsystems are concerned with power transfer and brightness rather than with image fidelity. Nonimaging Optics is a design approach that departs from the methods of traditional optical design to develop techniques for maximizing the collecting power of concentrator and illuminator systems.

Nonimaging devices substantially outperform conventional imaging lenses and mirrors in these applications, approaching the theoretical (thermodynamic) limit. Nonimaging design methods usually involve solving ordinary or partial differential equations, calculating the flow lines of the ray bundles, coupling the edge rays of extended sources and targets or optimizing a multi-parameter merit function computed by ray-tracing techniques. While geometrically based, the design fundamentals have been extended to the diffraction limited and even sub-wavelength domain. Therefore applicability exists in near-field optical microscopy and nanometer scale optics.

This symposium will address the theory of Nonimaging Optics and its application to the design and experimental realization of illumination and concentration systems, tailored freeform optics, display backlighting, condenser optics, high-flux solar and infrared concentration, daylighting, LED optical systems, laser pumping and luminaires.

The revival of considerable work in solar energy concentration for both photovoltaic and thermal applications, much of which includes nonimaging optics, prompts reincorporating these fields into this symposium.

The use of Nonimaging Optics promises higher efficiency, relaxed physical tolerances, improved optical uniformity, and reduced manufacturing costs. We encourage submissions ranging from fundamentals to critical design issues and practical applications.

Paper submissions are also solicited in the following and related areas:
- radiative transfer near the étendue limit
- concentrator optics
- illumination and irradiation optics
- solar photovoltaic and solar thermal concentration
- fiber-optic and light-pipe optical systems
- radiometry
- daylighting
- characterization of light-transfer devices
- freeform optics
- optical furnaces and radiative heating
- infrared detection
- LED applications
- laser pumping
- condenser optics.

Critical Dates

Abstract Due Date:
7 February 2011

Manuscript Due Date:
27 July 2011

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, whether it is an oral or poster presentation, and submit a full-length manuscript by the deadline. The contact author will be notified of abstract acceptance by email no later than 18 April 2011.
Optomechanics and Optical Manufacturing

Optomechanics: Innovations and Solutions (OP302)

Conference Chair: Alson E. Hatheway, Alson E. Hatheway Inc. (United States)
Program Committee: Anees Ahmad, Raytheon Missile Systems (United States); Joseph Antebi, Simpson Gumpertz & Heger Inc. (United States); Patrick A. Bournes, MicroMeasure, Inc. (United States); James H. Burge, College of Optical Sciences, The Univ. of Arizona (United States); John M. Castravets, Dallas Optical Systems, Inc. (United States); Robert G. Chave, RCAP Inc. (United States); Patrick A. Coronato, Raytheon Missile Systems (United States); John G. Daly, Vector Engineering (United States); Keith B. Doyle, MIT Lincoln Lab. (United States); Robert C. Guyer, BAE Systems (United States); Mark J. Hegge, Ball Aerospace & Technologies Corp. (United States); Tony B. Hull, L-3 Communications Tinsley Labs. Inc. (United States); William J. Lees, The Johns Hopkins Univ. (United States); John J. Polizotti, BAE Systems (United States); Santiago Royo, Univ. Politécnica de Catalunya (Spain); Ann F. Shipley, Univ. of Colorado at Boulder (United States); Deming Shu, Argonne National Lab. (United States); David M. Stubbs, Lockheed Martin Space Systems Co. (United States); Linda Usher, Executive Search Group (United States); Daniel Vukobratovich, Raytheon Missile Systems (United States); Paul R. Yoder, Jr., Consultant (United States); Carl H. Zweben, Consultant (United States)

The International Technical Group on Optomechanical Engineering of Instruments is organizing its biennial conference for designers, engineers, and scientists who conceive, design, analyze, and construct optical instruments and other precision devices. This conference will present leading-edge technology and advances in the state-of-the-related-arts that make products viable and valuable (whether the quantities are one-off or thousands-a-month). Also, mature and tested concepts for existing products will be presented as well as younger concepts that are still in development.

A special session is planned on the professional development of optomechanical engineers; their sources, their resources and their application in the industry.

Professional Development of Optomechanical Engineers: Optomechanical engineers appear to be in short supply
• what do optical physicists want in their optomechanical engineers?
• which disciplines provide the candidates who become optomechanical engineers?
• where do they get their training; university, self-study, mentoring?
• what skill sets are required?
• which tools do they need?

This symposium's primary topics of current interest to government agencies, educational institutions, non-profit organizations, and industry include:

Optical Structures: the design, analysis and tested performance of structures for optical instruments
• stable structures for telescopes, interferometers, spectrometers, coronagraphs and similar instruments including large terrestrial systems and proposed space instruments
• adjustable structures for systems and their instruments: how to maintain the metrology frame beyond the normal limits of stability for the basic structure
• lightweight structures for portable instruments, aircraft systems and spacecraft
• innovative applications of materials, singly or in combination, to achieve stiffness and line-of-sight stability with low mass structures.

Novel Optical Packaging Designs: the art of optomechanics at its best. The mounting of lenses, mirrors, windows, domes, gratings, prisms, detectors, diodes, fibers, filters, retarders, etc. and the geometric arrangement of them into useable package shapes for instruments of all kinds
• microscopes, cameras, telescopes, binoculars, projectors, lasers, spectrometers, interferometers
• off-axis and broad-band/multispectral systems: folding and splitting the optical path to serve multiple sensors
• component mounts, optical benches and enclosures.

Lightweight and Stiff Optical Systems: how to balance the challenging requirements of producing lightweight and dynamically stable optical systems at an affordable cost
• applications of silicon carbide, silicon, aluminum beryllium alloys, composites and other such materials
• material properties characterization such as fracture toughness, micro-yield, CTE, etc. and long-term survivability under dynamic loads
• design, modeling and analyses techniques for optics and support structures
• fabrication and assembly methods for ensuring high yield at an affordable cost.

Environmental Resistance: the design of environmentally robust optical systems
• athermalization: the design of instruments and systems to resist changes in the thermal environment
• shock and vibration resistance: the design of instruments to operate in high acceleration environments and/or to survive (maintain alignment) in highly dynamic launches in order to operate properly in a quieter environment
• gravitational insensitivity: the design of instruments and systems to resist the influences of a changing gravitational vector (changing in both amplitude and direction)
• aero-heating effects mitigation-modeling and simulation of thermal gradients and performance degradation of sensors, design techniques to mitigate the adverse effects of aero-heating, material selection and deployment mechanisms for aero-heating shields
• natural and nuclear radiation resistance: radiation hard optics materials for prompt and total doses, shielding and circumvention techniques, radiation dose simulation, and modeling techniques.

Compact Systems and Components: the design of optical systems to fit into uniquely-shaped and/or compact spaces
• fiber systems: the design and mounting of couplings, dividers, multiplexers
• seeker heads: the design of compact optics for various search, acquisition and tracking applications including Homeland Defense, missile guidance, baggage screening, battlefield surveillance
• applications of lenslets: the design and manufacture of lenslets, their mounting and positioning methods, and their application in components and systems
• design of heads-up displays and head-mounted displays.

Novel Manufacturing, Assembly and Integration Techniques: the optomechanical engineer’s art as applied to the manufacturing, assembly, and integration processes
• troubleshooting and diagnostics for the optomechanical engineer
• repair methods for components, assemblies and systems
• disassembly techniques for “permanently assembled” parts
• rules of thumb for use in integration and testing
• lessons learned in the school of hard knocks.

Design Validation by Testing: Mechanical testing of optical instruments to validate their design requires innovative methods
• simulating zero gravity for large instruments
• optical performance measurement in high g environments
• high and low temperature tests of optical mount designs.

Designed-in Alignment Mechanisms: The challenges of supplying the necessary alignment degrees of freedom for both factory alignment and operational adjustments such as temperature and pressure focus corrections and boresight shifts
• in-service correction of focus shifts from pressure and temperature changes
• automatic or built-in optical boresight adjustment
• minimizing the factory alignment time.

Extreme Delicate Components: Design of ultra-lightweight mirrors, fabrication and mounting of very thin mirrors and lenses, mounting of very soft optical materials
• calcium fluoride lenses, prisms and windows
• large meniscus lenses
• mirrors with large aspect ratios and difficult shapes.

This conference offers designers, engineers, and scientists an opportunity to be rewarded for their professional accomplishments with the recognition of their peers in the community who can best understand and appreciate their art. All are encouraged to participate and benefit from the presentations and discussions that ensue.

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Optical Materials and Structures Technologies V (OP303)

Conference Chair: Joseph L. Robichaud, L-3 Communications SSG-Tinsley (United States)
Cochairs: William A. Goodman, Trex Enterprises Corp. (United States); Matthias R. Krödel, ECM GmbH (Germany)

Program Committee: Scott R. Antonille, NASA Goddard Space Flight Ctr. (United States); Hans-Peter Dumon, Air Force Research Lab. (United States); Ron Eng, NASA Marshall Space Flight Ctr. (United States); Richard A. Haber, Rutgers, The State Univ. of New Jersey (United States); Lawrence E. Matson, Air Force Research Lab. (United States); Robert V. Michel, Brush Wellman Inc. (United States); Tsuyoshi Ozaki, Composites Research and Development Co., Ltd. (Japan); Iwonka Palusinski, The Aerospace Corp. (United States); Thomas B. Parsonage, Brush Wellman Inc. (United States); John W. Pepi, L-3 Communications SSG-Tinsley (United States); Marc Tricard, QED Technologies, Inc. (United States)

The Optical Materials and Structures Technologies Conference is complementary to the Optical Manufacturing and Testing Conference and addresses many of the interests of manufacturers, users, and researchers alike. This conference will provide an up-to-date material properties database for optical substrates and their support structures, a discussion of joining and bonding techniques for optical assemblies and instruments, and will relate the material properties to optical performance for various environments (e.g., cryogenic, space, radiation).

Papers are solicited on materials for reflective and transmissive optics and for reaction and support structures in the following areas:
- silicon optics (reflective and transmissive)
- beryllium and beryllium-alloy optics and structures
- silicon carbide optics and structures
- ceramic matrix composite optics and structures
- low-expansion ceramics and glasses (reflective and transmissive)
- calcium fluoride, zinc sulfide, zinc selenide, and silicon carbide (windows)
- materials for windows, fibers, and domes
- composite and novel optics (e.g., nano-laminate materials, syntactics, powder based, extruded)
- other mirror materials (e.g., aluminum)
- metal matrix composite optics and structures
- carbon fiber based composite structures.

New developments for forming optical substrates and joining optics and reaction or support structures are also solicited. Interests include:
- frits
- adhesives
- epoxies
- braze alloys
- solders
- other novel techniques (e.g., fusion, diffusion bonding).

The material properties for use in designing optical components, subassemblies, and assemblies for operation in space environments (e.g., UV, atomic oxygen), solar environments (e.g., high proton, electron and neutron flux), cryogenic environments (e.g., deep space), and launch environments are also requested. Performance related material properties include:
- coefficient of thermal expansion
- tensile strength
- fracture toughness
- thermal conductivity
- Young’s modulus of elasticity
- Poisson’s ratio
- specific heat
- index of refraction.

Lessons-learned case studies of recent projects are particularly desired.
Optical Manufacturing and Testing IX (OP304)

Conference Chairs: James H. Burge, College of Optical Sciences, The Univ. of Arizona (United States) and The Univ. of Arizona, Steward Observatory (United States); Oliver W. Fähnle, FISBA OPTIK AG (Switzerland); Ray Williamson, Ray Williamson Consulting (United States)

Program Committee: Dave Baiochi, RAND Corp. (United States); Michael Bray, MBO-Metrology (France); Andrew R. Clarkson, L-3 Brashear (United States); Glen C. Cole, L-3 Communications Tinsley Labs. Inc. (United States); David Content, NASA Goddard Space Flight Ctr. (United States); Olaf Dambon, Fraunhofer-Institut für Produktionstechnologie (Germany); Peter J. de Groot, Zygo Corporation (United States); Jessica DeGroote Nelson, Optimax Systems, Inc. (United States); Roland Geyl, Sagem SA (France); John E. Greivenkamp, College of Optical Sciences, The Univ. of Arizona (United States); Stephen D. Jacobs, Univ. of Rochester (United States); Stephen E. Kendrick, Ball Aerospace & Technologies Corp. (United States); Stephen J. Martinek, 4D Technology Corp. (United States); Gary W. Matthews, ITT Corp. (United States); Chunlin Miao, Univ. of Rochester (United States); James T. Mooney, ITT Corp. (United States); Robert E. Parks, Optical Perspectives Group, LLC (United States); Joseph L. Robichaud, L-3 Communications SSG-Tinsley (United States); Joanna Schmit, Veeco Instruments Inc. (United States); Shai N. Shafrir, OptiPro Systems (United States); Peter Z. Takacs, Brookhaven National Lab. (United States); Martin J. Valente, College of Optical Sciences, The Univ. of Arizona (United States); David D. Walker, Zeeko Ltd. (United Kingdom); Xue-jun Zhang, Changchun Institute of Optics, Fine Mechanics and Physics (China)

This conference is dedicated to the technologies for manufacturing and testing optical surfaces and components. Papers should show developments in processes, technologies, or equipment used for optical fabrication or measurement. Contributions that share lessons learned from recent projects are particularly desired.

Papers are specifically requested on:

Current and Future Application Requirements
- telescopes and large optics
- lithography
- space and cryogenic optics
- light-weight and flexible substrates
- steep aspheres and conformal optics
- deformable and active mirrors
- micro-optics
- mass production of optical components and systems
- high-power
- imaging systems
- x-ray and synchrotron optics
- polarization optics
- precision molded optics.

Advances in Manufacturing Materials, Abrasives, Tools, Machines, and Processes
- grinding and polishing
- computer aided processes
- diamond turning
- precision machining
- ion/plasma/water-jet removal
- material deposition
- optical contacting/advanced bond methods
- molding for glass or plastic
- technologies for replicating optical surfaces
- advanced finishing technologies
- material and process development for mirrors, lenses, and gratings.

New Developments in Optical Testing of Figure/Wavefront and Finish
- interferometry, holography, and speckle
- phase-measuring, spatial heterodyne, and static fringe analysis
- absolute calibration: flats, spheres, windows, etc.
- measurement of aspheres
- diffractive null correctors
- geometric-ray tests
- wavefront sensors
- high-spatial resolution
- MTF and encircled energy
- testing in adverse environments: vibration, atmosphere, cryogenic, vacuum, etc.
- figure, ripple, and roughness
- characterization of subsurface damage
- surface profilometry: optical and scanning probe
- scatter and BRDF.

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Optical Modeling and Performance Predictions V (OP305)

Conference Chair: Mark A. Kahan, Optical Research Associates (United States)

Program Committee: George Z. Angeli, California Institute of Technology (United States) and Thirty Meter Telescope (United States); Edward B. Bragg, Consultant (United States); Robert P. Breault, Breault Research Organization, Inc. (United States); Gail J. Brown, Air Force Research Lab. (United States); Robert J. Brown, Ball Aerospace & Technologies Corp. (United States); Thomas G. Brown, Univ. of Rochester Medical Ctr. (United States); William J. Cassarly, Optical Research Associates (United States); H. John Caulfield, Diversified Research Corp. (United States) and Fisk Univ. (United States); Mike Chainyk, Jet Propulsion Lab. (United States); Russell A. Chipman, College of Optical Sciences, The Univ. of Arizona (United States); David Doyle, Apple, Inc. (United States); Keith B. Doyle, MIT Lincoln Lab. (United States); G. Groot Gregory, Optical Research Associates (United States); Tony B. Hull, L-3 Communications Tinsley Labs. Inc. (United States); Robert J. Brown, Ball Aerospace & Technologies Corp. (United States); Gail J. Brown, Air Force Research Lab. (United States); Robert P. Breault, Breault Research Organization, Inc. (United States); Richard C. Juergens, Raytheon Missile Systems (United States); George N. Lawrence, Applied Optics Research (United States); Marie B. Levine, Jet Propulsion Lab. (United States); Steven P. Levitan, Univ. of Pittsburgh (United States); H. Angus Macleod, Thin Film Center, Inc. (United States); Gary W. Matthews, ITT Corp. (United States); Duncan T. Moore, Univ. of Rochester (United States); James D. Moore, Jr., ManTech SRS Technologies (United States); Gary E. Mosier, NASA Goddard Space Flight Ctr. (United States); Steven R. Mullirr, U.S. Army Research Lab. (United States); Sean G. O’Brien, U.S. Army Research Lab. (United States); Jefferson E. Odhner, OPTICS 1, Inc. (United States) and Odhner Holographics (United States); Malcolm Panchaki, CoMet Solutions Inc. (United States); David C. Redding, Jet Propulsion Lab. (United States); Harold B. Schall, The Boeing Co. (United States); David A. Vaughn, NASA Goddard Space Flight Ctr. (United States); James C. Wyant, College of Optical Sciences, The Univ. of Arizona (United States); Richard N. Youngworth, Light Capture, Inc. (United States); Feng Zhao, Jet Propulsion Lab. (United States)

This conference is dedicated to the modeling of imaging and non-imaging optical systems and associated test-equipment and related predictions of performance over a broad range of active and passive optical systems and engineering disciplines. Unclassified papers are solicited from nano-scale systems through to components such as special fiber-optic, gratings, holographic systems, light sources and detectors, and on to large deployable telescopes. Environmental factors can range from HEL through cryogenic, in configurations spanning the laboratory to underwater and outer-space and with wavelengths ranging from x-rays to THz to micro and mm waves.

Papers are specifically requested on current and evolving analytical techniques that address:

**Optical Models, Methods, and Performance Estimates**
- geometrical and physical optics
- diffractive optics and holographic systems
- beam propagation
- meta-materials (including negative index, photonic crystals, cloaking)
- polarization
- adaptive optics
- radiometry
- narcissus
- fiber-optics and photonics
- interferometers and nullers
- image doubling
- illumination (including lasers, LEDs, OLEDs, solar)
- stray light/ghosts
- quantum dots
- optimization
- phase/prescription retrieval
- tolerancing and probabilistic design.

**Electro-optical Models Including Relating Factors**
- detector quantum efficiency
- charge diffusion
- EMI/EMC influences on E-O performance.

**Optical Coating Performance**
- filters
- laser damage resistance.

**MEMS and MOEMS**
- electrostatics; Casimir forces
- structures.

**Structural and Opto-mechanical Modeling**
- ultra-lightweight optics, nano-laminates, membrane mirrors
- mounting stresses, G-Release, and/or launch and deployment
- high impact/shock& pressure loadings
- influence functions
- vibration and damping
- micro-dynamics and influences of piece-part inertia; friction/stiction
- mechanical influences such as scanning deformations and special zoom/servo effects
- thermo-elastic effects
- stress birefringence
- fracture mechanics
- proof testing models
- aspects such as lay-up anisotropy and material inhomogeneity
- nodal accuracy; meshing.
Thermal and Thermo-optical Modeling
- effects of energy absorption with depth in transmissive elements
- thermal run-away in IR elements
- aircraft/UAV/Instrument windows, missiles, and domes
- solar loading
- thermo-optical material characterizations over new wavelengths and/or temperatures
- system sterilization
- hole drilling, welding, and laser heat treating
- HEL effects including survivability and hardening
- recursive models where thermo-elastic changes in-turn impact heating
- effects of joint resistance on conduction changes
- meshing.

Integrated Models
- closely coupled thermal-structural-optical models
- optical control systems
- global optimizers
- acquisition, pointing, and tracking
- end-to-end simulations.

Space-borne (and/or Microlithographic) Factors
- contamination control
- particulate/NVR models
- photopolymerization
- radiative damage, atomic O2
- spacecraft charging
- micro-meteoroid modeling, including spalling.

Aero-optics
- boundary layer and shock wave effects
- convective effects and air-path conditioning/self-induced turbulence.

Modeling of Vision Systems
- HUDs
- HMDs.

Application-specific Unique Optical Models and Performance Predictions
- adaptive optics
- bio and medical optics/sensing
- lasers/laser communication systems
- LEDs/solid state lighting
- MEMs/nano technology
- existing/evolving photonic devices and systems
- photonic devices
- solar technology.

Other
- phenomenology
- reliability
- rules of thumb and scale factors of use to individual disciplines
- cost models of optical systems.

Of special interest are new methods of analysis, and contributions to a body of work that will help provide various model “anchors” and parametric relationships that correlate results with predictions.
Optical Design

Current Developments in Lens Design and Optical Engineering XII; and Advances in Thin Film Coatings VII (OP306)

Conference Chairs: R. Barry Johnson, Alabama A&M Univ. (United States) and Consultant (United States); Virendra N. Mahajan, The Aerospace Corp. (United States); Simon Thibault, ImmerVision (Canada) and Univ. Laval (Canada)

Program Committee: Julie Bentley, Univ. of Rochester (United States); Florian Bociort, Technische Univ. Delft (Netherlands); Pierre H. Chavel, Lab. Charles Fabry (France); Chung-Tse Chu, The Aerospace Corp. (United States); Apostolos Deslis, JENOPIK Optical Systems, Inc. (United States); José A. Díaz-Navas, Univ. de Granada (Spain); Alexander V. Goncharov, National Univ. of Orelan, Galway (Ireland); James E. Harvey, CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); Lakshminarayan Hazra, The Optical Society of India (India) and Univ. of Calcutta (India); Irina L. Livshits, Saint-Petersburg State Univ. of Information Technologies, Mechanics and Optics (Russian Federation); Michael Mandina, Optimax Systems, Inc. (United States); Pantazis Mouroulis, Jet Propulsion Lab. (United States); Ching-Cheng Sun, National Central Univ. (Taiwan); Yuzuru Takashima, Stanford Univ. (United States); Jennifer A. Turner-Valle, Ball Aerospace & Technologies Corp. (United States); Sergio Vázquez-Montiel, Instituto Nacional de Astrofísica, Óptica y Electrónica (Mexico); Yongtian Wang, Beijing Institute of Technology (China); Andrew P. Wood, Qioptiq Ltd. (United Kingdom); Maria J. Yzuel, Univ. Autónoma de Barcelona (Spain)

Optical design is a fascinating activity, ranging as it does from lens design and modeling with the help of the immensely powerful design software currently available, to the semi-intuitive art of creating the conceptual design which underlies any successful optical system. The ‘art’ depends on a wide-ranging knowledge of many of the sub-disciplines that make up optical engineering, which in turn encompasses the interaction between optics and all the activities that turn an optical design into an operational instrument.

Beyond ray tracing, the optical designer may employ the tools of radiative transfer, electromagnetic theory for detailed diffraction or polarization modeling, principles of scattering for stray light analysis and control, and other appropriate modeling tools and techniques for deriving suitable performance metrics arising from such fields as spectroscopy, astronomy, vision, or microscopy. And beyond optical design, the optical engineer is concerned with the fabrication of components, assembly and alignment techniques, metrology and calibration, as well as the interaction with other engineering disciplines such as mechanical, thermal, electronic, and software.

Current Developments serves the multi-faceted discipline that is lens design and optical engineering, and the multi-talented individuals that dedicate themselves to this field. This perennial conference, held since 1984 under a number of slightly varied titles, will continue to spotlight the hot topics in lens design and optical engineering while still covering the breadth of this field. The lens designer and the optical engineer, often the same person, will find this conference a home to stay abreast of the frontiers of this constantly evolving field.

Contributions dealing with recent developments in lens design techniques, instruments, components, processes, materials, systems, design, or topics in an optical engineering subject area at any wavelength belong here. Several new design and engineering topics have been introduced this year. They include solid state lighting, optics in harsh and hostile environment, and a joint session on hyperspectral sensors with the conference on Imaging Spectrometry in the Remote Sensing program track. Moreover, a session on advances in thin film coatings is also included. The range of applications for which optical thin films are employed continues to expand at a remarkable pace with significant developments in areas such as display technology, optical communications, femtosecond lasers, laser damage threshold, photovoltaic cell and HEAR coatings. Papers describing advances in any aspect of thin-film optical coatings are welcome.

The following is a non-exclusive listing of areas to be considered:

Theory and Applications
- lens design methodology and innovative lens designs
- aberration theory and image analysis
- advances in techniques for system design, modeling, and global optimization
- optics in consumer, medical, industrial, or space applications
- optics in art, artwork conservation, forensics, archaeology
- optics for spectroscopy and threat detection
- advances in microscopy, lithographic optics, cameras, visual systems, telescopes
- optical data storage
- bio-inspired design.

Call for Papers

Integration of Optical Designs into Complete Instruments
• interaction of optics with mechanics and electronics
• integrated modeling
• fabrication, tolerancing, alignment, stray light considerations
• incorporation of system metrics into optical design
• vision and physiological optics considerations.

Developments in Optical Components, Techniques, and Materials
• diffractive optics, micro-optics, gradient index optics, special optical surfaces
• optical fabrication techniques, novel materials and processes
• optical designs enabled by new techniques and materials
• innovative testing methodologies and instrumentation.

Optical Design for Solid state Lighting
• light extraction from LED dice
• optics for directivity enhancement
• light source modeling
• optics for phosphor or color mixing
• optics for light guides or diffusers
• optical design in lighting and display applications.

Optics in Harsh and Hostile Environments
• vacuum, cryogenic, and space systems
• high-radiation environment
• acid and toxic environment
• high temperature gradient
• extreme temperature variation
• underwater systems.

Thin-Film Optical Coatings
• design of multilayer films and coatings
• novel optical coating and thin-film materials
• substrate preparation, deposition and post-processing manufacturing methods
• characterization, monitoring, and measurement
• innovative applications of optical coatings and thin-films
• use and performance of coatings and filters in instruments.

Announcing a joint session on “Optical design and engineering of spectroscopic and hyperspectral sensors” with the conference on Imaging Spectrometry in the Remote Sensing program track. New enabling component technologies for these sensors such as lens design methodology, progress in dispersive elements, coatings, etc., along with specific optical engineering aspects such as optomechanical assembly and tolerancing, stray light concerns, and optical performance verification have a significant impact on the development and performance of spectroscopic and hyperspectral systems. This session will highlight optical engineering progress in these areas and how they relate to improvements in spectrometer and spectrometric sensor performance.

Critical Dates
Abstract Due Date: 7 February 2011
Manuscript Due Date: 27 July 2011

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, whether it is an oral or poster presentation, and submit a full-length manuscript by the deadline. The contact author will be notified of abstract acceptance by email no later than 18 April 2011.
Industry trends and advances in optical design software are allowing the modeling of optical systems in a way hardly thought of a few years ago. As a consequence the optical design community is seeing a great number of innovative, intriguing, and enticing optical designs, concepts, systems, and applications. Especially intriguing is the concept of optical design that includes the use of software post-processing for aberration correction, multi-segmented systems, and IR optics.

Optical design’s thought-provoking innovation is being seen in fields such as consumer products, astronomy, entertainment, health sciences, machine vision, and optical storage and processing. Micro- and nano-optics, as well as projection systems, head-mounted displays, diffractive optics, optics for virtual reality and astronomy, spectrometers, and 3D imaging are examples of systems that are receiving a large amount of attention.

Novel Optical Systems Design and Optimization brings to the optical design community a forum to discuss, learn, and network for key optical design trends. The conference is crafted to convey to the community a snapshot of the state-of-the-art technology. It focuses on the most novel systems, ideas, and techniques for designing optical systems in the 21st century. Finally, while novel technology is the focus of this conference, we cannot neglect the historical precedents in optical design. Thus, we are continuing to actively solicit submissions in the area of the history of optical design and systems, especially this year in the area of tricks of the trade in optical design.

Focus areas for paper submissions:
- optical design with software post-processing of the images
- optical technology inspired by biological systems
- optical systems for energy efficiency
- tricks of the trade in optical design.

Paper submissions are solicited in these additional following and related areas:
- liquid optics
- optical design and systems for biomedical applications
- miniature optical systems
- optical displays and 3D imaging
- head-mounted displays
- optical design and analysis software
- novel design and optimization methods
- optics education and outreach
- illumination optics
- special optical effects
- gradient index materials and systems
- novel optical elements and systems
- micro and nano-optics applications
- exotic and unconventional optics
- light propagation in optical systems
- lens systems for CCDs.

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Laser Beam Shaping XII (OP308)

Conference Chairs: Andrew Forbes, CSIR National Laser Ctr. (South Africa) and Univ. of KwaZulu-Natal (South Africa); Todd E. Lizotte, Hitachi Via Mechanics (USA), Inc. (United States)

Program Committee: Daniel M. Brown, Optosensors Technology, Inc. (United States); Thomas Caughey, Photonic Products Group, Inc. (United States); Fred M. Dickey, FMD Consulting LLC (United States); Michael R. Duparré, Friedrich-Schiller-Univ. Jena (Germany); Julio C. Gutiérrez-Vega, Instituto Tecnológico y de Estudios Superiores de Monterrey (Mexico); John A. Hoffnagle, IBM Almaden Research Ctr. (United States); Kurt J. Kanzler, JENOPTIK Optical Systems, Inc. (United States); Alexis V. Kudryashov, Moscow State Open Univ. (Russian Federation); William P. Latham, Air Force Research Lab. (United States); Carlos López-Mariscal, National Institute for Standards and Technology (United States) and Univ. of California, Santa Cruz (United States); Günter Luepke, The College of William & Mary (United States); Olivier Magnin, C2 Diagnostics (France); Paul F. Michalowski, Coming Tropel Corp. (United States); John Rauso, Nalux Nano-Optical, Inc. (United States); José Sasián, College of Optical Sciences, The Univ. of Arizona (United States); David L. Shealy, The Univ. of Alabama at Birmingham (United States); Kenneth J. Weible, SUSS MicroOptics SA (Switzerland); Uwe D. Zeitner, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); Shuyan Zhang, The College of William & Mary (United States)

Many scientific experiments and industrial and medical applications require the shaping of the spatial and temporal profiles of laser beams. The previous eleven Laser Beam Shaping conferences at SPIE have been excellent venues to integrate the various facets of beam shaping theory, design, and application. Interest in laser beam shaping techniques and applications continues to grow.

The purpose of this conference is to continue to provide a forum for the interaction of engineers and scientists interested in the various aspects of laser beam shaping. Papers on all forms of laser beam shaping theory, design, and application are solicited. Papers presenting data on proven systems are especially encouraged. In addition, the conference will consider papers involving the shaping of the radiation patterns of non-laser sources.

Topics include but are not limited to:

Theory
geometric and physical optics, vector diffraction theory, fundamental limits, mathematical and computational techniques, spatial and temporal beam profile shaping of short pulse lasers, polarization smoothing, smoothing by spectral dispersion, vortex beams, beam propagation.

Design
geometrical optics design, physical optics design, polarization, geometrical beam shapes, hybrid approaches, optimization-based design including genetic algorithms, intracavity approaches, diffractive, lens arrays, refractive, and Fresnel beam shaping diffusers and beam shaping transformers, broad band beam shaping, design software and codes, beam splitting and beam combining, pulse compression and pulse chirping.

Fabrication and Testing
refractive, diffractive, reflective, and GRIN systems, hybrid diffractive/refractive elements, digital holography, and Spatial Light Modulators (SLMs), E-Beam writing, Diamond Turning, Grayscale Lithography, Thin Film Optics, RIE and Chemical Etching Technologies.

Wave Optics
novel laser beams, vortex beams, non-diffracting fields, structured light, propagation through linear and non-linear systems, propagation through turbulence, orbital angular momentum of light.

Performance Measurement and Figures of Merit (FOM)
spatial and temporal profile measurement, FOM of beam profiles of laser beams, fabrication quality and alignment error.

Micro-optics, Micro-fabrication, and Micro Manipulation
beam shaping for MOEMS, MEMS, and optical tweezing and trapping.

Industrial and Commercial Applications
material processing, laser communications, optical tagging, laser displays, illumination applications, surface modification, structured light applications, microscopy, theatrical laser light shows and special effects, optical data storage.

Military Applications
laser ranging, laser targeting, laser weapons and laser counter measurements (dazzling).

Fiber Injection Applications
fiber injection systems and beam shaping optics, high peak and average power applications, fiber injection criteria, fiber damage mechanisms at high power levels, communications and sensors applications, single and multimode applications.

Medical and Biomedical Applications
dermatology, cosmetic surgery, ophthalmology, laser vision correction, surgery, fiber optic delivery methods, therapeutic systems, photodynamic therapy, dentistry, UV sterilization, water treatment, hospital UV germicidal air and surface disinfection, industrial and biomedical sterilization - lamp and laser beam shaping technology.

Lithographic Applications
condensers for UV, deep-UV, and extreme-UV lithographic steppers, holographic projection processing applications, beam-shaping methods of image enhancement, interference lithography.

Real-Time or Adaptive Beam Shaping
adaptive optics, spatial light modulators, acousto-optical modulators, computer generated holograms, liquid lens technology.

Laser Resonators
diode pumping of lasers, intracavity laser beam shaping, laser modes.

Short Pulse Technology
femtosecond laser pulse shaping and pulse compression techniques.

Environmental “Green” or Geospatial Technology
LIDAR beam shaping, surveying.

X-ray Beam Technology
displacement, aperture, collimation, focusing, or imaging.
Optical Design

Nonimaging Optics: Efficient Design for Illumination and Solar Concentration VIII (OP221)

*Conference Chairs:* Roland Winston, Univ. of California, Merced (United States); Jeffrey M. Gordon, Ben-Gurion Univ. of the Negev (Israel)

*Program Committee:* Pablo Benitez, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (Spain); William J. Cassarly, Optical Research Associates (United States); Daniel Feuermann, Ben-Gurion Univ. of the Negev (Israel); Philip L. Gleckman, eSolar Inc. (United States); Ralf Leutz, Concentrator Optics GmbH (Germany); Juan C. Miñano, Univ. Politécnica de Madrid (Spain) and Light Prescriptions Innovators LLC (Spain); Narkis E. Shatz, SAIC (United States)

Many important optical subsystems are concerned with power transfer and brightness rather than with image fidelity. Nonimaging Optics is a design approach that departs from the methods of traditional optical design to develop techniques for maximizing the collecting power of concentrator and illuminator systems.

Nonimaging devices substantially outperform conventional imaging lenses and mirrors in these applications, approaching the theoretical (thermodynamic) limit. Nonimaging design methods usually involve solving ordinary or partial differential equations, calculating the flow lines of the ray bundles, coupling the edge rays of extended sources and targets or optimizing a multi-parameter merit function computed by ray-tracing techniques. While geometrically based, the design fundamentals have been extended to the diffraction limited and even sub-wavelength domain. Therefore applicability exists in near-field optical microscopy and nanometer scale optics.

This symposium will address the theory of Nonimaging Optics and its application to the design and experimental realization of illumination and concentration systems, tailored freeform optics, display backlighting, condenser optics, high-flux solar and infrared concentration, daylighting, LED optical systems, laser pumping and luminaires.

The revival of considerable work in solar energy concentration for both photovoltaic and thermal applications, much of which includes nonimaging optics, prompts reincorporating these fields into this symposium.

The use of Nonimaging Optics promises higher efficiency, relaxed physical tolerances, improved optical uniformity, and reduced manufacturing costs. We encourage submissions ranging from fundamentals to critical design issues and practical applications.

Paper submissions are also solicited in the following and related areas:
- radiative transfer near the étendue limit
- concentrator optics
- illumination and irradiation optics
- solar photovoltaic and solar thermal concentration
- fiber-optic and light-pipe optical systems
- radiometry
- daylighting
- characterization of light-transfer devices
- freeform optics
- optical furnaces and radiative heating
- infrared detection
- LED applications
- laser pumping
- condenser optics.

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Time and Frequency Metrology III (OP309)

Conference Chairs: Tetsuya Ido, National Institute of Information and Communications Technology (Japan); Thomas R. Schibli, JILA (United States) and Univ. of Colorado at Boulder (United States)
Program Committee: John G. Hartnett, The Univ. of Western Australia (Australia); Hajime Inaba, National Institute of Advanced Industrial Science and Technology (Japan); R. Jason Jones, College of Optical Sciences, The Univ. of Arizona (United States); Ekkehard Peik, Physikalisch-Technische Bundesanstalt (Germany); John D. Prestage, Jet Propulsion Lab. (United States); Jun Ye, JILA (United States)

Advances in time and frequency metrology rely upon a broad and ever growing set of sophisticated tools and innovative ideas. The measurement of stable frequencies from the microwave to the ultraviolet, and the control and characterization of temporal intervals from hours to attoseconds with unprecedented accuracies pushes the limits of current technology and will have a strong impact on a range of scientific and industrial disciplines. Optical frequency combs nowadays enable the transfer of almost any time or frequency standard to any spectral or temporal region without compromising stability or accuracy. The performance, reliability, and spectral range of such frequency combs continue to improve as novel sources are developed. The stability and accuracy of optical clocks (both ionic and atomic) have surpassed their microwave counterparts. This places even more stringent requirements on the optical comb clockwork and much improved techniques for remote comparison between distant sites. Space-based and commercial applications place increasing demands on stability, size, robustness, and ease of use of optical standards and technology. This conference on Time and Frequency Metrology will provide a forum to join researchers from these broad fields to interact, disseminate, and share their latest results. Sessions will consist of both invited and contributed papers. Topics include:

- optical and microwave frequency standards (atomic, ionic, molecular, etc.)
- frequency standards in exotic spectral bands (THz, VUV, X-ray, etc)
- time and frequency transfer and dissemination
- compact/portable frequency standards
- optical frequency combs (novel devices and applications)
- ultrastable optical and microwave oscillators
- photonic microwave oscillators
- low noise/timing jitter sources
- noise characterization and mitigation techniques
- quantum limited/enabled measurements
- measurements below the standard quantum limit
- novel standards for telecommunication systems
- novel THz generation and detection techniques
- precision laser spectroscopy and metrology
- attosecond timing and generation technology
- astronomical and space-based applications of frequency standards
- tests of fundamental physics
- supercontinuum and broad-band pulse generation.

Critical Dates
Abstract Due Date: 7 February 2011
Manuscript Due Date: 27 July 2011

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, whether it is an oral or poster presentation, and submit a full-length manuscript by the deadline. The contact author will be notified of abstract acceptance by email no later than 18 April 2011.
Advanced Metrology

Dimensional Optical Metrology and Inspection for Practical Applications (OP310)

Conference Chairs: Kevin Harding, GE Global Research (United States); Peisen S. Huang, Stony Brook Univ. (United States); Toru Yoshizawa, Saitama Medical Univ. (Japan)

Program Committee: Yasuhiko Arai, Kansai Univ. (Japan); Anand K. Asundi, Nanyang Technological Univ. (Singapore); Mehdi Daneshpanah, GE Global Research (United States); Qingying Hu, Akrometrix LLC (United States); Katsuchi Kitagawa, Toray Precision Co., Ltd. (Japan); Peter Kühmstedt, Fraunhofer-Institut für Angewandte Optik und Feinmechanik (Germany); Yukitoshi Otani, Utsunomiya Univ. (Japan); Osami Sasaki, Niigata Univ. (Japan); Guiju Song, GE Global Research (China); Xianyu Su, Sichuan Univ. (China); Joseph D. Tobiason, Micro Encoder Inc. (United States); Rainer Tutsch, Technische Univ. Braunschweig (Germany); Jiangtao Xi, Univ. of Wollongong (Australia); Song Zhang, Iowa State Univ. (United States)

This conference will focus on methods, analysis, and applications of optical metrology and inspection as applied to various industries, with particular emphasis on practical applications for non-optical parts. The field of optical metrology and inspection has grown to wide acceptance for many applications in industry. The advances in machine vision have provided compact, smart camera systems, new cameras and lighting systems, and better ways of communicating with the outside world. Two- and three-dimensional methods have seen wide use in the electronics industry, but have also made advances in traditional areas such as automotive and aerospace manufacturing. These methods are being used for defect inspection, precision measurements, and the detection of flaws. Modern computing power has made analysis methods such as phase shifting a viable tool for fast on-line inspection for process control and metrology applications.

This conference is intended to address the latest advances and future developments in the areas of optical inspection and metrology as they are applied to practical applications. Imaging and image processing techniques are also welcome to this conference.

- machine/robot vision methods, architectures and applications
- lighting methods and systems for inspection
- surface inspection methods and applications
- special optical systems for inspection and measurements
- 2D and 3D machine vision methods and applications
- structured light methods and applications
- image range measurement methods
- micro- and nano-scale measurement methods
- interferometric techniques applied to non-optical parts
- phase shifting methods applied to industrial inspection of non-optical parts
- optical methods for surface metrology

- mechano-optics and photonics for metrology and inspection
- system calibration and error analysis
- dimensional standards and artifacts
- 3D data manipulation
- on-line and process control measurements
- reverse engineering applications
- on-machine tool measurements of shape and finish
- high-resolution and high-speed inspection applications.

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Call for Papers

Instrumentation, Metrology, and Standards for Nanomanufacturing, Optics, and Semiconductors V (OP114)

Conference Chair: Michael T. Postek, National Institute of Standards and Technology (United States)
Co-chairs: Victoria A. Coleman, National Measurement Institute of Australia (Australia); Zu-Han Gu, Surface Optics Corp. (United States)

Program Committee: John A. Allgair, GLOBAL FOUNDRIES, Inc. (Germany); Russell A. Chipman, College of Optical Sciences, The Univ. of Arizona (United States); Khershed P. Cooper, U.S. Naval Research Lab. (United States); Thomas A. Germer, National Institute of Standards and Technology (United States); Daniel J. C. Herr, Semiconductor Research Corp. (United States); Mark D. Hoover, The National Institute for Occupational Safety and Health (United States); Alexei A. Maradudin, Univ. of California, Irvine (United States); Ndubuisi G. Orji, National Institute of Standards and Technology (United States); Nora Savage, U.S. Environmental Protection Agency (United States); John Small, National Institute of Standards and Technology (United States); Shouhong Tang, KLA-Tencor Corp. (United States); John F. Valley, Raytex USA Corp. (United States); Xianfan Xu, Purdue Univ. (United States)

Meeting the challenges arising from the tremendous developments in the rapidly increasing field of nanotechnology and the essential bridge from concept to real world products posed by nanomanufacturing, advanced instrumentation metrology and standards have become extremely important to the success of that endeavor. Novel achievements in optics, semiconductors, and nanotechnologies altogether significantly enhance the demands for highly sensitive and efficient metrology tools. The requirements have also increased for rapid and thorough coverage of large functional areas. This includes the fast and area-covering measurement of properties such as nanoroughness, flatness and figure, thin film structure, and nano-particle contamination. Furthermore, for the development of nanostructured surfaces with specific functionalities (e.g. self-cleaning, tribological effects), a tight link between measurement and modeling tool becomes essential.

Nanoscience conceives the ideas which grow into products and nanomanufacturing is the essential bridge between discovery and real world nanotech products. Nanomanufacturing is the vehicle by which the Nation and the World will realize the promise of major technological innovation across a spectrum of products that will affect virtually every industrial sector. For nanotech products to achieve the broad impacts envisioned, they must be manufactured in market-appropriate quantities in a reliable, repeatable, and commercially viable manner. In addition, they must be manufactured so that environmental and human health concerns are met, worker safety issues are appropriately assessed and handled, and liability issues are addressed. Critical to this realization of robust nanomanufacturing is the development of the necessary instrumentation, metrology, and standards.

The multidisciplinary character of the conference will provide a forum to present and discuss newest developments of metrology techniques as well as industrial needs for new measurement equipment. The measurement principles include e.g. scanning-probe microscopy, optical profilometry, light scattering, SEM-based metrology, ellipsometry, reflectometry, scanning microscopy, and interferometry.Integration of these instruments, Interoperability, and Information Management are also critical elements that must be considered for viable nanomanufacturing. Advanced instrumentation, metrology and standards will allow the physical dimensions, properties, functionality, and purity of the materials, processes, tools, systems, products, and emissions that will constitute nanomanufacturing to be measured and characterized. This will in turn enable production to be scalable, controllable, predictable, and repeatable to meet market needs. If a nano-product cannot be measured, it cannot be manufactured; additionally if that product cannot be made safely it also should not be manufactured.

The Advanced Instrumentation, Metrology, and Standards for Nanomanufacturing, Optics, and Semiconductors Conference will become the leading forum for the exchange of foundational information and discussion of instrumentation, metrology and standards which are needed components of nanomanufacturing. This conference welcomes original technical papers on these and other relevant topics. Criteria for abstract peer review and rating will include contribution to scientific understanding, relevance and interest to the nanomanufacturing community, and lack of advertisements. Submitted papers must concentrate on the underlying technologies and methods, not on product marketing. Consistent with the SPIE conference charter and goals, please, submit the technical papers in the technology areas listed below:

- nanomanufacturing methodologies
- metrology and inspection methodologies
- high resolution optics, including full-field, near-field and scanned microscopy, scatterometry, and interferometric techniques
- particle beam (electron, ion), including scanned microscopy and elemental analysis
- atomic force microscopy
- limits of metrology and inspection systems
- regional alliances/clusters for nanomanufacturing
- dimensional metrology for nanomanufacturing
- new metrology requirements for nanomanufacturing
- new instrumentation needed for nanomanufacturing
- characterization metrologies and novel measurement techniques

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Advanced Metrology

Instrumentation, Metrology, and Standards for Nanomanufacturing, Optics, and Semiconductors V (OP114) continued

- process control, characterization, and yield enhancement
- process optimization, monitoring, and quality assurance and reliability
- integration, interoperability, and information management
- calibration for metrology tools linewidth, pitch standards, and reference materials
- estimation of total measurement error, including precision and accuracy
- tool matching
- reference measurement systems, traceability and metrology comparisons
- instrument resolution
- environmental, health and safety monitoring and metrology
- environmental contamination and its measurement
- focused ion beam for nanomanufacturing and metrology
- 3-D metrology
- measurement system modeling and simulation
- physics of the metrology processes, system-sample interaction
- modeling of systems and samples: characterization and model parameters
- predictive modeling: combining experimental and simulated data
- data analysis methods, library-based image analysis, and algorithms
- sampling strategies
- systems integration
- application of statistical data analysis methods in manufacturing
- process integration of image recording and transfer, etch, and deposition
- metrology and related functional testing through self-test in systems-on-a-chip
- characterization of nanostructured functional (e.g. superhydrophobic or hydrophilic) surfaces
- nanotopography and nanoroughness measurement and analysis
- thin film characterization
- CD metrology for semiconductor components
- calibration and standardization in optical metrology
- requirements and roadmaps for advanced characterization tools

SPECIAL “GREEN” MATERIALS AND METROLOGY SESSION

Dr. Nora Savage, Environmental Protection Agency (United States)

The optics and photonics industries are poised to be instrumental factors in the realization of environmental sustainability. Starting with the employment of benign materials in the research and production of novel devices enabled by the science to the development of innovative reclaim and recycling options for materials and devices that have reached the end of the product life cycle, optics and photonics have the potential to impact the way we devise, employ and dispose of/ recycle products. As a result of the size and inter-disciplinary nature of these industries, efforts and activities by the members thereof toward protection of public health and the ecosystem can usher in an environmental consciousness within our society. In addition, the application of technological advances in these areas can transform conventional components and devices. The resultant novel products would have a more environmentally friendly design.

This session will provide information concerning novel photonic and optical devices and components that are processed using benign materials. The processes and devices showcased will inform the audience about potential methodologies and tools for developing such products. This session will also feature presentations concerning the advances in the field which result in the replacement of more toxic constituents and products with other “greener”, constituents and products. Such products would include those that use less energy, require less water, and utilize fewer starting materials. Such devices and products would have increased durability and efficiency. Anticipated benefits to public health and the environment will be described.
Optical System Alignment, Tolerancing, and Verification V (OP311)

Conference Chairs: José Sasián, College of Optical Sciences, The Univ. of Arizona (United States); Richard N. Youngworth, Light Capture, Inc. (United States)

Program Committee: Scott Burkhart, Lawrence Livermore National Lab. (United States); Matthew B. Dubin, College of Optical Sciences, The Univ. of Arizona (United States); Sen Han, Suzhou H&L Instruments, LLC (China); Jürgen Jahns, FernUniv. in Hagen (Germany); Chao-Wen Liang, National Central Univ. (Taiwan); Robert M. Malone, National Security Technologies, LLC (United States); Maria D. Nowak, NASA Goddard Space Flight Ctr. (United States); Raymond G. Ohl IV, NASA Goddard Space Flight Ctr. (United States); Craig Olson, L-3 Communications Sonoma EO (United States); Robert E. Parks, Optical Perspectives Group, LLC (United States); Mitchell C. Ruda, Ruda-Cardinal, Inc. (United States); Daniel G. Smith, Nikon Research Corp. of America (United States); Yana Z. Williams, GE Global Research (United States)

The topics of tolerancing, alignment, and verification are crucial in the development of successful optical systems. This conference will continue to emphasize that the assembly of actual optical systems requires alignment of different system components. The precision level of the alignment depends on the assigned tolerance error budget, and so alignment and tolerances are interrelated. Verification involves validating optical system performance, including assurance that performance remains operator-independent during system use. This conference seeks to further the state-of-the-art in alignment and tolerancing, including verification of subsystems and at the system level, by providing a forum where these essential topics can be discussed. The conference also seeks to provide the audience with past and current insights in these topics. This fifth conference continues to build on the successful conferences held at SPIE Optics and Photonics from 2007-2010.

Papers are solicited in the following areas:
- theories of alignment and tolerancing
- approaches to tolerancing and error budgets
- tolerance desensitization and nominal design
- modeling and simulation for alignment, tolerancing, and verification
- alignment techniques, equipment, and tools
- optical alignment examples
- alignment in traditional lens systems
- alignment of micro optics
- alignment of coherent and high power optical systems
- optical alignment of nanostructures
- case studies and alignment pitfalls
- alignment and tolerancing of aspheres
- loosening tolerances using active elements
- alignment in electro-optical systems
- alignment in metrology applications
- alignment of fiber optic systems
- active optical system alignment and tolerancing
- system verification approaches
- examples and applications of system verification
- tools and techniques for verification.

Critical Dates

Abstract Due Date: 7 February 2011
Manuscript Due Date: 27 July 2011

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, whether it is an oral or poster presentation, and submit a full-length manuscript by the deadline. The contact author will be notified by email no later than 18 April 2011.
Optical Technologies for Arming, Safing, Fuzing, and Firing VII (OP312)

Conference Chairs: Fred M. Dickey, FMD Consulting LLC (United States); Richard A. Beyer, U.S. Army Research Lab. (United States)

Program Committee: Adrian A. Akinci, Los Alamos National Lab. (United States); Thomas J. Biachowski, Naval Surface Warfare Ctr. Indian Head Div. (United States); Michael D. Bowden, AWE plc (United Kingdom); Gary C. Catella, Gooch & Housego, Cleveland (United States); David L. Damm, Sandia National Labs. (United States); David W. Ewick, Ensign-Bickford Aerospace & Defense Co. (United States); Andrew Forbes, CSIR National Laser Ctr. (South Africa) and Univ. of KwaZulu-Natal (South Africa); Scott J. Hamlin, MegaWatt Lasers, Inc. (United States); Christopher R. Hardy, Kigre, Inc. (United States); Stephen R. Lerner, Laser Diode Inc. (United States); Todd E. Lizotte, Hitachi Via Mechanics (USA), Inc. (United States); Mikhail Maiorov, AKELA Laser Corp. (United States); Robert V. McDaniel, Elbit Systems of America (United States); Gregg L. Morelli, Honeywell Federal Manufacturing & Technologies, LLC (United States); Barry T. Neyer, PerkinElmer, Inc. (United States); Adam Parker, QinetiQ Ltd. (United Kingdom); Alex Rosiewicz, EM4, Inc. (United States); Raymond J. Silva, BAE Systems (United States); Kelly Simmons-Potter, The Univ. of Arizona (United States); Gabriel L. Smith, U.S. Army Research, Development and Engineering Command (United States)

Optical technologies are playing an increasingly important role in systems designed to operate in harsh environments and under extreme operating conditions where safety and reliability are crucial. Optical fibers provide a fast, safe means of transferring data or energy throughout a system. One of the major advantages of optical devices is that they can be made relatively insensitive to induced spurious signals, thus making them ideal for high electric field or radiation environments. Due to its advantages over traditional electrical architectures, optics is finding an ever-increasing role in future weapon system designs. The ability of optical architectures to reliably operate in harsh environments also makes them ideal for many industrial and medical uses. Optical triggering can remove interference from electrical noise in the system and can even supply the stimulus to initiate a detonation event. In addition, optics is used to provide power, sensing and signaling in explosive environments, such as fuel mixtures. Also, operation under extreme conditions opens a new domain in reliability research related to performance prediction for systems designed for shorter lifetime. The purpose of this conference is to provide a forum for the interaction of members from scientific, military, and industrial institutions that employ optical technologies in weapons-related areas and in industrial and scientific applications. Papers presenting current research and development activities as well as complete systems and subsystems are encouraged.

Conference topics include, but are not limited to:
- weapon subsystems: optical technology related to the arming, safing, fuzing, or firing of the system
- optical power transfer: photovoltaic arrays, optical to electrical conversion, DC-to-DC conversion
- optical signal transfer: state sensing, control, optical MEMS
- optical initiation and characterization of explosives and propellants
- industrial and scientific applications: such as mining, controlled demolition, rocket motor ignition
- optoelectronics: photocells, laser diodes, optical triggers
- factors limiting maximum output power of diode, solid state, and fiber lasers
- extreme power levels achieved under drive conditions significantly exceeding normal operational levels
- radiation hardness of optical components: transient and steady-state response, optics, fibers, VCSEL, laser diode
- optical technologies for disarming, defeating, or destroying devices including explosives and IEDs
- laser machining and drilling of novel safe-and-arm components.

Keynote Speaker for 2011 conference: Barbara J. Machak, SES, Executive Director, Enterprise and Systems Integration Center, ARDEC, Picatinny Arsenal, NJ, will be speaking on “Laser Ignition in the Army: Advances and Why Our Customers Like It.”
This conference will examine recent progress in UV, x-ray, and gamma-ray instrumentation for astrophysics and solar system missions. We seek to highlight recent missions, new concepts, and techniques for detection in spectroscopy and imaging, and their application to specific experiments both current and future. Examples of space science missions exploring the UV, x-ray, and gamma-ray bands include ASTRO-E2, CHANDRA, GLAST, XMM-Newton, RXTE, INTEGRAL, NuSTAR, ConX, HST, GALEX, ROSETTA, FERMI, KEPLER, LBTI, SWIFT, LCROSS, JUNO, LAMP, HINODE, XEUS, TIMED-SEE and WSO.

We request contributions detailing the operation of the instrumentation on these (and other planned) missions, with presentation of early experimental results. The development of advanced instrumentation through sounding rocket experiments and basic laboratory research are also fundamental for progress in space astrophysics, and therefore of specific interest. Moreover, the radiation environment in space presents unique instrumentation problems for each new mission.

Hence, we encourage submissions on all types of space hardware program development, and especially results for missions related to instrument technology and the space environment. Work on novel experimental techniques, detector, spectroscopy, and imaging systems for these wavelength regions is of particular interest.

Topics that will be covered include, but are not restricted to:

**UV and soft x-ray detection**
- microchannel plates, photocathodes, photodiodes, gaseous counters
- calibration reference devices, windows and filters.
- Si, CZT, Ge, and other detectors, CCDs, CMOS, and CID's
- mixed signal ASIC design for position sensitive detectors
- superconducting detection techniques, STJ, TES, calorimeters.

**Hard x-ray and gamma-ray spectroscopic and imaging techniques**
- scintillator crystal spectrometers
- gas and liquid proportional counters
- gas scintillation and solid state drift chambers
- coded apertures, modulation collimators, grid collimators
- imaging via crystal diffraction.

**Spaceborne experiments and missions**
- flight instruments, calibration, and results
- hard x-ray and gamma-ray spectrometers and imagers
- monitoring and timing instruments
- FUV, EUV, and soft x-ray spectroscopy and imaging
- space radiation background and its instrumental suppression
- radiation damage effects in instruments and detectors
- integrated circuits and ASIC’S for-flight applications.

Access last year’s papers for this year’s innovation.
This conference covers innovative technologies and instrument concepts for advanced optical systems in space. The space science community uses innovative space optics to provide imaging and spectrographic information from the ultra-violet across the visible to the far IR to support space science in planetary, astrophysical, and exoplanet research.

Both the space astronomy and the space planetary science communities are prioritizing their scientific research programs. For example, the recent National Academy of Sciences Astronomy and Astrophysics Astro2010 Decadal Survey Executive Summary reports: “The priority science objectives chosen by the Survey Committee for the decade 2012-2021 are searching for the first stars, galaxies, and black holes; seeking nearby habitable planets; and advancing understanding of the fundamental physics of the universe.”

Similarly, the National Academy of Sciences Planetary Science Decadal Survey 2009-2011 is expected to report the priority science objectives for the planetary sciences for the decade 2013-2022 in the spring of 2011. Both Surveys place a major emphasis on cost realism.

To accomplish the objectives defined by these Surveys requires the innovative synthesis of a diverse set of information to be derived from both ground and space-based telescopes and instruments. Innovative solutions to develop, deploy, and operate affordable space telescopes having very wide spatial, temporal, and spectral coverage; excellent resolution (spatial, temporal, and spectral); extremely high sensitivity and dynamic range; and very large (perhaps segmented or sparse) apertures are of interest to this conference. In many cases new, innovative instruments are required and the integrated (telescope, instrument, processing) observatory system must function within the larger context of a complete observational architecture, whether addressing astrophysical or planetary science questions.

This conference seeks papers that discuss highly innovative, indeed radical, space telescope technologies, concepts for new telescopes, and innovative non-conventional instruments.

Specific topics include:

- Imaginative space-based observational approaches to address specific science issues
- Innovative telescope concepts, such as cylindrical mirrors, off-axis concepts, formation flyers, etc.
- Ultra-lightweight optical materials; diffractive, membrane and advanced mirror concepts
- Cryogenic optical telescope systems for thermal IR applications
- Fabrication technologies
- New optical structural technologies
- Technologies for figuring, finishing, and coating large optics
- Actuation of large mirrors, including primary optics
- Wavefront sensing and control
- Deployment, assembly, and other space infrastructure technologies
- Innovative imaging spectrographs
- Unconventional dispersive and interferometric techniques for spectrometry
- Interplanetary very high bandwidth optical communications

Many of these technologies can serve a dual use as instrumentation for both astrophysical and planetary missions. Astrophysics missions cover very diverse spectral regions; each one has its own technical challenges. Planetary missions use distant telescopic imaging, flybys, and orbiting platforms. However, the planetary sciences have their own unique needs, and this conference is therefore also seeking presentation of novel ideas for planetary optical instrumentation (including passive and active X-ray, UV, visible, and IR wavebands) and for overcoming problems unique to planetary missions (e.g., extreme environments, mass and power constraints, schedule requirements, and low data rates), as well as early results from ongoing missions.
Finally, papers are sought to address system engineering issues that must be resolved to maximize the scientific return while minimizing the costs and schedules of the complete observational astronomy architecture. Possible topics include, but are not limited to:

- Innovative end-to-end optical system performance verification and validation
- Innovative data and image processing methods to optimize extraction of science information and synergies with related disciplines
- Integration of technologies to mitigate the constraints placed upon the space telescope system by pointing and tracking, telescope structure and stiffness, materials limitations, and thermal management in all relevant environments
- System modeling and architectural concepts to maximize accomplishment of the science objectives assigned by Astro2010, both within the specific topics cited by the Committee and across the complete spectrum of those topics.

Critical Dates

Abstract Due Date: 7 February 2011
Manuscript Due Date: 27 July 2011

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, whether it is an oral or poster presentation, and submit a full-length manuscript by the deadline. The contact author will be notified of abstract acceptance by email no later than 18 April 2011.
Currently operating x-ray observatories—Chandra (AXAF), XMM-Newton, Suzaku (Astro-E2), Swift, and Hinode (Solar-B)—demonstrate the importance of imaging optics to x-ray astronomy. Launching within the next few years, Spectrum Röntgen Gamma’s eROSITA will conduct the most sensitive x-ray all-sky survey. Also during this period, NuSTAR and Astro-H will extend the power of focused imaging into the hard-x-ray band and GEMS will use focusing optics to enhance its sensitivity for x-ray polarimetry. Collectively, these missions significantly advance technologies for high-angular resolution, large collecting areas, high-spectral resolution, and lightweight optical components.

Requirements for the International X-ray Observatory (IXO)—a proposed facility-class mission under joint study by NASA, ESA, and JAXA—are currently stimulating significant progress in developing technologies for lightweight, large-area, precision, x-ray mirror and grating systems. Future missions will require further advances in order to enhance such capabilities for EUV, x-ray, and gamma-ray astronomy.

This conference provides a forum for discussion of recent progress in imaging and spectroscopic optics for EUV, x-ray, and gamma-ray astronomy. Conference sessions will cover all areas of optical science and technology relevant to such optics, including the following:

- development of lightweight, precision or high-throughput grazing-incidence optics
- development of lightweight, precision grating systems for dispersive spectroscopy
- material selection, formulation, deposition, and characterization of multilayers
- uses of multilayers for normal- and grazing-incidence mirrors, filters, and synthetic crystals
- applications of Kirkpatrick-Baez, microchannel-plate, pore, and capillary optics
- theoretical and experimental analysis of surface properties and contamination of mirrors
- approaches and analyses for addressing system-level optical-performance issues-pre-collimators, baffles, filters, etc.
- concepts, designs, and experiments in wide-field imaging
- concepts, designs, and experiments in high-resolution refractive/diffactive imaging
- concepts, designs, and experiments in diffactive (Bragg or Laue) imaging
- concepts, designs, and experiments in interferometric imaging
- concepts, designs, and experiments in active x-ray optics
- design, fabrication, metrology, alignment, assembly, and testing of imaging optical systems
- design, fabrication, metrology, alignment, assembly, and testing of spectroscopic optical systems
- design, fabrication, and testing of coded-aperture masks for high-energy imaging
- design, fabrication, and testing of (visible-light) Cherenkov telescope arrays for high-energy gamma-ray astrophysics
- cross-fertilization of x-ray-optics technologies between astronomy and other fields.
Call for Papers

Solar Physics and Space Weather Instrumentation IV (OP404)

Conference Chairs: Silvano Fineschi, INAF - Osservatorio Astronomico di Torino (Italy); Judy Fennelly, Air Force Research Lab. (United States)

Program Committee: Frédéric Auchère, Institut d’Astrophysique Spatiale (France); Thomas R. Caudill, Air Force Research Lab. (United States); Ioannis A. Daglis, National Observatory of Athens (Greece); Dominic B. Doyle, European Space Research and Technology Ctr. (Netherlands); Siraj Hasan, Indian Institute of Astrophysics (India); John D. Moses, U.S. Naval Research Lab. (United States); Toshifumi Shimizu, Japan Aerospace Exploration Agency (Japan); Sébastien Vivès, Observatoire Astronomique de Marseille-Provence (France)

This conference will focus on instrumentation, observatories, space missions and programs for observations from the Sun to Earth’s upper atmosphere and space environment. The aim is to bring together diverse communities working on all elements of solar physics and space weather instrumentation.

Studying solar phenomena and monitoring space weather requires observations using both space-based and ground-based instrumentations covering the different regions of the Sun-Earth system, the Sun, interplanetary medium, magnetosphere, ionosphere and thermosphere. Papers are solicited concerning all instrumentation supporting solar physics and space weather. This includes but is not limited to concepts, designs, fabrication processes, calibration, data trending, instrument modeling, and satellite lifetime prediction modeling. We are also interested in all past, current and future solar space missions and satellite and ground constellation of space weather instrumentation with a strong focus on Space Situational Awareness.

This conference is intended to provide the solar physics community and that of Earth’s space environment with a forum for discussing the latest updates on instrumentation, observation techniques, and programs in their respective fields, and for proposing innovative ideas for future Sun-Earth coordinated observations.

Papers are solicited concerning, but not restricted to, the following topics:

- solar and heliophysics missions, including: TRACE, SOHO, STEREO, SORCE, GOES, RHESSI, Hinode, TIMED, SMEI, SDO, and sounding rockets such as HERSCHEL, RAISE, SUMI
- missions for observations of the Earth’s space environment
- DMSP, NPOESS, GOES, POES, METOP, ACE, C/NOFS, DSX, RBSP, COSMIC, IMAGE, POLAR, and other current & future missions
- space weather programs including ‘Sun-Earth Connection’
- ground-based solar telescopes
- in-situ heliophysics and magnetospheric instrumentation
- in situ observation - density, electric fields
- adaptive optics for solar telescopes
- solar polarimetry
- IR imaging, spectroscopy, polarimetry
- innovative detectors
- balloon-borne telescopes
- radio arrays for solar observations
- EUV/UV imaging, spectroscopy, detectors
- calibration techniques and facilities
- ionosphere/thermosphere observations
- thermospheric (neutral) winds
- energetic particles
- auroral dynamics
- radiation belt observations.
Several exciting space telescopes are newly conceived, under development, newly launched or stalwart tools of astrophysics and remote sensing. The conference invites contributes to speak about the detector and related imaging aspects of these missions and about detector development in general:

- very large-format or mosaiced arrays
- radiation effects on detectors (total ionizing dose, displacement damage dose, transient effects, single event effects)
- advances in focal plane electronics and on-chip electronics
- advances in CCDs, active pixel sensors and alternative sensing technologies
- advances in image processing in conjunction with detector development
- improved laboratory testing techniques for detector characterization

The conference is interested in hearing about results from on-orbit missions, technical challenges for upcoming missions, progress on focal plane system development for current programs and conceptual studies for necessary future missions. All aspects of detector technology are of interest - improved resolution for low light imaging, low noise sensors, large dynamic range sensors, broad band spectral response sensors, improved anti-reflection (AR) coatings for higher quantum efficiency, suppression of image artifacts, stitching, IR detectors for space telescopes, optical gratings and filters used in conjunction with focal plane arrays and thermal management of focal plane arrays. This conference welcomes presentations on new radiation test results on devices, improved image processing is another area of focal plane array optimization - inter-scene contrast control, transient event mitigation and image artifact suppression and similar topics are of interest. As the focal plane array and the focal plane electronics become ever more integrated, it will be important to understand on-chip electronics, miniaturization of off-chip electronics and detector versus detector electronics optimization for whole system improvement. Laboratory test techniques and data acquisitions systems continue to improve and presentation of those enhanced techniques are of interest, such as measurements of response time, modulation transfer functional (MTF) and noise.
Astronomical Adaptive Optics Systems and Applications V (OP406)

Conference Chairs: Robert K. Tyson, The Univ. of North Carolina at Charlotte (United States); Michael Hart, The Univ. of Arizona (United States)

The conference committee solicits oral and poster papers that describe astronomical adaptive optics systems, novel technologies for implementing them, and their scientific applications.

Papers are solicited in the following broad areas:

- existing systems for astronomy
- planned systems for future ELTs
- adaptive and active optics technology developments
- laser beacon systems and technology
- multiconjugate and multi-object systems and controls
- extreme adaptive optics (ExAO) system development
- recent science results using adaptive optics technology
- techniques for overcoming scintillation effects
- data reduction techniques for adaptive optics imagery
- post-processing and extensions of adaptive optics techniques.

Cryogenic Optical Systems and Instruments XIV (OP407)

Conference Chairs: James B. Heaney, Stinger Ghaffarian Technologies, Inc. (United States); E. Todd Kvamme, Lockheed Martin Space Systems Co. (United States)

Program Committee: David Chaney, Ball Aerospace & Technologies Corp. (United States); Steven A. Macenka, Propulsion Lab. (United States); Raymond G. Ohl IV, NASA Goddard Space Flight Ctr. (United States); Leigh A. Ryder, Lockheed Martin Space Systems Co. (United States); Theodore D. Swanson, NASA Goddard Space Flight Ctr. (United States)

This is the fourteenth in a series of biennial conferences whose goal has been to provide a forum for the open exchange of new ideas in the technology of optical systems and instruments used at cryogenic temperatures. The published SPIE Proceedings from this series constitute a valued reference library in this technology. They contain a description of the complete evolution of cryogenic systems: from design concept and analysis, through instrument development and test, to final performance evaluation and actual usage, in both terrestrial and aerospace applications.

SPIE's Annual Meeting in San Diego will provide an opportunity to continue this series with the addition of a discussion of current activities and new technologies. Our Cryogenic Optical Systems and Instruments XIII Conference that was held in 2009 featured a number of presentations that discussed the current status of the cryo-optics of the instruments destined for spaceflight aboard NASA's James Webb Space Telescope, the European GAIA mission, and other state-of-the-art cryogenic technologies. In 2011 we expect to learn more about progress in these areas and others that have evolved further along their design and testing paths.

Papers are solicited in the following and related topics:

- cryogenic system design
- cryo-optical technology: mirrors, lenses, mounts, alignment mechanisms
- cryo-optical material and component properties, measurement and behavior
- cryogenic instruments: aerospace, terrestrial
- cryogenic/IR mechanisms, testing, and performance
- cryogenic Dewars, coolers: aerospace, terrestrial
- closed-cycle cryogenic systems
- control and monitoring of cryogenic/IR systems
- theoretical and experimental heat transfer analyses for cryogenic systems
- performance evaluation of cryogenic instruments
- analytical tools for cryogenic system analysis.
Astronomical Optics and Instrumentation

Techniques and Instrumentation for Detection of Exoplanets V (OP408)

Conference Chair: Stuart Shaklan, Jet Propulsion Lab. (United States)

Program Committee: David P. Bennett, Univ. of Notre Dame (United States); Olivier Guyon, Subaru Telescope, National Astronomical Observatory of Japan (United States), and Research Corp. of the Univ. of Hawaii (United States), and The Univ. of Arizona (United States); Richard G. Lyon, NASA Goddard Space Flight Ctr. (United States); Bruce A. Macintosh, Lawrence Livermore National Lab. (United States); M. Charley Noecker, Ball Aerospace & Technologies Corp. (United States); Rémi Soummer, Space Telescope Science Institute (United States)

The recent National Academy of Sciences decadal survey in astronomy and astrophysics highlighted exoplanet research as an important aspect of NASA’s science program in the coming decades. Inspired by the discovery of hundreds of planetary systems using radial velocity measurements and gravitational micro-lensing, direct imaging with the Hubble Space Telescope and ground-based adaptive optics systems, and spectral characterization of transiting systems, significant investments in ground and space-based exoplanet imaging and characterization technologies have resulted in great progress toward the ultimate goal of characterizing exoplanet systems containing terrestrial planets. The first dedicated ExAO coronagraph systems will soon become operational on large telescopes and are expected to measure significant numbers of spectra of giant planets. The Kepler and COROT observatories will measure the frequency of terrestrial planets out to the habitable zone, while gravitational microlensing in space will yield data on terrestrial planets at radii within and beyond the habitable zone. These results will inform the required scale, duration, and agility of future planet imaging and characterization missions.

The key challenge in this field in the coming decade is for the community to support a mission architecture and technologies that will be capable of characterizing a significant number of terrestrial exoplanets. This session seeks papers that describe mission concepts, design reference missions, technology development approaches, and specific technologies for the direct and indirect detection of exo-planets either from ground-based facilities or current and future space observatories. Other key questions involve techniques for characterizing the Zodiacal dust analogs of nearby stars that are potential future targets for direct imaging missions.

Papers are solicited in, but are not limited to, topics such as:
- radial velocity measurements
- gravitational microlensing
- astrometric search for planets
- planetary transit detection
- coronagraphy for planet detection
- interferometric systems for planet detection
- occulter systems for planet detection
- starlight suppression
- high contrast imaging with adaptive optics
- image processing techniques for extracting images and spectra
- exoplanet characterization instrumentation including polarimetry
- spectroscopy of exo-planets
- techniques for detection of circumstellar dust.

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Astrobiology continues to grow at an astonishing pace. The NASA Mars Reconnaissance Orbiter and the ESA Mars Express Omega Sensor discovered hydrated phyllosilicates and NASA’s Spirit rover detected magnesium iron carbonate deposits indicating early Mars was extensively altered by liquid water. The NASA Opportunity Rover continues to explore and has found four meteorites on Mars. The Cassini spacecraft has investigated Saturn’s moons and found evidence for water geysers erupting from Enceladus. Liquid water on Titan and kerogen-like hydrocarbons on Iapetus. The Stardust Mission returned images of comet Wild-2. NASA’s Deep Impact spacecraft observed the release of cyanide gas from comet Hartley 2 to increase five-fold between Sept. 9 and Sept 17, 2010 with no increase in dust emissions. Japan’s HAYABUSA spacecraft returned images of asteroid Itokawa and NASA’s DAWN Mission should arrive at asteroid Vesta in July, 2011. The Russian Phobos-Grunt Spacecraft is being prepared for the December 2011 Mars launch window to carry samples of Phobos. Autonomous robots are being deployed in remote regions of Earth in preparation for exploration of icy moons of the Solar System. Microbial extremophiles inhabit the most hostile environments on Earth. Many bacteria are able to grow on alternate chirality substrates and the search for a shadow biosphere is well underway. Chemical biomarkers and microfossils in archaean rocks and carbonaceous meteorites are providing clues to the origin, evolution, diversity and distribution of life on Earth and in the Cosmos.
Optics and Photonics for Information Processing V (OP313)

Conference Chairs: Khan M. Iftekharuddin, The Univ. of Memphis (United States); Abdul A. S. Awwal, Lawrence Livermore National Lab. (United States)

Program Committee: Henri H. Arsenault, Univ. Laval (Canada); Stephen G. Azevedo, Lawrence Livermore National Lab. (United States); George Barbastathis, Massachusetts Institute of Technology (United States); Juan Campos, Univ. Autònoma de Barcelona (Spain); David P. Casasent, Carnegie Mellon Univ. (United States); H. John Caulfield, Alabama A&M Univ. (United States) and Diversified Research Corp. (United States); Pietro Ferraro, Istituto Nazionale di Ottica Applicata (Italy); Laurence Hassebrook, Univ. of Kentucky (United States); Kazuyoshi Itoh, Osaka Univ. (Japan); Mohammad A. Karim, Old Dominion Univ. (United States); Byoungchoo Lee, Seoul National Univ. (Korea, Republic of); Abhijit Mahalanobis, Lockheed Martin Missiles and Fire Control (United States); Mohammad A. Matin, Univ. of Denver (United States); Osamu Matoba, Kobe Univ. (Japan); Alastair D. McAulay, Lehigh Univ. (United States); Nasser M. Nasrabadi, U.S. Army Research Lab. (United States); Thomas J. Naughton, National Univ. of Ireland, Maynooth (Ireland); Mark A. Neifeld, The Univ. of Arizona (United States); Takanori Nomura, Wakayama Univ. (Japan); Ting-Chung Poon, Virginia Polytechnic Institute and State Univ. (United States); Philippe Réfrégier, Institut Fresnel (France); Joseph Rosen, Ben-Gurion Univ. of the Negev (Israel); Firooz A. Sadjadi, Lockheed Martin Maritime Systems & Sensors (United States); John T. Sheridan, Univ. College Dublin (Ireland); Enrique Tajahuerce, Univ. Jaume I (Spain); Jun Tanida, Osaka Univ. (Japan); Shyh-Lin Tsao, Cherry Tree Consulting Co. (Taiwan) and National Taiwan Normal Univ. (Taiwan); Cardinal Warde, Massachusetts Institute of Technology (United States); Frank Wyrowski, Friedrich-Schiller-Univ. Jena (Germany); Toyohiko Yatagai, Utsunomiya Univ. (Japan); Francis T. S. Yu, The Pennsylvania State Univ. (United States); Maria J. Yzuel, Univ. Autònoma de Barcelona (Spain)

This conference is intended to provide a forum for interchange on various algorithms, systems, sensors, and architectures for novel applications in optics and photonics in information processing. Original unpublished contributions reporting recent advances in analog and hybrid optical information systems and techniques are solicited. All abstracts will be reviewed by the program committee for originality and merit. Topics of interest include, but are not limited to, the following:

Algorithms
- optical pattern recognition, optimum filtering, correlation-based processors, correlation devices, optical correlation hardware, nonlinear techniques for pattern recognition
- nonlinear, neural networks algorithms
- novel transforms for optical imaging systems, including wavelets transforms
- optical Image processing algorithms.

Architecture and Systems
- spatial light modulators (SLMs) for optical information systems
- optical systems and algorithms for SAR image processing and recognition
- holographic techniques in information processing, and information display systems
- optical storage/memory systems for information processing
- optical systems for 3-D pattern recognition, 3D imaging and image processing
- applications of novel optical materials for information processing
- Task-specific information for pattern recognition
- photorefractive correlators for optical information systems
- numerical modeling of wave propagation, system optimization, selection criterion
- noise in optical computing system and reduction techniques
- selection criterion for detectors, spatial light modulators and geometrical optical constraints for computing systems
- packaging for optical information processing
- devices and components for optical information systems.

Optical Switching and Interconnects
- optics in server architecture
- nonlinear optical phenomena for ultrafast switching
- waveguide, optical fiber based, polarization, and intensity switching, optical limit switches
- optical multiplexing, optical implementation of novel computer and switching architectures, wavelength domain processing
- interconnection networks: fiber optic, free-space, massively parallel optical interconnections, static and reconfigurable interconnects, optical backplanes and VCSEL and VLSI implementation of interconnects and FPGA based optical devices
- applications of interconnection systems: computer communications, optical back bones for conventional computers, optical/hybrid interconnects for electronic computers.
Call for Papers

Digital Optical Processing
- Multi-valued logic, linear algebra processor, system demonstrations, fault-tolerant computing, optical logic and memory
- holographic memory-based computing, integrated optics, and soliton-based and semiconductor devices for optical computing
- logarithmic, exponential, and function based analog optical computing
- modeling of holographic elements, joint optimization
- Computational sensing, computational imaging
- device performance under amplitude, phase noise, effects of nonlinearity in the system, quantum image construction.

Applications in Biophotonics
- optical processing for biophotonics
- applications of optical systems to information security
- optical systems for biometrics sensing and recognition
- optical encryption, watermarking.

Image Processing Applications
- novel x-ray based image processing, algorithms and systems, noise processing, applications in medical, EUV, modeling, etc.
- image processing of optical images for large scale systems such as laser fusion facilities, applications in optical alignment, optics inspection, off-normal detection.

Optical Information Processing in Different Countries
- review of optical information processing research over decades around the globe.

Critical Dates
Abstract Due Date: 7 February 2011
Manuscript Due Date: 27 July 2011

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, whether it is an oral or poster presentation, and submit a full-length manuscript by the deadline. The contact author will be notified of abstract acceptance by email no later than 18 April 2011.
The field of digital image processing has experienced continuous and significant expansion in recent years. The usefulness of this technology is apparent in many different disciplines covering medicine through remote sensing. The advances and wide availability of image processing hardware has further enhanced the usefulness of image processing. The Application of Digital Image Processing conference welcomes contributions of new results and novel techniques from this important technology.

Papers are solicited in the broad areas of digital image processing applications, including:

- medical applications
- digital cinema
- color processing
- robot vision
- facsimile
- registration techniques
- image processing architectures, workstations and programmable DSPs
- Multimedia applications
- high-quality color representation
- impact of standardization on image processing
- restorations and enhancements
- image transmission and coding
- remote sensing
- hybrid techniques
- pattern recognition
- multidimensional image processing
- video processing
- high-resolution display
- super-high-definition image processing
- computational imaging
- visual search.

Access last year’s papers for this year’s innovation.
Data compression and encryption are rapidly becoming crucial technologies that enable efficient and secure medical, commercial, and government-related computing applications. Compression increases data storage capacity through reduction of redundancy in source data (e.g., remote sensing, surveillance, or medical imaging) while exploiting limited communication channel bandwidth (e.g., audio or video transmission and wireless computing). Encryption is employed in authentication and copyright protection (e.g., digital watermarking or steganography), as well as traditional data security applications. Given the current practical emphasis placed on trustworthy computing, security of computing systems, prevention of terrorist attack, and emergency response in recent natural disasters, encryption used alone or together with compression has become progressively more important implementationally.

This conference brings together experts in the mathematics of data or image compression and encryption, and features illustrative applications as proof-of-principle. Emphasis will be placed on innovative theory, algorithms, and analytical techniques for data characterization and representation, data-independent compression schemes with high accuracy, especially for audio, video, and hyperspectral data; and encryption innovations such as watermarking for video authentication, computing with compressed data, accuracy of image reconstruction using decompressed data, and analysis of the vulnerability of cryptosystems. Proof-of-principle illustrative applications can include medical imaging, remote sensing, data processing/storage, audio-coded video, and military imaging, com-munications, or computing.

Topics include, but are not limited to:

Data Compression
- fundamental questions about compression, including the nature of compressibility at bit, byte/pixel, region, and object levels (e.g., high-level semantics vs. low-level redundancy)
- theory and metrics for characterizing the compressibility of data, images, or signals for use with selected compression transforms
- innovations in compression - analysis of complexity, error analysis and noise resilience, rate/distortion behavior, and robustness, theoretically and with examples of realistic application scenarios
- model-based hyperspectral / multidimensional image compression
- semantic compression, including measures of semantic redundancy
- synergy between hyperspectral-based sensing and compression
- audio and video (A/V) synchronization and authentication in compressed A/V datastreams, including MPEG-3, MPEG-4, MPEG-7, and audio-coded images in commercial multimedia
- solution of inverse problems using compression techniques
- model-based error detection - crossing the boundary between interpolation and extrapolation in error estimation
- theory and methods by which compression can benefit from approximation theory, for example, progressive compression and its relationship to theory of successive approximation.

Examples of Illustrative Applications:
- Surveillance or environmental image compression, Medical or digital forensic imaging; Homeland Security surveillance and communications; and Airborne/spaceborne imaging with remote sensing using stand-alone or networked sensors.

Data Encryption and Security
- watermarking for video authentication, as well as copyright protection of still or moving images and audio signals
- nonlinear watermarking technology
- survivability of watermarking to spatial operations, linear and nonlinear arithmetic and region-based operations, as well as compression/decompression operations
- forensic tracking of the use or modification of an image or signal (e.g., video or audio products) with watermarks that record operations performed on the image (digital forensics)
- emerging standards for watermarking and authentication
- steganography / steganalysis and their use in digital authentication
- detection of information concealed steganographically in imagery
- techniques and measures for estimating security for encrypting signals or images using established or emerging transforms
- encryption schemes that use concepts or mathematics of chaos theory or probabilistic models (e.g., digital watermarking)
- cryptanalysis of symmetric and asymmetric cryptosystems
- error analysis of sensing algorithms applied to compressed or decompressed data, including tomography using compressed data
- performance analysis and vulnerability of cryptosystems.
Examples of Illustrative Applications:
Authentication, Video/Audio watermarking for authentication and commercial validation, e-Commerce, Commercial and military communications; Digital forensics; Medical data archival / transmission.

Interaction Between Data Compression and Encryption
- interaction between watermarking and compression, for example, use of compression algorithms to assess the utility or robustness of linear or nonlinear watermarking techniques
- effect of compression error on digital watermark survivability
- secure image transmission using encryption of compressed data
- transmission of semantically-compressed imagery, including effects of channel error on image reconstruction
- techniques for decreasing the error sensitivity of compressed or encrypted data (e.g., progressive encoding, tagged blocks)
- computation using encrypted (resp. compressed) data for increased security (resp. computational efficiency)
- watermarking as a steganographic process
  - interaction between steganography and steganalysis in forensic analysis
- cryptanalysis/steganalysis as a process of recognizing patterns in compressed or encrypted datasets, signals, or images, with applications to data mining, image database search, etc.
- development of specific data compression transforms, for speeding up image processing, pattern recognition, tomography, or visualization of large datasets when computations are carried out over compressed data.

Examples of Illustrative Applications:
Security surveillance, Battlefield imaging and surveillance, Forensic imaging, Data mining, Internet video secure transmission, Remote sensing, Scientific database management, Medical imaging, Contraband detection, and Visualization of large datasets.
Mathematics of Error Analysis and Estimation with Applications (OP316)

Conference Chair: Mark S. Schmalz, Univ. of Florida (United States)

Program Committee: Mark L. Fowler, Binghamton Univ. (United States); Takuro Kida, Tokyo Institute of Technology (Japan); Liffofd McLauchlan, Texas A&M Univ.-Kingsville (United States); Mehrube Mehrübeoglu, Texas A&M Univ. Corpus Christi (United States)

The analysis and estimation of computational and data error in digital computing algorithms has long been a supporting technology in image and signal processing (ISP), remote sensing, astrodynamics, industrial systems engineering, and a wide variety of military applications. As the complexity of computer software increases, and as the available precision of computational resources increases, there has been a tendency to place less emphasis on numerical analysis and error propagation estimation in the development of ISP algorithms and systems. However, as ISP, compression, and pattern classification paradigms and algorithms converge, techniques for space, time, and error analysis are re-emerging as an area of research interest.

This conference emphasizes the role of mathematics as a rigorous basis for error analysis and estimation, especially for estimating performance of complex image and signal processing algorithms. Contributed papers will be judged on the basis of mathematical content primarily, and practical relevance secondarily. Articles may be physically speculative but must be mathematically sound.

Specific areas of interest include, but are not limited to:

• forward and backward error and stability analysis of algorithms and systems at levels of abstraction at and above the bit level of computer arithmetic operations
• novel statistical and probabilistic methods in error analysis and performance estimation, especially as applied to nonlinear operations
• techniques for more accurately estimating typical (vs. worst-case) error bounds in computational cascades
• impact of error analysis on development of algorithm design techniques, e.g., successive approximation techniques for iterative or recursive algorithms.

Of additional interest are the following analytical topics, which may be specialized:

• optimal or near-optimal theoretical estimation / representation of error at multiple levels of abstraction (e.g., continuous representation of a function, discrete representation, vs. computer arithmetic computation)
• multiple types of error analysis or estimation procedures operating concurrently or selectively (e.g., bit-level deterministic analysis, operation-level deterministic or statistical analysis, placement of statistical bounds on forward or backward algorithm error or stability)

• progressive accumulation of data error in relationship to computational error given error, noise, or uncertainty in prior assumptions or input patterns
• use of successive-approximation techniques for characterizing error in linear and nonlinear systems, especially in engineering applications. Applications should provide proof-of-principle or illustrate details of technique, for example:
  • reliability and robustness of error estimation algorithms in the presence of noisy data, for example, surveillance video image sequences or remote sensing imagery
  • techniques for robust, accurate prediction of a function's performance in the presence of computational and data error, for example, accuracy of pattern classifiers such as neural nets with linear or nonlinear kernels in the presence of input noise and error or limited precision
  • error analysis of algorithms for processing remote sensing imagery, including techniques based on fuzzy set theory and neural network methods.
Mathematical Methods in Pattern and Image Analysis II (OP317)

Conference Chairs: Gerhard X. Ritter, Univ. of Florida (United States); Junior Barrera, Univ. de São Paulo (Brazil); Jaakko T. Astola, Tampere Univ. of Technology (Finland); Mark S. Schmalz, Univ. of Florida (United States)

Program Committee: Karel Fliegel, Czech Technical Univ. in Prague (Czech Republic); Yuichi Kida, Ohu Univ. (Japan); Lifford McLauchlan, Texas A&M Univ.-Kingsville (United States); Mehrube Mehrübeoglu, Texas A&M Univ. Corpus Christi (United States); Françoise Prêteux, Mines ParisTech (France)

Pattern recognition is fast becoming an enabling technology in applications as diverse as image and signal processing, remote sensing, data and image compression, surveillance imaging, industrial vision and audio signal processing, medical data processing, and a wide variety of military applications. The development and testing of pattern recognition algorithms has long been key to mathematics and computer science research. Additionally, as pattern recognition paradigms and algorithms are increasingly incorporated into practical applications, techniques for performance analysis of pattern classifiers are collectively emerging as an area of research interest.

This conference emphasizes the role of mathematics as a rigorous basis for pattern and image analysis, and for the performance analysis of pattern classifiers. Contributed papers will be judged on the basis of mathematical content. Articles may be physically speculative but must be mathematically sound. Applications should not be the primary focus, but may be employed as illustration of technique.

Specific areas of interest include, but are not limited to:

- adaptive pattern recognition, including learning paradigms such as neural nets, or dynamically configured template-based classifiers
- fuzzy set theory and neural network methods in image analysis and pattern recognition
- statistical and probabilistic methods in image analysis and pattern recognition
- geometric, nonlinear, and morphological methods
- PDE and wavelet methods in image and pattern analysis, particularly for the processing of signals or images transformed by compression or encryption.

Of additional interest are the following analytical topics:

- theoretical prediction of classifier errors and computational performance in various pattern recognition paradigms given error, noise, or uncertainty in prior assumptions or input patterns
- techniques for adaptively compensating trainable classifiers for nonergodic inputs
- complexity analysis of data-dependent pattern recognition architectures or algorithms, as a function of data type and data complexity

- reliability and robustness of pattern recognition algorithms in the presence of partial information, including inputs corrupted by various types of noise
- techniques for robust, accurate combination of multiple classifier outputs, to include statistical methods for classifier refinement
- paradigms for tailoring pattern recognition strategies to specific applications areas, without loss of generality in the classifier.
This conference will provide a forum for discussion of advances in algorithms for sensor signal and data processing, including track initiation, maintenance, termination, sensor fusion, and signal detection. Of interest are targets that are too small for effective use of traditional automatic target recognition with a single frame of data. These targets include point-source targets, unresolved closely spaced objects, small extended objects, clusters of small targets, and chemical/biological threats.

Of particular interest is the processing of low observables or tracking in a dense environment of false signals, clutter, or targets. There is an increasing need for improvement in algorithm efficiency, i.e., improved performance relative to processor resources required. Also needed are accurate evaluations and predictions of required resources and of performance under realistic conditions.

Papers are invited on algorithm concepts and details, results of feasibility studies and detailed performance evaluations, analytical studies, simulation and performance evaluation techniques, related mathematical and statistical methods, and methods combining signal level processing and tracking. Of special interest are papers that provide information for selecting algorithms for an application. This includes the characteristics of algorithms in terms of performance and required resources as a function of operating conditions.

Papers about both tactical and strategic applications are solicited. Video and PC demonstrations of performance are solicited. Papers are solicited in the following and related areas:

**Signal Processing**
- signal detection
- chemical/biological signal processing
- linear or nonlinear estimation and filtering
- low signal-to-ratio clutter ratio processing
- multiple frame signal processing/track-before-detect
- closely spaced object resolution/characterization
- extended object and cluster processing
- background removal/clutter rejection/image preprocessing
- detecting targets that obscure the background
- jitter, drift, bias estimation
- gamma circumvention
- threshold adjustment and control/CFAR processing
- image/frame registration
- fuse-before-detect.

**Tracking: Association and Filtering**
- single and multiple target tracking
- tracking with chemical/biological sensors
- tracking low observables/dim targets
- single and multiple sensor data tracking
- tracking filters or data association
- reversible decision and multiple hypotheses tracking
- target detection and acquisition
- methods to accommodate false signals, clutter, and stars
- track initiation, maintenance, and termination
- efficient gate search approaches
- maneuvering target/multiple model tracking
- sensor data fusion/network-centric processing
- tracking with dissimilar or non-collocated multiple sensors
- sensor registration bias/gridlock processing
- tracking with unresolved closely spaced objects
- point source, small extended object, and cluster tracking
- improved track consistency and quality assessment.

**Signal and Data Processing Issues**
- multiple platform processing distribution
- algorithms for concurrent/parallel processing
- critical open issues and algorithm tradeoffs
- impact of sensor design or scanning pattern on processing
- phenomenology considerations
- performance: evaluation methods, statistics, prediction
- modeling, simulations, and algorithm testbeds
- efficient/robust/adaptive processing methods
- promising advanced or innovative techniques
- target typing, classification, or discrimination
- counter-countermeasures
- processing multispectral data
- use of track data in signal processing
- integrated signal and data processing
- hyperspectral processing
- target-weapon assignment methods
- processing target features and attributes
- combat identification
- algorithms for homeland security
- network-centric resource management
- chemical/biological defense processing
- processing of fusion-level functions.
Wavelets and Sparsity XIV (OP319)

Conference Chairs: Manos Papadakis, Univ. of Houston (United States); Dimitri Van De Ville, Ecole Polytechnique Fédérale de Lausanne (Switzerland) and Univ. of Geneva (Switzerland); Vivek K. Goyal, Massachusetts Institute of Technology (United States)

Program Committee: Akram Aldroubi, Vanderbilt Univ. (United States); Radu V. Balan, Univ. of Maryland, College Park (United States); John J. Benedetto, Univ. of Maryland, College Park (United States); Bernhard G. Bodmann, Univ. of Houston (United States); Peter G. Casazza, Univ. of Missouri-Columbia (United States); Matthew C. Fickus, Air Force Institute of Technology (United States); William T. Freeman, Massachusetts Institute of Technology (United States); Onur G. Guleryuz, DoCoMo Communications Labs. USA, Inc. (United States); Ioannis A. Kakadiaris, Univ. of Houston (United States); Ilya A. Krishtal, Northern Illinois Univ. (United States); Gitta Kutyniok, Univ. Osnabrück (Germany); Demetrio Labate, Univ. of Houston (United States); Andrew F. Laine, Columbia Univ. (United States); Michael Liebling, Univ. of California, Santa Barbara (United States); Christophe Olivo-Marin, Institut Pasteur (France); Ivan W. Selesnick, Polytechnic Institute of NYU (United States); Jean-Luc Starck, Commissariat à l’Énergie Atomique (France); Michael Unser, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Yves Wiaux, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Lei Ying, Univ. of Wisconsin-Milwaukee (United States)

This long-running series provides a forum for presentation of results in theory and applications of sparse representations. Originally, the focus of these conference series was on wavelets, but in the course of many successful meetings the topics of this conference series expanded and now encompass the entire domain of the theory and applications of all signals that have a sparse representation regardless of their dimensionality. The conference welcomes original papers on the mathematics of signal and image processing and analysis and in all areas of mathematical sciences that are affected fundamentally by the choice of signal representation. The series distinguishes itself by successfully straddling disciplinary boundaries; it has drawn preeminent researchers in mathematics, signal and image processing and analysis, computer vision, medical imaging, neuroscience, physics, and other fields. It focuses on novel applications of signal analysis and processing methods, refinements of existing techniques, and new theoretical developments.

Topics for submission may include (but are not limited to):

- wavelet theory and multirate filterbanks
- overcomplete representations in finite- and infinite-dimensional spaces
- new constructions of bases and frames for sparse representations
- time-frequency analysis
- sparse representations in physics, neuroscience, and bioimaging, visualization, computational geometry and face recognition
- multiresolution surface representations and graphics
- wavelets, fractal analysis, and multiscale random processes
- wavelets and approximation theory, sampling and operator theory
- applications in communications and signal processing
- applications in radar and sonar
- compressed sensing
- sigma-delta quantization

Note: Please follow the submission instructions below carefully. Submit an extended abstract of 2 pages plus as many figures as needed (in addition to the 250 word text-only Abstract required by SPIE), and include a summary cover sheet that includes:

1. Description of the problem addressed: Why is it important?
2. Description of the original contribution of this work: How does it compare with previous work on the problem and work on similar problems?

History of the event: http://www.waveletseries.org

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Advances in X-Ray/EUV Optics and Components VI (OP320)

Conference Chairs: Christian Morawe, European Synchrotron Radiation Facility (France); Ali M. Khounsary, Argonne National Lab. (United States); Shunji Goto, Japan Synchrotron Radiation Research Institute (Japan)

Program Committee: Lucia Alianelli, Diamond Light Source Ltd. (United Kingdom); Lahsen Assoufid, Argonne National Lab. (United States); Stefan Braun, Fraunhofer-Institut für Werkstoff- und Strahltechnik (Germany); Shih-Lin Chang, National Tsing Hua Univ. (Taiwan); Raymond Conley, Jr., Brookhaven National Lab. (United States); Sultan B. Dabagov, Istituto Nazionale di Fisica Nucleare (Italy); Christian David, Paul Scherrer Institut (Switzerland); Hans M. Hertz, Royal Institute of Technology (Sweden); Keiichi Hirano, KEK-High Energy Accelerator Research Organization (Japan); Werner H. Jark, Sincrotrone Trieste S.C.p.A. (Italy); Yasushi Kagoshima, Univ. of Hyogo (Japan); Alexander Y. Kazimirov, Cornell Univ. (United States); George A. Kyrala, Los Alamos National Lab. (United States); Carolyn A. MacDonald, Univ. at Albany (United States); Howard A. Padmore, Lawrence Berkeley National Lab. (United States); Ladislav Pina, Czech Technical Univ. in Prague (Czech Republic); Michael J. Pivovarov, Lawrence Livermore National Lab. (United States); Yuriy Y. Platonov, Rigaku Innovative Technologies (United States); Seunghyu Rah, Pohang Univ. of Science and Technology (Korea, Republic of); Wa’el Salah, SESAME (Jordan); Horst Schulte-Schrepping, Deutsches Elektronen-Synchrotron (Germany); Regina Soufl i, Lawrence Livermore National Lab. (United States); Joerg Wiesmann, Incotec GmbH (Germany); Stephen W. Wilkins, Commonwealth Scientific and Industrial Research Organisation (Australia); Makina Yabashi, Japan Synchrotron Radiation Research Institute (Japan) and RIKEN (Japan); Kazuto Yamauchi, Osaka Univ. (Japan); Brian W. Yates, Canadian Light Source Inc. (Canada)

Expanding use of x-ray and EUV radiation in many scientific and technical applications requires the continued development of new and improved sources and optics to deliver brighter, better-conditioned beams to the end-user. This conference focuses on the advances, as well as the emerging needs, in x-ray and EUV sources, optics, and applications including next-generation synchrotron sources, EUV photolithography, laboratory sources, and x-ray astronomy.

In radiation to sources and source/optics integration, the topics covered include design, development, fabrication, installation, evaluation, and applications of optical elements such as mirrors, monochromators, multilayers, zone-plates, lenses, and detectors. It is also an aim of this conference to provide an opportunity for the developers and users to share both the progress and challenges in each of these and related areas.

Presentations covering emerging needs, progress reports, and topical reviews related to the following and related topics are solicited:
- x-ray sources (novel, synchrotron, laboratory-based, etc.)
- x-ray and EUV mirrors
- crystal optics design, fabrication, and applications
- coating- and multilayer-based optics and performance
- refractive optics
- capillary, poly-capillary optics, and wave-guides
- filters and windows
- novel optical substrates, materials, processes, and applications
- frontiers in mirror fabrication: surface figuring and finishing techniques, capabilities, and limitations
- management of optical components under high heat/radiation load and in hostile environments
- thermal and mechanical stability of optical system
- bendable/deformable optics
- adaptive/active/passive shape control of optical elements
- nanofocusing optics
- coherence preservation and optical surface quality
- emerging needs in x-ray and EUV optics.

Critical Dates

Abstract Due Date: 7 February 2011
Manuscript Due Date: 27 July 2011

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, whether it is an oral or poster presentation, and submit a full-length manuscript by the deadline. The contact author will be notified of abstract acceptance by email no later than 18 April 2011.
X-Ray Lasers and Coherent X-Ray Sources: Development and Applications (OP321)

Conference Chairs: James Dunn, Lawrence Livermore National Lab. (United States); Annie Klisnick, ISMO, CNRS, Univ. Paris-Sud 11 (France)

Program Committee: Hiroyuki Daido, Japan Atomic Energy Agency (Japan); Sylvie Jacquemot, Ecole Polytechnique (France); Do-Kyeong Ko, Gwangju Institute of Science and Technology (Korea, Republic of); Ciaran L. S. Lewis, Queen’s Univ. Belfast (United Kingdom); Katsumi Midorikawa, RIKEN (Japan); Stefan Moeller, SLAC National Accelerator Lab. (United States); Peter-Viktor Nickles, Gwangju Institute of Science and Technology (Korea, Republic of); Joseph Nilsen, Lawrence Livermore National Lab. (United States); Geoffrey J. Pert, The Univ. of York (United Kingdom); Jorge J. Rocca, Colorado State Univ. (United States); Szymon Suckewer, Princeton Univ. (United States); Gregory J. Tallents, The Univ. of York (United Kingdom); Alexander V. Vinogradov, P.N. Lebedev Physical Institute (Russian Federation)

This conference will be dedicated to new developments and applications of x-ray lasers and other coherent x-ray sources with attention to supporting technologies and diagnostics. Recent results in the generation of intense, coherent x-rays and progress toward practical devices and their applications will be reported. Areas of research in plasma-based x-ray lasers, 4th generation accelerator-based sources and higher harmonic generation will be presented.

Papers are solicited on the following topics:

• laser-pumped x-ray lasers
• discharge excitation and other nonlaser pumping methods
• high-harmonic XUV and x-ray sources
• free-electron laser generation in the XUV, soft and hard x-ray region
• high brightness and ultrashort x-ray sources
• injection-seeding of x-ray laser amplifiers
• high-repetition-rate x-ray lasers
• new lasing transitions and novel x-ray laser schemes
• characterization of x-ray laser properties
• modeling of x-ray lasers
• applications to high-field x-ray science, generation and study of matter under extreme conditions
• applications to coherent imaging, interferometry, lithography, metrology, ablation, material science
• diagnostics and optics for x-ray lasers and coherent x-ray sources.
Advances in Computational Methods for X-Ray Optics II (OP322)

Conference Chairs: Manuel Sanchez del Rio, European Synchrotron Radiation Facility (France); Oleg Chubar, Brookhaven National Lab. (United States)
Co-chairs: Carolyn A. MacDonald, Univ. at Albany (United States); Kawal J. S. Sawhney, Diamond Light Source Ltd. (United Kingdom)

Program Committee: Lucia Alianelli, Diamond Light Source Ltd. (United Kingdom); Johannes Bahrdt, Helmholtz-Zentrum Berlin für Materialien und Energie GmbH (Germany); Manfred Bitter, Princeton Univ. (United States); Sebastien Boutet, SLAC National Accelerator Lab. (United States); Roger J. Dejesus, Argonne National Lab. (United States); Gianluca Geloni, European XFEL GmbH (Germany); Kenneth Hill, Princeton Univ. (United States); Mourad Idir, Brookhaven National Lab. (United States) and Synchrotron SOLEIL (France); Tetsuya Ishikawa, RIKEN (Japan); Cameron M. Kewish, Synchrotron SOLEIL (France); Ali M. Khounsary, Argonne National Lab. (United States); Jacek Krzywinski, Instytut Fizyki (Poland) and SLAC National Accelerator Lab. (United States); Kim Leffman, Riso National Lab. (Denmark); Bernd Meyer, Lab. Nacional de Luz Sincrotron (Brazil); Giovanni Pareschi, INAF – Osservatorio Astronomico di Brera (Italy); Ruben Y. Reininger, Brookhaven National Lab. (United States); Wa’el Salah, SESAME (Jordan); Liubov Samoylova, European XFEL GmbH (Germany); David A. Shapiro, Brookhaven National Lab. (United States); Yuri Shvyd’ko, Argonne National Lab. (United States); Anatoly A. Snigirev, European Synchrotron Radiation Facility (France); Alexeei Y. Suvorov, Japan Synchrotron Radiation Research Institute (Japan); Laszlo Vincze, Univ. Gent (Belgium); Timm Weitkamp, Synchrotron SOLEIL (France); Valeriy Yashchuk, Lawrence Berkeley National Lab. (United States)

The goal of this conference is to provide an up-to-date coverage of software and algorithms for designing, optimizing and upgrading the optics of x-ray instruments. It aims to bring together engineers and scientists developing x-ray optical software and users of these codes for the design and optimization of x-ray optics from different fields: synchrotron, astrophysics and plasma physics.

Papers are solicited on the following and related topics:

- simulation methods (ray tracing, Monte Carlo, phase space, wavefront propagation)
- simulations and optimization of complete instruments
- simulation of x-ray sources (synchrotron, XFEL, x-ray tubes, plasmas)
- treatment of diffraction limited sources
- reflective optics (mirrors, capillaries, poly-capillaries, micropore and lobster-eye optics)
- refractive optics (single and compound lenses)
- diffractive optics (gratings, multilayers, crystals, zone plates)
- micro- and nano-focusing optics
- numerical methods in dynamical diffraction theory (curved and deformed crystals, mosaics, crystals, time-dependent diffraction)
- modeling surface imperfections (figure and slope errors, roughness) and thermal deformation
- methods in metrology (e.g., calculation and match of PSD from different apparatus) and usage of metrology data in optics calculations
- transformation of beam characteristics (polarization, time-dependence, coherence) by optical elements
- databases: optical constants, metrology data
- computer methods to deal with intensive calculations, parallel computing, graphics processing units, etc.
- software codes and packages (commercial, proprietary and open source).

This conference will be followed by a workshop on “Partially Coherent X-Ray Beam Propagation: Theory and Computation,” with a four-part agenda:

i) summarize the state-of-the-art in theory and simulations of the propagation of coherent and partially coherent x-ray beams
ii) define the present and future needs and goals, and prioritize them
iii) discuss and modify a draft proposal prepared a priori by the organizers to achieve these goals
iv) finalize a consensus joint collaboration agreement/contract including technical goals, a timetable, and engagements of the parts.

Critical Dates

Abstract Due Date: 7 February 2011
Manuscript Due Date: 27 July 2011

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, whether it is an oral or poster presentation, and submit a full-length manuscript by the deadline. The contact author will be notified of abstract acceptance by email no later than 18 April 2011.
Advances continue to be made in hard x-ray, gamma-ray, neutron detectors and associated technologies for spectroscopy and imaging of these energetic photons and particles. Many types of position and energy sensitive detectors are actively being developed, including semiconductor detectors and arrays, high-density noble gas detectors, phosphors, scintillators, thin film transistor arrays, charge-coupled devices, microchannel plates, and calorimetric detectors. These detectors are being employed singly, or in conjunction with optical components and x-ray/gamma-ray sources to produce systems having important applications ranging from medical diagnostics and treatment to astronomical research. Important examples include nuclear medicine, dental imaging, dosimetry, industrial radiography, nondestructive testing, heavy metals analysis, cargo inspection, nuclear safeguards and surveillance, treaty verification, explosives detection, and environmental monitoring.

This conference will provide rapid dissemination of the latest results from the forefront of research on hard x-ray gamma-ray and neutron detector physics through seminal invited papers and qualified contributed papers from academic, government, and industry researchers.

Important new results are solicited concerning, but not limited to, the following general areas:

- theory of hard x-ray and gamma-ray detector operation
- design, fabrication, and testing of new devices for direct and indirect photon detection
- advanced room-temperature semiconductor materials such as: CdZnTe; CdTe; Si; HgI2; PbI2; InP; GaAs; BiI3; TiBr; InI; CdSe; ZnSe; polycrystalline films; amorphous Si; and amorphous Se
- semiconductor crystal growth and characterization
- electrical contacts and their effects on device response
- scintillators, scintillator/PM tube devices, scintillating fiber optics, phosphors
- scintillator/semiconductor array devices
- microchannel plates
- gaseous and liquid medium detectors
- calorimeters
- low-temperature detection systems
- development of neutron and charged particle detectors
- advanced readout electronics including smart-sparse charge amplifier arrays, CCDs, CID, TFTs
- development of electronic techniques to compensate for material deficiencies
- radiation damage, aging, and environmental effects
- spatial, energy, and timing sensitivity and resolution
- novel device structures for spectroscopic and imaging detectors
- fabrication and tests of strip and pixel arrays and discrete detectors
- development of the detectors for space, cargo inspection, nondestructive testing, dosimetry, x-ray fluorescence, environmental, industrial, security, safeguards, and surveillance applications.
Medical Applications of Radiation Detectors (OP324)

Conference Chairs: H. Bradford Barber, Health Sciences Ctr., The Univ. of Arizona (United States); Hans Roehrig, Health Sciences Ctr., The Univ. of Arizona (United States); Douglas J. Wagenaar, Gamma Medica-Ideas, Inc. (United States)

Program Committee: Geoffrey Harding, Morpho Detection (Germany); Ralph B. James, Brookhaven National Lab. (United States); Denny L. Lee, DxRay, Inc. (United States); Vivek V. Nagarkar, Radiation Monitoring Devices, Inc. (United States); Eiichi Sato, Iwate Medical Univ. (Japan); Michael R. Squillante, Radiation Monitoring Devices, Inc. (United States)

The recent development of new radiation detector materials has resulted in great interest in rethinking the design of biomedical imaging systems that make use of gamma-rays or x-rays. Pixellated semiconductor detector arrays of such materials as CdTe or CdZnTe (CZT) hold great promise for improving both the spatial resolution and the energy resolution of imaging detectors; semiconductor detectors are now being incorporated into both clinical nuclear medicine cameras and commercial small-animal imaging systems.

Meanwhile, new scintillators, such as the lanthanide halides and SrI2, have been identified that have high light yield, fast response and improved energy resolution. These new scintillators also have the potential to replace NaI(Tl) or LSO in conventional imaging systems. Continuing research into the new scintillators is driven by the need for better detectors for Positron Emission Tomography (PET), but applications in single photon emission computed tomography (SPECT) are also contemplated. Parallel improvements in scintillation light detectors such as: better multi-anode PMTs with better quantum efficiency and more pixels, avalanche photodiode arrays and SSPMs, should encourage the development of a new generation of compact imaging systems for biomedicine.

Improvements in electronic readout circuits have similarly driven the development of ever larger semiconductor-detector pixel arrays to the point where applications in digital radiography may soon be practical. The novel properties of the new detector materials and readout technologies can also make possible new types of multimodality imaging systems.

This conference is intended to be of interest to a broad range of researchers, from those developing new detectors that might have medical applications, to those developing medical imaging systems, or testing them in the clinic, to those just interested in what medical imaging possibilities are on the horizon.

We invite submission of papers on, but not limited to, the following topics:

- new applications of semiconductor detectors in medicine (CdZnTe, CdTe, TlBr, Ge, Si, etc.)
- medical applications of new scintillators (LaBr3:Ce, LaCl3:Ce, elpasolites, SrI2, etc)
- novel small-animal x-ray/gamma-ray imaging systems, including multi-modality systems
- new imaging configurations for PET or SPECT
- collimators for imaging optics for medical x-ray or gamma-ray imaging
- medical applications of Compton imaging
- pixelated imagers for digital radiography
- small gamma cameras or detector systems for intraoperative use
- improved detectors for portal imaging
- metrology for new clinical radiology systems
- gamma-ray or x-ray microscopy
- compact, portable instruments for biomedical imaging
- biomedical neutron imaging.

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Penetrating Radiation Systems and Applications XII (OP325)

Conference Chairs: F. Patrick Doty, Sandia National Labs. (United States); Richard C. Schirato, Los Alamos National Lab. (United States); Gary P. Grim, Los Alamos National Lab. (United States)

Program Committee: Patrick L. Feng, Sandia National Labs., California (United States); Paul Guss, National Security Technologies, LLC (United States); Khalid M. Hattar, Sandia National Labs. (United States); Michael J. King, Rapiscan Systems Labs. (United States); Edward A. McKigney, Los Alamos National Lab. (United States); Wondwosen Mengesha, Physical Optics Corp. (United States); Michael R. Squillante, Radiation Monitoring Devices, Inc. (United States)

Penetrating Radiation refers to various forms of energetic ionizing radiation such as: gamma rays, x-rays, protons and alpha particles, neutrons and beta particles (electrons and positrons). Penetrating radiation technologies span a wide range of applications of benefit to mankind. Examples include: medical imaging, biomedical research, nuclear safeguards, and nonproliferation, explosives detection and threat reduction, nondestructive testing, and materials research. Penetrating radiation presents unique challenges to the designers of components and systems, due to the nature of its interactions with matter. This conference provides an interdisciplinary forum for detector-materials developers, instrument designers and users to report on recent results, improvements, and new approaches for using penetrating radiation. Emphasis is on new detector materials, novel applications and imaging. Contributed papers are solicited concerning, but not limited to:

- nuclear safeguards
- nondestructive test and evaluation
- materials characterization
- homeland security
- elemental analysis in rock, coal, and minerals
- explosives detection
- neutron imaging
- new applications for semiconductor detectors (CdZnTe, CdTe, Hgl2, etc.)
- applications for new scintillation detector materials such as lanthanide halides and lanthanide silicates
- coded-aperture imaging
- Compton imaging
- sources of penetrating radiation
- high-speed pulse and spectral processing
- neutron scattering instrumentation
- gamma-ray and neutron radiography
- nuclear chemistry
- process monitoring and control.
Earth Observing Systems XVI (OP501)

Conference Chairs: James J. Butler, NASA Goddard Space Flight Ctr. (United States); Xiaoxiong Xiong, NASA Goddard Space Flight Ctr. (United States); Xingfa Gu, Institute of Remote Sensing Applications (China)

Program Committee: Philip E. Ardanuy, Raytheon Intelligence & Information Systems (United States); Robert A. Barnes, NASA Goddard Space Flight Ctr. (United States); Jeffrey S. Czapla-Myers, College of Optical Sciences, The Univ. of Arizona (United States); Armin W. Doerry, Sandia National Labs. (United States); Thomas S. Pagano, Jet Propulsion Lab. (United States); Jeffery J. Puschell, Raytheon Space & Airborne Systems (United States); Carl F. Schueler, Orbital Sciences Corp. (United States)

Since EOS XV in August 2010, NASA has continued the operation of its Earth Observing System (EOS) series of missions and has continued both instrument and platform preparations for the upcoming National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP) and the follow-on Joint Polar Satellite System (JPSS) missions. NASA is currently developing the Observational Land Imager (OLI) and the Thermal Infrared Sensor (TIRS) for the Landsat Data Continuity Mission (LDCM). Missions are being formulated in response to the U.S. National Research Council’s recent decadal survey on Earth science and applications from space. ESA and Eumetsat are performing instrument formulation and launch planning for their future Earth Explorers and Sentinels Missions, Meteosat Third Generation, and post-Eumetsat Polar System (post-EPS) programs. JAXA continues operation of its Advanced Land Observing Satellite (ALOS), the Greenhouse gas Observation Satellite (GOSAT), and is preparing for launch of the GCOM-W and -C satellites. In addition, preparations are underway for the joint ESA/JAXA EarthCARE mission. Commercial and governmental groups from around the globe are developing relatively low-cost Earth-viewing missions and sensors incorporating new technologies via programs similar to NASA’s New Millennium Program (NMP), Earth System Science Program (ESSP), and Instrument Incubator Program (IIP). At the same time, mission and sensor developments for the Geostationary Operational Environmental Satellites (GOES)-R next-generation of U.S. operational weather satellites are underway in addition to continuing launches of the European Space Agency (ESA) MetOp platforms. Many of these missions have resulted or will result in the design, development, and testing of heritage and/or new generations of remote sensing systems which will be the subject of EOS XVI in August 2011. In addition, topics from past, current, and future EOS missions in China are included in this conference.

In addition to the specific systems mentioned above, papers are solicited in the following general areas:

- Earth-observing mission studies including new system requirements
- commercial system designs
- electro-optical sensor designs and sensitivity studies
- microwave remote sensing systems
- system validation and vicarious calibration
- airborne simulators
- sensor test results including pre-launch calibration and characterization
- techniques for enhancing data processing, reprocessing, archival, dissemination, and utilization
- conversion from research to operational systems
- on-orbit calibration, performance, and characterization
- enabling technologies (optics, antennas, electronics, calibration techniques, detectors, and models).

Critical Dates

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Remote Sensing

Infrared Remote Sensing and Instrumentation XIX (OP502)

Conference Chairs: Marija Strojnik, Ctr. de Investigaciones en Óptica, A.C. (Mexico); Gonzalo Paez, Ctr. de Investigaciones en Óptica, A.C. (Mexico)

Program Committee: John Antoniades, BAE Systems (United States); Gabriele E. Arnold, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Gail E. Bingham, Space Dynamics Lab. (United States); Gail J. Brown, Air Force Research Lab. (United States); David A. Cardimona, Air Force Research Lab. (United States); Catherine J. Cesarsky, European Southern Observatory (Germany); John D. Elwell, Space Dynamics Lab. (United States); Jam Farhoomand, TechnoScience Corp. (United States); Gerald T. Fraser, National Institute of Standards and Technology (United States); John C. Gille, National Ctr. for Atmospheric Research (United States); Sarath D. Gunapala, Jet Propulsion Lab. (United States); Dietrich Lemke, Max-Planck-Institut für Astronomie (Germany); Jan L. Williams, C-Systems Management Consultants (United States); Jürgen Wolf, NASA Ames Research Ctr. (United States)

A great deal of knowledge about the Earth’s environment and about space (including outer space) has recently been acquired using infrared remote sensing techniques. In this conference we plan to bring together scientists and engineers involved with the design, engineering, and data analysis of existing and future infrared remote sensing instruments, including scientific returns obtained from remotely collected data.

Areas of interest include:
- scientific objectives for future missions
- scientific results for those missions that have flown
- instrument design requirements to meet mission objectives and the resultant design and implementation experiences
- sensor technology challenges in meeting instrument requirements
- instrument and sensor integration challenges and experiences
- planned and required enabling technologies.

Papers are solicited on the following and related topics:

Remote Sensing Fundamentals
- radiometry and energy throughput
- imaging
- fundamental limits to IR imaging, including detector quantum noise and background limit
- stray light considerations, including analysis, signal-to-noise, and instrument performance limitations
- instrument calibration, comparison of predicted and measured results
- space environment and radiation effects
- calibration and testing
- standards and characterization of components and materials
- IR/electro-optical system modeling and simulations.

Instrument Facilities
- Planck Observatory
- James Webb Space Telescope
- SPICA Far-IR Facility
- SAFIR Telescope
- Darwin
- SOFIA
- SIRTF
- HERSCHEL
- EOS Instruments.

Instruments and their Scientific Returns
- bolometers
- spectrometers
- imaging cameras
- photometers (multiband)
- radiometers
- imaging and non-imaging interferometers
- micro-cameras.

Remote Sensing
- Earth resource mapping
- atmosphere and weather prediction
- space exploration
- remote calibration.

Enabling Technologies
- sensor design
- cold read-out electronics
- infrared materials.

Infrared Telescopes for Earth Remote Sensing, Focal Plane Technology, and Detection Schemes
- near-IR detectors
- IR detectors
- far-IR detectors
- sub-mm detectors
- focal plane layout and architecture.
Infrared Sensors, Devices, and Applications (OP503)

Conference Chairs: Paul D. LeVan, Air Force Research Lab. (United States); Ashok K. Sood, Magnolia Optical Technologies, Inc. (United States); Priyalal S. Wijewarnasuriya, U.S. Army Research Lab. (United States)

Program Committee: Eustace L. Dereniak, College of Optical Sciences, The Univ. of Arizona (United States); Nibir K. Dhar, Defense Advanced Research Projects Agency (United States); Arvind I. D’Souza, DRS Sensors & Targeting Systems, Inc. (United States); Barbara G. Grant, Lines and Lights Technology (United States); Sarah D. Gunapala, Jet Propulsion Lab. (United States); John P. Hartke, U.S. Military Academy (United States); John E. Hubbs, Ball Aerospace & Technologies Corp. (United States); Sanjay Krishna, Ctr. for High Technology Materials (United States); Michael W. Kudenov, College of Optical Sciences, The Univ. of Arizona (United States); Randolph E. Longshore, Raytheon Missile Systems (Retired) (United States); Hiroshi Murakami, Japan Aerospace Exploration Agency (Japan); Manijeh Razeghi, Northwestern Univ. (United States); James A. Stobie, BAE Systems (United States); William B. Weissbard, Teledyne Imaging Sensors (United States); Jimmy Xu, Brown Univ. (United States); Sung-shik Yoo, Northrop Grumman Electronic Systems (United States)

The detection of infrared radiation has proven to be a viable investigative tool in environmental studies, homeland security, medical, automotive, and military applications. This conference will provide a forum for papers, ranging from basic device physics to novel applications. There will be sessions featuring image processing techniques on the focal plane and smart readout electronics. Rapid development in feature size has led to the need for continual state-of-the-art updates to the optics community. Recent developments in strained superlattices, type II antimony-based detector materials, InAs:GaAs, and developments in room temperature infrared detectors have resulted in significant material advances. Various architectures using signal conditioning technology have been demonstrated at cryogenic temperatures for higher performance cooled IR FPAs, and are therefore available as tools for researchers in various disciplines. We are looking for papers that demonstrate state-of-the-art in novel readout structures, on-chip signal processing, and papers that will provide information on newly designed, less expensive digital circuits for fast and ultrafast signal processors on the focal plane array.

In addition, the conference is intended as a high-level forum bringing together scientists and engineers involved in the research, design, and development of infrared sensors and unique IR device structures including nanotechnology.

Papers are solicited for, but not limited to, the following topics:

- SWIR, MWIR, LWIR detectors
- nano technology based EO/IR detectors
- nano/micro bolometers
- HgCdTe (MCT) technology
- strained layer superlattice FPAs
- higher operating temperature detectors
- avalanche photodiodes
- very long-wavelength detectors
- electronic readout image intensifier devices
- innovative low noise readout circuits
- advanced microchannel plates
- advanced fiber optics
- medical imaging
- cameras for low-light-level high-definition TV
- photon-counting imaging
- lidar and ladar imaging
- image intensifiers for military night vision systems
- plasmonic IR applications
- robotic vision
- unmanned autonomous vehicle cameras
- underwater imaging
- multi-spectral systems
- infrared detector materials (i.e., InSb, HgCdTe, GaAs)
- smart focal planes
- diffractive optics on FPA
- commercial applications
- space-based sensing applications
- astronomical applications
- industrial applications
- automotive applications
- medical applications
- imaging spectrometer applications
- imaging polarimeter applications
- FPA data processing
- cryogenic electronics
- on-FPA signal processing
- S/H on-chip.

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Remote sensing and related geospatial technologies are providing opportunities for natural and managed ecosystems monitoring and management that have been heretofore unavailable.

Ecosystems are sensitive to changes caused by both natural events and human activities. Concerns about water availability and quality, sanitation, loss of biodiversity, invasive species, elevated CO₂, nitrogen deposition, sustainable soil fertility and food production, land use and land cover change, ecosystem degradation, human social systems (urbanization), health and hygiene, environmental policy, disease of pests, plants, and humans require community effort and new technologies. Enhanced monitoring capabilities are essential for early detection, assessment, and mitigation of changes that can indicate harm to the environment.

Remote sensing and geospatial information technologies have the ability to monitor and, therefore, oversee how human activities impact the environment on local, regional, national, and global scales. Integrated system models increase the capability to simulate, evaluate, understand, and ultimately predict ecosystem changes and their interactions with other natural processes and human activities as well as consequent impacts. Scientists are applying advanced remote sensing technologies and integrated system models to solve problems that are facing our resource managers as well as stakeholders. This conference is designed to focus on the use of remote sensing and models for sustainability in agriculture, forest, hydrology, ecology, wetland, and arid and semi-arid ecosystems to improve our fundamental understanding of the Earth’s biophysical processes and their interactions with other natural variations and human activities, and to develop and improve techniques for analyzing and interpreting remotely sensed data from Earth observation systems.

We are seeking contributions to this conference from the following research areas:

- remote sensing in ecosystems (agriculture, forest, grassland, wetland, arid and semi-arid lands) assessment and monitoring
- specific parameter retrievals using visible, infrared, microwave, lidar techniques
- aircraft and ground-based sensor systems
- new and future satellite observing systems for ecosystems
- site-specific agricultural management
- agricultural yield and monitoring
- remote sensing of the hydrological cycle including soil moisture, water quality, and open water
- bioproductivity and resources sustainability
- land cover dynamics, including land cover classification, and degradation assessment
- remote sensing for urbanization impacts
- assimilation of functional models with remotely sensed variables
- development and application of integrated models for objective evaluation, better understanding and improved prediction of ecosystem changes and interactions with climate and other natural variations and human activities.

In addition to papers on current applications of remote sensing to natural ecosystems management, this conference will also give special attention to the subject of the future of space-based and airborne observations. Example topics include, but are not limited to, the most recent or planned new instrument launches; technology impacts on the requirements for post-launch reconfigurability; management of extremely high-data volumes; and innovative approaches to minimizing the effects of atmospheric confounders.
Satellite Data Compression, Communications, and Processing VII (OP505)

Conference Chairs: Bormin Huang, Univ. of Wisconsin-Madison (United States); Antonio J. Plaza, Univ. de Extremadura (Spain); Carole Thiebaut, Ctr. National d’Etudes Spatiales (France)

Co-chairs: Chulhee Lee, Yonsei Univ. (Korea, Republic of); Yunsong Li, Xidian Univ. (China); Shen-En Qian, Canadian Space Agency (Canada)

Program Committee: Isidore Paul Akam Bita, LUXSPACE Sarl (Luxembourg); Philip E. Ardanuy, Raytheon Intelligence & Information Systems (United States); Chien-I Chang, Univ. of Maryland, Baltimore County (United States); Yang-Lang Chang, National Taipe Univ. of Technology (Taiwan);

Myungjin Choi, Korea Aerospace Research Institute (Korea, Republic of); Qian Du, Mississippi State Univ. (United States); Yong Fang, Northwest A&F Univ. (China); Lingjia Gu, Jilin Univ. (China); Mingyi He, Northwestern Polytechnical Univ. (China); Roger W. Heymann, National Environmental Satellite, Data, and Information Service (United States); Matthew A. Klimesh, Jet Propulsion Lab. (United States); Kai Liu, Xidian Univ. (China); Enrico Magli, Politecnico di Torino (Italy); Jarno S. Miellikainen, Univ. of Eastern Finland (Finland); Jordi Portell de Mora, Institut d’Estudis Espacials de Catalunya (Spain);

Jeffery J. Puschell, Raytheon Space & Airborne Systems (United States); Hsuan Ren, National Central Univ. (Taiwan); Ana M. C. Ruedin, Univ. de Buenos Aires (Argentina); Jordi Serra-Ruiz, Univ. Oberta de Catalunya (Spain); Joan Serra-Sagrista, Univ. Autónoma de Barcelona (Spain); Ziping Shi, Univ. of Electronic Science and Technology of China (China); Raffaele Vitulli, European Space Research and TechnologyCtr. (Netherlands); Shih-Chieh Wei, Tamkang Univ. (Taiwan); Jiaji Wu, Xidian Univ. (China); Song Xiao, Xidian Univ. (China)

With the advances in modern active and passive sensor technologies with higher spectral and/or spatial resolutions and faster scanning speeds, more powerful airborne and spaceborne instruments are being developed for remote sensing of the atmosphere, oceans, lands of Earth, and other planets. These technologies result in a significant increase in data volume. The increase presents a challenge to satellites with limited access to a growing congested radio frequency spectrum. Data compression techniques provide data reduction for effective downlink and rebroadcast as well as economic archiving. Data communication techniques facilitate robust information transfer over a limited-bandwidth noisy channel.

This conference provides an interdisciplinary forum for exchanging the latest research results and views in the areas of satellite data compression and communication. The advances in satellite data compression have been influenced by the progress and knowledge in generic 2D and 3D image and video coding techniques. Research in these areas is also welcome in hope to inspire the scientists in satellite data compression. This conference also extends its interests to data processing techniques to improve or analyze the noisy data via onboard pre-processing or onsite post-processing. Topics of interest include but are not limited to:

Data Compression
Ultraspectral/hyperspectral/multispectral compression, lossless/near-lossless/lossy compression, generic image and video coding, onboard compression algorithms and chips, error-resilient source coding, distributed source coding, joint source-channel coding, source coding in multiple access networks, vector quantization, compression using wavelets, ridgelets, bandlets, curvelets or multiwavelets, fractal compression, multiple description coding, error control, bit-rate allocation, unequal error protection, parallel compression algorithms, GPU-based compression, compression-based anomaly detection, compression of geographic information systems (GIS), interferogram data compression, grating data compression, GPS/SAR/ LIDAR data compression, space and astronomy data compression, applications of compression to geophysical product retrieval, other topics related to data compression.

Data Communications
Error-correcting channel coding, advanced modulations, restricted radio frequency spectrum, telemetry systems, telecommand systems, space link protocol, link analysis, transmission techniques, multiple access, satellite networks, multi-beam satellites, communication payload, Turbo codes, low-density parity-check codes (LDPCs), applications of Europe’s DVB satellite standard, 4D-8PSK-TCM modulation, out-of-band emission control, other topics related to data communication.

Data Processing
Filter design, digital filters, data reduction, sampling and quantization, compressive sensing, data archiving, data indexing, image registration, image restoration, image interpolation, data recovery, de-striping, bowtie correction, data calibration, data correction, data enhancement, noise filtering, analog and digital signal processing, statistical signal processing, adaptive signal processing, geometric transformation, image stabilization, color correction, brightness and contrast adjustment, data representation and transforms, super-resolution, multi-resolution processing and wavelet, motion analysis and tracking, sub-pixel target detection, endmember extraction, spectral unmixing, feature extraction, morphological image processing, neural networks, fuzzy processing, data format, content-based retrieval, image quality assessment, sensor array and multi-channel systems, data hiding, data encryption, watermarking and authentication, pattern recognition, data mining, data fusion, information retrieval from compressed data, other topics related to data processing.
Remote Sensing

Atmospheric and Environmental Remote Sensing Data Processing and Utilization VII: Readiness for GEOSS V (OP506)

Conference Chairs: Mitchell D. Goldberg, National Environmental Satellite, Data, and Information Service (United States); Hal J. Bloom, Earth Resources Technology, Inc. (United States)

Program Committee: Philip E. Ardanuy, Raytheon Intelligence & Information Systems (United States); John J. Bates, National Environmental Satellite, Data, and Information Service (United States); James J. Butler, NASA Goddard Space Flight Ctr. (United States); Changyong Cao, National Environmental Satellite, Data, and Information Service (United States); Wei Gao, Colorado State Univ. (United States); Steve Goodman, National Oceanic and Atmospheric Administration (United States); Allen H.-L. Huang, Univ. of Wisconsin-Madison (United States); John F. Le Marshall, Bureau of Meteorology/Victoria (Australia); Johannes Schmetz, European Organisation for the Exploitation of Meteorological Satellites (Germany); William L. Smith, Jr., NASA Langley Research Ctr. (United States)

This year’s focus is to continue the full scope of end-to-end atmospheric and environmental remote sensing data utilization in areas key to preparation for the Integrated Earth Observations System (IEOS), the U.S. component of the Global Earth Observing System of Systems (GEOSS). The conference goals are to discuss and focus on those preparations needed for improved IEOS information and services. These include five basic areas: (1) calibration, intercalibration, and characterization of the observing system, (2) algorithm development of integrated products and data fusion, including GOES-R and NPOES Preparatory Program (NPP), (3) data utilization in Numerical Weather Prediction (NWP) and environmental forecasting models, (4) advanced information systems and decision support tools, and (5) data access and archive activities. Furthermore, data management and common system architecture of the existing and new polar and geostationary remote sensing systems will also be the focal point of presentations and discussions.

To achieve the stated goals, papers are solicited in, but not limited to, the following areas:

• integrated product solutions using multiple systems
• measurement noise characterization; specifically, aspects and methods for solidifying satellite instrument calibration and intercalibration requirements needed to measure small-scale signals associated with long-term global climate change
• identification of key satellite remote sensing validation problems/issues and methods for solving these issues
• common system architecture design and implementation
• data management including access and archive strategies and plans.

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Imaging Spectrometry XVI (OP507)

Conference Chairs: Sylvia S. Shen, The Aerospace Corp. (United States); Paul E. Lewis, National Geospatial-Intelligence Agency (United States)

Cochair: Robert T. Kroutil, Dynamax Corp. (United States)

Program Committee: Christoph C. Borel, Air Force Institute of Technology (United States); Chein-I Chang, Univ. of Maryland, Baltimore County (United States); Thomas Cooley, Air Force Research Lab. (United States); Eustace L. Dereniak, College of Optical Sciences, The Univ. of Arizona (United States); Kevin C. Gross, Air Force Institute of Technology (United States); Terrence S. Lomheim, The Aerospace Corp. (United States); Pantazis Mouroulis, Jet Propulsion Lab. (United States); Luc Rochette, LR Tech (Canada); Bernhard Sang, Kayser-Threde GmbH (Germany); John R. Schott, Rochester Institute of Technology (United States)

The newest operational and planned imaging sensors collect high signal-to-noise ratio, high-resolution spatial and spectral data. The capability to simultaneously image in hundreds of spectral bands has led to the term “hyperspectral imaging spectrometry”. The availability of such detailed hyperspectral data poses unique challenges to system designers and data analysts. These challenges include sensor designs, system trade-offs, calibration, onboard processing, data precision and compression, atmospheric correction, as well as understanding of hyperspectral phenomenology and its translation into useful exploitation capabilities.

The continuing objective of this conference is to assemble experts in sensor design, data exploitation, and applications to demonstrate the utility and to comprehensively advance the capabilities of imaging spectrometry. Areas of interest are active and passive sensors; sensor system designs and trade-offs; near-real-time and automated data processing; techniques to detect, identify, and classify objects, emissions, and physical phenomena in hyperspectral data; fusion of remote sensing data from disparate sensors and wavelength regions.

Two special interest topics are:
- spectroscopic instrumentation and methodologies for obtaining quantitative atmospheric greenhouse gas profiles
- approaches for determining retrieved greenhouse gas profile accuracy

Papers are solicited on these special interest topics. Practitioners involved in these special interest topics are invited to participate in an open forum to discuss the state of the art and future requirements for improving retrieved profile accuracies.

Papers are also solicited in, but not limited to, the following areas:
- current and developmental sensor concepts for VNIR, SWIR, MWIR, and LWIR
- active and passive spaceborne, airborne, and ground-based sensor design and development
- ultraviolet through longwave infrared imaging systems
- real-time and off-line data processing and exploitation methods and algorithms
- imaging polarimetry and spectro-polarimetry
- spectral signature libraries, laboratory and field measurement data collection techniques, reflectance and BRDF libraries and models

- atmospheric correction and sensor artifact removal techniques
- applications in the areas of emergency and disaster response, homeland security, defense, astronomy, medical, forensics, pathology, land remote sensing, geology, oceanography, meteorology, cartography, civil and environmental monitoring
- valued enhanced capability achieved through sensor fusion.

Announcing a joint session on “Optical design and engineering of spectroscopic sensors”.

This will be a coordinated joint session with the Conference on Current Developments in Lens Design and Optical Engineering in the Optical Engineering Track.

New enabling component technologies for spectroscopic sensors such as lens design methodology, progress in dispersive elements, coatings, etc., along with specific optical engineering aspects such as optomechanical assembly and tolerancing, stray light concerns, and optical performance verification have a significant impact on the development and performance of spectroscopic systems. This session will highlight optical engineering progress in these areas and how they relate to improvements in spectrometer and spectrometric sensor performance.
Remote Sensing System Engineering IV (OP508)

Conference Chairs: Philip E. Ardanuy, Raytheon Intelligence & Information Systems (United States); Jeffery J. Puschell, Raytheon Space & Airborne Systems (United States)
Cochairs: Hal J. Bloom, Earth Resources Technology, Inc. (United States); Allen H.-L. Huang, Univ. of Wisconsin-Madison (United States)

Program Committee: Stephen A. Kota, The Aerospace Corp. (United States); R. Patrick Earhart, Ball Corp. (United States); William B. Gail, Microsoft Corp. (United States); Om P. Gupta, Iridium Satellite LLC (United States); Wei-Min Hao, U.S. Forest Service (United States); Gerard Jansson, Intelsat Global Service Corp. (United States); Stephen A. Mango, NOAA / NESDIS Office of Satellite Operations (United States); Carl F. Schueler, Orbital Sciences Corp. (United States)

The goals of the Remote Sensing System Engineering IV conference are first and foremost to exchange critical and invaluable lessons learned in the system engineering of ground-, air-, and space-based remote sensing systems. Additional goals are to discuss existing and emerging design approaches, engineering methods, tools, and future trends for engineering of remote sensing systems. Remote sensing systems, and systems of systems, are defined by their often complex inputs, outputs, components, and processes, with complex functional and structural inter-relationships. System engineering is an essential, but often underestimated, discipline required throughout the conceptual design, development, and test of complicated instrumentation; how it is practiced during development profoundly determines instrument performance, cost, and schedule and development risk.

Remote Sensing System Engineering IV is intended to provide a forum for presentation and discussion and help correct historical deficiencies that have led to significant performance shortfalls, cost growths, and schedule slips in both large and small remote sensing systems by facilitating the exchange of system engineering lessons learned and best practices across an underserved, multi-disciplinary, and highly distributed community. As examples, the Government Accountability Office (GAO) has identified multiple programs which "experienced escalating costs, schedule delays, and technical difficulties" and for which the program life cycle costs had grown significantly. There are multiple opportunities for improved systems engineering processes (e.g., risk management and management reserve, etc.) that relate to current and future operational and research-class missions which are also currently experiencing systems engineering-related cost growth, and schedule and performance impacts.

Topics include: (1) systems engineering best practices and lessons learned; (2) system architecture and design; (3) requirements, performance metrics, and measures of success; (4) modeling and simulation tools and methods; (5) design and integration of distributed architectures; (6) use of commercial assets in future remote sensing systems; and (7) the end user, effective data/information/system utilization, and optimum return on investment.

Papers are solicited in:
- systems engineering best practices, and lessons learned
- system architecture and design for current and future experimental, research, and operational remote sensors for Earth imaging and mapping, atmospheric, oceanic and land remote sensing and systems for remotely sensing and imaging objects in space near Earth
- system engineering metrics and measures of success leading to optimal system design
- methods and approaches for system requirements identification, definition, and allocation for operational programs
- end-to-end system modeling and simulation methods and tools
- system engineering approaches for optimizing transition of research systems to operational use
- distributed remote sensing system architectures
- evolution of systems to networks
- integrated system of systems: engineering approaches and methods
- remote sensors as secondary payloads onboard satellite communication systems and other commercial systems.
Lidar Remote Sensing for Environmental Monitoring XII (OP510)

Conference Chair: Upendra N. Singh, NASA Langley Research Ctr. (United States)
Program Committee: James B. Abshire, NASA Goddard Space Flight Ctr. (United States); Farzin Azmajarjadian, NASA Langley Research Ctr. (United States); Kazuhiro Asai, Tohoku Institute of Technology (Japan); Robert L. Byer, Stanford Univ. (United States); William C. Edwards, NASA Langley Research Ctr. (United States); Floyd E. Hovis, Fibertek, Inc. (United States); Jason J. Hyon, Jet Propulsion Lab. (United States); George Komar, NASA Goddard Space Flight Ctr. (United States); Kohei Mizutani, National Institute of Information and Communications Technology (Japan); Haris Riris, NASA Goddard Space Flight Ctr. (United States); Shiv K. Sharma, Univ. of Hawai‘i (United States); Venkataraman Sivakumar, Council for Scientific and Industrial Research (South Africa); Jinxue Wang, Raytheon Co. (United States); Thomas D. Wilkerson, Space Dynamics Lab. (United States)

Optical remote sensing techniques are being widely used for continuous, systematic monitoring of atmospheric constituents and meteorological parameters using ground-, air-, and satellite-based remote sensing instruments. The ability of laser/telescope systems to reach out to great distances in the atmosphere has opened up a major field of applied optics that now attracts the efforts of scientists and engineers from many countries.

This technology makes it possible to rapidly obtain profiles of atmospheric properties (e.g. temperature and wind) and constituents (e.g. H₂O, O₃, and CO₂). Time-dependent 3D mapping of the atmosphere has now become a reality through the international development of the lidar technique. Lidar practice now incorporates a wide variety of optical phenomena (absorption, fluorescence, etc.). Applications are increasing in the areas of meteorology, urban and industrial air pollution, aircraft safety, global monitoring of ozone and climate change, and the basic processes of atmospheric dynamics. Global wind profiling and CO₂ measurement from space requires high energy and high power lasers for extended operation. Laser risk reduction, technology maturation and life time testing at component and system level has become an important issue for space deployment. Similarly, thermal, contamination, and radiation effects are needed to be fully understood for developing highly efficient, long life, high power laser sources for long-term operation in space. As the world moves towards increased population and industrial development, laser remote sensing will become more and more important as the method of choice for obtaining the environmental data needed in intelligent decision-making for resource management. This conference focuses on current and future laser remote sensing technologies, techniques, applications, and observations related to environmental monitoring.

To allow maximum participation, a wide range of topics will be considered for presentation and discussion at the conference. The suggested list of topics to be covered in this conference is:

- solid state and fiber laser developments for lidar applications
- high-power laser diodes for space lidar applications
- innovative lidar detector and receiver technologies
- efficient, compact, ground-, air-, and space-borne lidar systems
- laser ranging and imaging
- space reliability and thermal, contamination, and radiation effects on component and systems for space
- lidar methods for constituent monitoring (DIAL, Raman, Raman/DIAL, Resonance)
- lidar methods for natural resource management (vegetation, fishery)
- laser-based remote chemical and biological detection and analysis
- tunable IR to mid-IR lidar for chemical/pollution detection
- wind field profiling (coherent, direct)
- atmospheric aerosols and cloud studies lidar applications to global issues (ozone depletion, climate change, global transport of pollutants)
- lidar applications to regional issues (urban pollution, dust transport)
- polar cloud monitoring (PSCs, NLCs, PMCs)
- atmospheric dynamics (boundary layer, gravity waves, tides, etc.)
- multi-sensor stations and campaigns for comprehensive atmospheric characterization
- affordable lidar for cloud, aerosol, and pollution monitoring
- global scale monitoring by satellite-borne lidars.

Critical Dates

Abstract Due Date: 7 February 2011
Manuscript Due Date: 27 July 2011

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, whether it is an oral or poster presentation, and submit a full-length manuscript by the deadline. The contact author will be notified of abstract acceptance by email no later than 18 April 2011.
Remote Sensing

Polarization Science and Remote Sensing V (OP511)

Conference Chairs: Joseph A. Shaw, Montana State Univ. (United States); J. Scott Tyo, College of Optical Sciences, The Univ. of Arizona (United States)

Program Committee: David B. Chenault, Polaris Sensor Technologies, Inc. (United States); Russell A. Chipman, College of Optical Sciences, The Univ. of Arizona (United States); Aristide C. Dogariu, CREOL, The College of Optics and Photonics, Univ. of Central Florida (United States); Michael J. Duggin, Air Force Research Lab. (United States); Dennis H. Goldstein, Polaris Sensor Technologies, Inc. (United States); Brian G. Hoover, Advanced Optical Technologies (United States); Yoav Y. Schechner, California Institute of Technology (United States)

Optical polarization is a powerful tool used in many aspects of remote sensing. Active and passive polarimetric sensors have been developed for use in all optical regions from UV - LWIR. Polarization has been demonstrated to enhance target contrast, aid in target identification, assist in the penetration of scattering media, probe material surfaces, and characterize atmospheric and biological aerosols and cloud particles. Applications of polarimetry include passive and active air- and ground-based sensors, underwater imagers, medical imagery, astronomy, and non-imaging sensors for environmental and industrial monitoring applications. In addition, polarization vision is known to be used by many species of vertebrates and invertebrates for the identification of prey and intra-species communications.

This conference will focus on the science, mathematics, phenomenology, and applications of polarization and polarimetric remote sensing. Papers are encouraged that discuss novel theoretical treatment or practical applications of polarimetric measurements or polarimetric imagery.

Papers are solicited on the following and related topics:

Polarization in Remote Sensing
• atmospheric polarization measurements and modeling
• cloud and haze property determinations
• atmospheric and biological aerosol measurements
• terrestrial and planetary surface polarization
• agricultural crop and soil polarization and modeling
• solar, astronomical or astrophysical applications
• polarization remote sensing programs
• spectropolarimetry
• polarization lidar/ladar and other active polarimetry.

Polarization Phenomenology of Natural and Artificial Scenes

Polarization Vision
Polarimetric Image Quality Metrics
Polarization in Computer Vision

Polarization Metrology and Instrumentation
• polarimetry (passive and active)
• ellipsometry
• polarization scattered light measurements
• spectropolarimetry
• imaging polarimetry
• biological microscopy and instrumentation.

Polarization Analysis of Optical Systems
• polarization in optical design and polarization ray tracing
• polarization aberrations
• instrumental polarization
• polarimeter calibration.

Polarization-Based Optical Systems and Components
• laser radar (lidar or ladar) and other active polarimeters
• polarization imagers
• optical signal processors and computers
• optical data storage
• fiber optic sensors
• optical modulators.

Polarization Properties of Sources and Detectors

Polarization Properties of Materials
• liquid crystals and crystalline materials
• ceramics and plastics
• organic and biological materials
• optical fiber.

Mathematics of Coherence, Polarization, and Scattering Polarization of Optical Elements
• polarizers and retarders
• thin film coatings; phase conjugators
• lenses, mirrors, gratings, beamsplitters
• optical fibers and waveguides.
Atmospheric Optics: Turbulence and Propagation
(OP512)

Conference Chairs: Alexander M. J. van Eijk, TNO Defence, Security and Safety (Netherlands); Stephen M. Hammel, Space and Naval Warfare Systems Command (United States)

Program Committee: Matthew M. Bold, Lockheed Martin Space Systems Co. (United States); Warren Lewis, Met Office (United Kingdom); Vladimir Markov, MetroLaser, Inc. (United States); Vincent Michau, ONERA (France); Jennifer C. Ricklin, Lockheed Martin Corp. (United States); Don D. Seeley, High Energy Laser Joint Technology Office (United States); Alexander M. Sergeev, Institute of Applied Physics (Russian Federation); Karin Stein, Fraunhofer-Institut für Optronik, Bildetechnik und Bildauswertung (Germany); Michael T. Valley, Sandia National Labs. (United States); Thomas Weyrauch, Univ. of Dayton (United States)

The effects of the atmosphere on optical propagation can often be the limiting performance factor in many optical system applications. The primary factors in beam degradation are: absorption and scattering by molecules, aerosols and clouds; large-scale refractive effects; and optical turbulence. For many applications, it is necessary to understand how these factors can be predicted and modeled, and hence to describe the interactions and correlations between the factors. Specific environments remain difficult for beam propagation models: long horizontal propagation paths near the ocean surface or near the land surface can encounter large vertical gradients in turbulence intensity and in extinction. Inhomogeneous regions such as coastal areas, mountains, or urban islands are difficult to simulate.

For imaging systems, atmospheric effects may lead to serious degradation of image quality, e.g., through contrast reduction, blurring and scintillation. Due to its chaotic nature and its high spatial and temporal frequencies, atmospheric turbulence is presently one of the most important factors determining image quality. For a reliable assessment of system performance, a description of turbulence intensity and its impact on imaging systems is crucial. There is thus a need for a description of turbulence in terms of environmental parameters, in terms of its impact on image quality, and in terms of image processing techniques to improve image quality by removing turbulence effects.

More and more, it is realized that the description of the atmosphere, and knowledge of atmospheric turbulence and propagation characteristics, is not uniquely related to a single sensor type. The description of atmospheric effects can be translated to a suite of sensors, ranging from optical to radiofrequency to communication systems. The broad goal of this conference is therefore to stimulate interdisciplinary discussions of atmospheric turbulence and propagation phenomena and their impact on optical, radar and communication systems.

Papers are solicited in the following and related topics:

- measurement and modeling of the effects of turbulence on propagation and system performance
- measurement and modeling of the effects of aerosol (including dust), rain, and clouds on propagation and system performance
- nowcasting and forecasting of propagation effects
- critical analyses of the current state-of-the-art propagation and radiance codes
- inversion techniques, applying the sensor as probe of the atmospheric state
- techniques for mitigation of atmospheric effects, and sensor fusion
- sensor signal (image) improvement techniques by removing atmospheric effects
- impact of atmospheric effects on sensor task performance (tracking, beam pointing, wavefront control).
Interest and attention given to laser/Free-Space Optics (FSO) and high-frequency directional RF communications through various media (the atmosphere, water, and their interfaces) continues to grow. However, high data rate directional wireless (FSO/RF) communications remains an emerging technology with a number of technical challenges preventing widespread acceptance and implementation. The focusing and transmission of directed laser or RF energy through the atmosphere, space, and air-water interfaces involves problems related to signal reception, tracking, steering, pointing, laser-beam propagation, laser speckle, rain effects, system design, and information processing. The effects of the atmosphere on optical propagation can often be the limiting performance factor in many optical communication applications. The objective of this conference is to provide a forum for researchers, product engineers, and systems developers to present and discuss the latest developments in FSO communication systems for commercial and defense applications.

Papers are solicited in, but are not limited to, the following and related topics:

- laser and hybrid (combination of laser and RF) communications: advanced techniques and issues
- advances in laser beam steering, scanning, and shaping technologies
- laser propagation and tracking in the atmosphere
- effects of rain on high-frequency directional RF
- atmospheric effects on high data rate free-space optical data links (including pulse broadening)
- long wavelength free-space laser communications
- dual- and multi-use technologies for space communications, image transfer, and surveillance
- adaptive optics and other mitigation techniques for free-space laser communications systems
- techniques to mitigate fading and beam breakup due to atmospheric turbulence/scintillation: spatial, temporal, polarization, and coding diversity strategies, and adaptive approaches
- error correction coding techniques for the atmospheric channel
- optical/RF components for free-space laser/hybrid communication systems
- novel optical receivers and architectures to improve link SNR and reliability
- characterization, measurements, and modeling of free-space optical data links (horizontal and slant geometries)
- characterization and modeling of atmospheric effects (aerosols, turbulence, fog, rain, smoke, etc.) on optical and RF communication links
- underwater FSO communications
- novel techniques for rapid target acquisition, laser beam pointing, and tracking
- the effect of aerosols on laser beam propagation through the atmosphere
- experimental demonstrations, tests, and performance characterizations in the laboratory and the field
- communication using modulated retro-reflection
- terminal design aspects for free-space optical link (for satellite- or land-mobile-terminals)
- integration of optical links in networking concepts (e.g., inter-aircraft MANET)
- optical and RF atmospheric propagation in the marine environment
- design and development of flight-worthy and space-worthy optical communication links
- deep-space/inter-satellite optical communications
- multi-input multi-output (MIMO) techniques applied to FSO
- free-space optical communications in indoor environments
- high data rate image transfer between various platforms (UAV, airborne, and ground-based)
- underwater and UV communications: applications and concepts of FSO in sensor networks for monitoring climate change in the air and under water.
Quantum Communications and Quantum Imaging IX (OP514)

Conference Chairs: Ronald E. Meyers, U.S. Army Research Lab. (United States); Yanhua Shih, Univ. of Maryland, Baltimore County (United States); Keith S. Deacon, U.S. Army Research Lab. (United States)

Program Committee: Stefania Castelletto, Univ. of Melbourne (Australia); Milena D’Angelo, Univ. degli Studi di Bari (Italy); Mark T. Gruneisen, Air Force Research Lab. (United States); Richard J. Hughes, Los Alamos National Lab. (United States); Yoon-Ho Kim, Pohang Univ. of Science and Technology (Korea, Republic of); Todd B. Pittman, Univ. of Maryland, Baltimore County (United States); Barry C. Sanders, Univ. of Calgary (Canada); Alexander V. Sergienko, Boston Univ. (United States); Dmitry V. Strekalov, Jet Propulsion Lab. (United States); Shigeki Takeuchi, Hokkaido Univ. (Japan); Xiao Tang, National Institute of Standards and Technology (United States); Arnold Tunick, U.S. Army Research Lab. (United States); Zhi Zhao, Oak Ridge National Lab. (United States)

Quantum communications and quantum imaging are emerging technologies that promise great benefits beyond classical communications and classical imaging as well as great challenges. The objective of this conference is to provide a forum for scientists, researchers, and system developers in both fields and encourage technology exchange between the quantum communication and quantum imaging research communities.

Papers are solicited on the following and related topics:

Quantum Communications and Enabling Science and Technology
- quantum free-space and fiber optics communications and cryptography
- quantum communications and quantum imaging free-space and fiber optics experimental demonstrations, tests, and performance
- teleportation; continuous variable teleportation
- quantum key distribution (QKD), entangled QKD, stochastic QKD, heralded QKD
- atmospheric quantum communication propagation theory, simulation
- atmospheric quantum communication and satellite technologies
- atmospheric effects on quantum systems
- nonlinear crystal and fiber use in generating and engineering entanglement
- single-photon sources
- photon sources, continuous and pulsed laser sources of entangled photons
- single-photon and multi-photon detectors
- multi-photon and multiple-particle entangled states and entangled beams
- squeezed states
- quantum two-photon sensing and detection
- slow/trapped light and photons
- qubit physics, single and multi-photon physics
- quantum sensors.

Quantum Imaging and Metrology
- quantum ghost imaging, ghost imaging
- quantum imaging and metrology through the atmosphere: technology, theory, simulation
- quantum imaging and quantum lithography
- quantum clock synchronization
- quantum holography and quantum identification
- quantum interference
- quantum measurements using cameras
- fast cameras for quantum technology
- quantum imaging at diverse wavelengths
- nonlocal quantum imaging physics
- new ways to make pseudo thermal sources for quantum imaging
- quantum imaging theory
- uncertainty principle in quantum imaging
- quantum image communication
- quantum versus classical imaging physics
- quantum imaging versus speckle imaging
- quantum imaging experiments
- quantum imaging and satellites
- quantum imaging noise reduction
- quantum remote sensing
- quantum lidar and quantum ladar
- bi-photon photo resist
- bi-photon and n-photon quantum imaging
- incoherent light and solar light quantum imaging
- quantum imaging resolution and super-resolution
- quantum imaging for medical applications
- quantum imaging using fluorescence
- color and multi-spectral quantum imaging
- quantum relativity, GPS, and metrology
- quantum clocks in quantum coincidence measurements.
Quantum Internet and Quantum Information

- fundamental properties of the photon relating to quantum imaging, quantum communications, and quantum information
- quantum computing with photons
- simulation of the evolution of quantum communication, quantum computing, quantum imaging systems
- quantum storage, gates, and control
- optical/photonic/fiber quantum computing
- Bell state analyzer development
- type-II quantum computing theory, hardware, software, and applications
- fine-grained quantum computing, few-qubit computing, and communication
- novel quantum computing
- quantum information communication
- quantum data compression
- quantum secret sharing
- quantum algorithms
- quantum intrusion detection
- quantum state engineering
- quantum random number generation
- quantum communication using entanglement
- information in a photon
- compressive sensing and compressive imaging with quantum information
- non-classical information from entangled states and non-entangled states.

Critical Dates

Abstract Due Date:
7 February 2011

Manuscript Due Date:
27 July 2011

Please Note: Submissions imply the intent of at least one author to register, attend the symposium, present the paper as scheduled, whether it is an oral or poster presentation, and submit a full-length manuscript by the deadline. The contact author will be notified of abstract acceptance by email no later than 18 April 2011.
Call for Papers

Advanced Wavefront Control: Methods, Devices, and Applications IX (OP515)

Conference Chairs: Darryl J. Sanchez, Air Force Research Lab. (United States); David C. Dayton, Applied Technology Associates (United States); Troy A. Rhoardarmer, SAIC (United States)

Program Committee: Kevin L. Baker, Lawrence Livermore National Lab. (United States); Jeffrey D. Barchers, Nutronics, Inc. (United States); Charles C. Beckner, Jr., Air Force Research Lab. (United States); Thomas Bifano, Boston Univ. (United States); Philip J. Bos, Kent State Univ. (United States); Tanya Cherazova, Lomonosov Moscow State Univ. (Russian Federation); Lewis F. DeSandre, Office of Naval Research Global (United Kingdom); Robert J. Grasso, Northrop Grumman Electronic Systems (United States); Alexis V. Kudryashov, Moscow State Open Univ. (Russian Federation); Gordon D. Love, Durham Univ. (United Kingdom); Justin D. Mansell, Active Optical Systems, LLC (United States); Dan K. Marker, Air Force Research Lab. (United States); Aaron J. Masino, MZA Associates Corp. (United States); Kent L. Miller, Air Force Office of Scientific Research (United States); Denis W. Oesch, SAIC (United States); Jim F. Riker, Air Force Research Lab. (United States); James R. Rotgé, Boeing LTS Inc. (United States); Jason D. Schmidt, Air Force Institute of Technology (United States); Don D. Seeley, High Energy Laser Joint Technology Office (United States); Vladimir Y. Venediktov, S.I. Vavilov State Optical Institute (Russian Federation)

New developments in wavefront control elements with increased range and resolution create opportunities for new applications as well as new challenges for wavefront sensing and control systems. Emerging wavefront-control technologies include mechanically deformed mirrors, membrane-based mirrors, micro-electro-mechanical-system (MEMS) mirrors, curvature mirrors, liquid-crystal-on-silicon (LCOS) phase modulators, and optically addressed liquid-crystal (LC) spatial light modulators (OASLMs). Systems of interest include space-based, airborne, and ground-based adaptive optical systems and laser systems including systems requiring compensation for extended path aberrations, high-speed aberrations, aero-optics effects, highly scintillated optical fields, and systems with inherently large aberrations. Applications for this technology include adaptive imaging and beam directing optical systems, free-space optical communication, object identification, on-the-fly image processing, medical imaging, and line-of-sight stabilization.

This conference continues the technical dialogue on these topics, with a focus on new adaptive optics systems, architectures, methods, and devices; atmospheric turbulence effects modeling and compensation; and on dynamic correction of severely aberrated systems using diffractive optics principles. The conference goal is to stimulate the transition to a new generation of adaptive optical systems having active/adaptive high-resolution, high-speed, and wide dynamic range wavefront control as well as transition to commercial applications.

Papers are solicited in the following and related topics:

**Devices**
- device development for high-resolution, high-speed, and large-range wavefront phase modulation including mechanically deformable mirrors, membrane-based mirrors, MEMS mirrors, LCOS phase modulators, and OASLMs
- actuation technologies for deformed mirrors, MEMS mirrors, and membrane-based mirrors, including piezoelectric, electrostrictive, electrostatic, magnetic, and mechanical approaches as well as continuous and segmented facesheets
- high-pixel-number addressing schemes, including CMOS, TFT, e-beam, and optical approaches
- highly compliant facesheet technologies, including polymer and silicon-based approaches, for MEMS mirrors, and novel technologies for deformable primary mirrors
- management of thermal effects in wavefront control devices
- component technologies for reconfigurable diffractive optics elements for modulo-lambda wavefront control.

**Wavefront Sensing**
- high-resolution and large-range wavefront aberration sensing and analysis
- wavefront sensing with extended, non-cooperative beacons
- scene-based wavefront sensing
- advances in gradient, curvature, and interferometric wavefront sensors
- wavefront sensing in the presence of speckle
- innovative alternatives to conventional wavefront sensing approaches.

**Controls**
- control system approaches for systems with very large numbers of control channels
- novel wavefront control algorithms and adaptive system architectures
- advanced wavefront control systems for applications such as ground-to-ground imaging, retinal imaging, confocal microscopy, ultrashort pulse shaping, fiber coupling, laser communications, laser designation, astronomy, wavefront control inside laser cavity, etc.
- analysis of nonlinear systems, devices, and processes for imaging, wave propagation, and information processing as it relates to wavefront spatio-temporal dynamics
- innovative control system approaches for systems with segmented facesheets
- wavefront sensor-less and metric optimization-based control systems.
Atmospheric and Space Optical Systems

Advanced Wavefront Control: Methods, Devices, and Applications IX (OP515) continued

Systems
• multi-conjugate adaptive optics systems for extended-path aberration compensation
• dynamic measurement, control, and correction approaches for severely aberrated optics and flexible optics
• reconfigurable diffractive optical systems
• wide dynamic range wavefront sensing and control including severe aberration control and nonmechanical beam steering
• opto-electronic and silicon integrated systems for high-resolution wavefront sensing and control.

Applications
• novel applications of membrane mirrors, MEMS mirrors, and LC spatial phase modulators
• opthomological applications of adaptive optics and wavefront sensing
• compensation of large aberrations in ultra-lightweight telescope systems
• micro-scale adaptive optics systems
• optical systems for active/adaptive information and image processing based on spatial phase modulation techniques
• optical generation of spatial patterns/signals and chaotic regimes based on wavefront nonlinear dynamics
• artificial turbulence generation, dynamics, and measurement
• advanced fast steering mirror hardware, line-of-sight control systems, and base motion jitter rejection.
• technology transition to new commercial applications.

An exchange of practical as well as innovative ideas is anticipated.

Optical Engineering + Applications
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Submit your abstract today!
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Nanophotonics and Macrophotonics for Space Environments V (OP516)

Conference Chairs: Edward W. Taylor, International Photonics Consultants, Inc. (United States); David A. Cardimona, Air Force Research Lab. (United States)

Cochair: Ronald G. Pirich, Northrop Grumman Aerospace Systems (United States)

Program Committee: Mansoor Alam, Nufern (United States); Koen Clays, Katholieke Univ. Leuven (Belgium); Douglas M. Craig, Air Force Research Lab. (United States); Michael J. Hayduk, Air Force Research Lab. (United States); Mark G. Kuzyk, Washington State Univ. (United States); Narasimha S. Prasad, NASA Langley Research Ctr. (United States); Anthony D. Sanchez, Air Force Research Lab. (United States)

The focus of this conference will be the presentation of papers dealing with emerging and advanced nano- and macrophotonic technologies appropriate for use in space and terrestrial applications where the effects of ionizing radiation, temperature ranging, and other environmental effects such as atomic oxygen (AO), vacuum, and ultraviolet (UV) radiation can degrade space sensors, systems, and related components.

Papers are sought dealing with satellite architectures and systems, especially those ranging from small to pico-satellite payloads which require micro-component and systems such as ring laser gyros, integrated monolithic photonics and new, innovative, miniaturized, cost-effective, reliable and radiation resistant sensor and communications technologies. Emerging and improved photonics technology can facilitate implementation of future small sat systems, as well as significantly improve related dual-use commercial and military terrestrial system applications where reduced size, reliability, and resistance to temperature and ionizing and displacement radiations are major issues. Topics dealing with research and development in these areas, and especially technologies expected to operate in adverse UV and AO environments found in near-Earth orbits or galactic cosmic rays encountered in interplanetary space, are solicited. Recent innovations in nanotechnologies, photonic crystals, photonic bandgap devices, quantum-well, quantum-dot and nanoparticle semiconductor components, molecularly engineered organic, biological and polymer-based photonics both linear and nonlinear are sought. Papers that highlight and explore the latest innovations in hybrid-inorganic-organic/polymer technologies are strongly encouraged.

Papers reporting on commercial and military R & D breakthroughs and implementation of hardened nano-, micro-, and macrophotonic components and systems such as: optical fibers, fiber gratings, fiber amplifiers, and fiber lasers as well as optical sensors, optical data buses, high- and low-power laser sources, detectors, modulators, couplers, optical interconnects, multiplexers-demultiplexers, signal processing systems, guidance systems, targeting, radar, imaging, optical communications, optical limiter materials and components, as well as other related photonic technologies are solicited. Authors involved in demonstrations of photonic components and systems for radiation hardened space and terrestrial environments are especially encouraged to present papers. Papers are sought reporting on the use of photonics in aerospace, DOD applications, space missions, and space experimentation, as well as the related behavior of photonic sensors, systems, and components in the harsh environments found in particle accelerators.

Several keynote paper presentations dealing with specific photonics areas are planned and authors interested in presenting keynote topics should contact Conference Chair Ed Taylor at (505) 797-4799 or IntPhoton@aol.com.
Adaptive Coded Aperture Imaging and Non-Imaging Sensors V (OP517)

Conference Chairs: Stanley Rogers, Air Force Research Lab. (United States); David P. Casasent, Carnegie Mellon Univ. (United States)

Co-chairs: Timothy Clark, Defense Advanced Research Projects Agency (United States); Keith L. Lewis, Sciovis Ltd. (United Kingdom)

Program Committee: Ravindra A. Athale, MITRE Corp. (United States); David J. Brady, Duke Univ. (United States); Michael T. Eismann, Air Force Research Lab. (United States); Brian Gold, U.S. Air Force (United States); Stephen R. Gottesman, Northrop Grumman Electronic Systems (United States); Michael Groenen, U.S. Army Night Vision & Electronic Sensors Directorate (United States); James G. Grote, Air Force Research Lab. (United States); Mikhail A. Gutin, Applied Science Innovations, Inc. (United States); Thomas E. Haberfelde, Lockheed Martin Corp. (United States); Abhijit Mahalanobis, Lockheed Martin Missiles and Fire Control (United States); Mark E. McNie, QinetiQ Ltd. (United Kingdom); Mark A. Neifeld, The Univ. of Arizona (United States); Christopher W. Slinger, QinetiQ Ltd. (United Kingdom); LaVern A. Starman, Air Force Institute of Technology (United States); Nikola S. Subotic, Michigan Tech Research Institute (United States)

Papers are solicited in the following general categories:

- comparison of the effectiveness of adaptive coded aperture sensors in relation to conventional IR FPA systems with/without signal processing
- design of adaptive coded aperture sensors and their radiometric performance, including novel architectures derived from bio-inspiration
- identification and discussion of novel IR, and other optical applications, for adaptive coded aperture imaging sensors and components
- novel mask technologies (employing micro- or nano-arrays) for optical switching, shuttering and phase modulation across various wavebands
- advanced algorithms for use in the de-convolution of the outputs of adaptive coded aperture sensors to provide real-time imagery
- novel developments of diffractive imaging hardware components which can be leveraged to enable adaptive coded aperture sensing (focusing on minimizing system size, weight, power, complexity, and cost while increasing processing speed)
- novel materials (nano, bio, etc.) for enabling better adaptive coded aperture sensor components and system developments
- advanced algorithms for use in the de-convolution of the outputs of adaptive coded aperture sensors to provide real-time imagery
- IR and other optical adaptive coded aperture sensor integration, test, and evaluation
- adaptive coded aperture imagers resolution, identification and discussion of novel IR, and other optical “applications,” for adaptive coded aperture imaging sensors and components
- embedded signal processing techniques exploiting FPGAs and related devices
- exploitation of multiple foveae to enable simultaneous addressing of multiple fields of regard
- field of view enhancement opportunities.

Adaptive Coded Aperture (Diffraction) Sensing is an emerging technology enabling real-time, wide-area IR/visible sensing and imaging. Exploiting unique imaging architectures, adaptive coded aperture sensors achieve wide field of view, near-instantaneous optical path repositioning and high resolution while reducing weight, power consumption, and cost of air- and space-borne sensors. Such sensors may be used for military, civilian, or commercial applications in all optical bands; however, this forum has a “special interest” focused on affordable, fast, compact, high-performance, robust diffraction-limited imaging sensors for IR applications.

This conference is intended as an international forum for the presentation and discussion of advances in adaptive coded aperture sensor technology, including applications, architecture, critical sub-systems, design, signal processing, algorithms, integration, test and evaluation of wide field of view and high-resolution coded aperture systems.

A major emphasis of the conference will be on the critical components used in adaptive coded aperture sensing, such as optical switch arrays and phase modulators used to create and control the high-speed adaptive coded aperture masks plus the associated signal processing and imaging algorithms. Strong emphasis will also be placed on novel component developments which will leverage, as a minimum, photonic-microsystems, MEMS, MOEMS, and nanophotonic technologies. Novel materials (nano, bio, etc.) which may be leveraged for better system performance/efficiency opportunities are also encouraged. In addition, adaptive coded aperture imaging systems and components and system architecture will be covered. Finally, it is anticipated that selected applications will be covered, especially in tactical (including autonomous platforms) and security systems as well as in global surveillance.

This conference will bring together researchers, developers, and users of coded aperture imagers from government, academia, FFRDC, and industry to discuss different imaging and non-imaging techniques, technology, and components as well as a broad spectrum of applications.

Participation is expected from all branches of DoD, Intelligence Community, Homeland Security, NASA, NOAA, law enforcement, and urban development groups, and from overseas.
Call for Papers

Unconventional Imaging VII (OP518)

Conference Chairs: Jean J. Dolne, The Boeing Co. (United States); Thomas J. Karr, Raytheon Space & Airborne Systems (United States); Victor L. Gamiz, Air Force Research Lab. (United States)

Program Committee: Stephen C. Cain, Air Force Institute of Technology (United States); James R. Fienup, Univ. of Rochester (United States); Wes D. Freiwald, Pacific Defense Solutions, LLC (United States); Richard B. Holmes, Boeing LTS Inc. (United States); Liren Liu, Shanghai Institute of Optics and Fine Mechanics (China); Zhaowei Liu, Univ. of California, San Diego (United States); Sergio R. Restaino, Air Force Research Lab. (United States); Michael C. Roggemann, Michigan Technological Univ. (United States); Robert K. Tyson, The Univ. of North Carolina at Charlotte (United States); David G. Voelz, New Mexico State Univ. (United States)

The combination of novel imaging techniques, sophisticated synthesis and reconstruction algorithms, and powerful digital computers promises revolutionary advances in high-resolution imagery with higher information content than that offered by conventional imagery. Evolving techniques have exploited diverse properties of the electromagnetic-field and novel measurement schemes. The digital computer has become an important tool in the synthesis of high-resolution imagery from measurements and the subsequent analysis and interpretation. Application areas include long-range imaging through atmospheric turbulence, optical and electron microscopy, synthetic aperture imaging, 3- and 4D imaging, tomographic imaging, biological imaging and imaging of nanostructures.

The objective of this conference is to bring together scientists and researchers interested in the development of unconventional imaging techniques as well as those interested in the scientific interpretation and analysis of the imagery with enhanced information content. Therefore, we seek papers that describe novel imaging approaches using unconventional means of sensing, collection, data processing, and interpretation. Desired are papers that discuss imaging concepts, with various combinations of analysis, modeling and simulation, or experimental results.

Papers from industry, government, academia, and other research organizations are solicited on the following and related areas:

- imaging from active or passive illumination
- imaging from image-plane measurements, pupil-plane measurements, or both
- imaging from diversity measurements, including phase diversity, polarization diversity, aperture diversity, wavelength diversity, and wavefront sensing
- imaging through turbid media
- imaging using ultra-fast pulses
- synthetic aperture imaging
- multidimensional imaging
- nanoimaging
- mm wave imaging
- image fusion and stitching
- superresolution image processing
- multispectral and hyperspectral imaging
- information-theoretic limits for image recovery and synthesis
- experimental results or hardware related to the implementation of unconventional imaging systems
- modeling and applications for which image recovery and synthesis are important.

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