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2012 Security+ Defence

24–27 September 2012

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Location
Edinburgh International Conference Centre
Edinburgh,
United Kingdom

Co-located with SPIE Remote Sensing

Conference
24–27 September 2012

Exhibition
25–26 September 2012

Technologies
- Electro-Optical Sensing
- Infrared Systems
- Optical Materials and Technologies
- Unmanned/Unattended Sensors and Networks
- Biological and Chemical Sensing
- Imaging and Display Technologies

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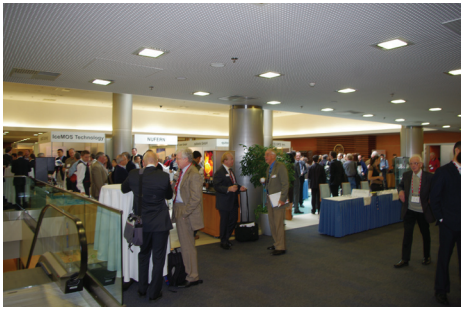

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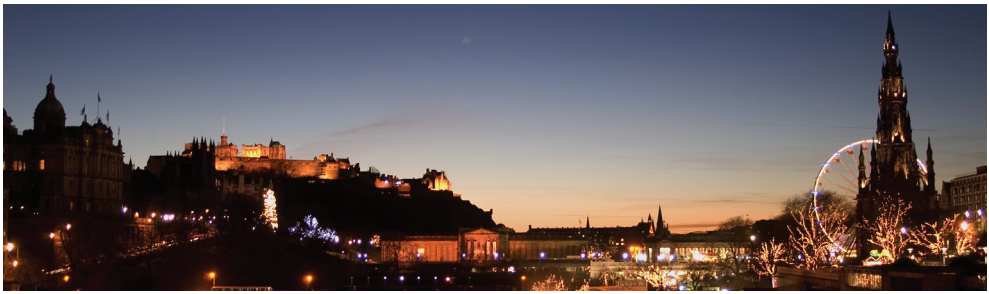

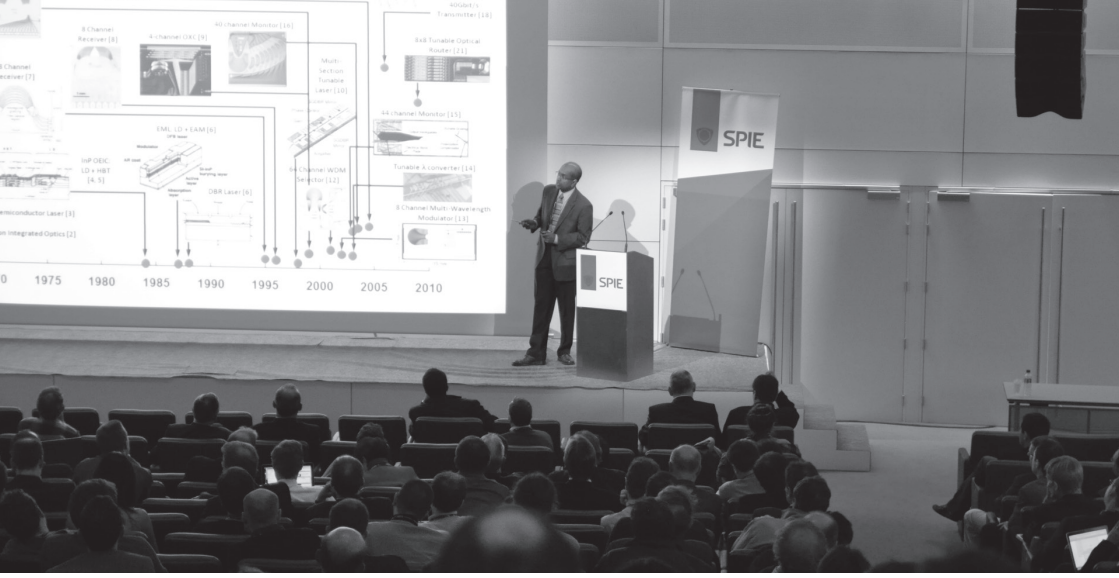

Conferences

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In addition to providing membership services, SPIE Europe Ltd. organises and manages internationally recognised conferences, education programmes, and technical exhibitions featuring emerging technologies in optics and photonics.

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Leslie C. Laycock, BAE Systems (United Kingdom)

Colin Lewis, Ministry of Defence (United Kingdom)

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David H. Titterton, Defence Science and Technology Lab. (United Kingdom)

Henry J. White, BAE Systems (United Kingdom)

Roberto Zamboni, Consiglio Nazionale delle Ricerche (Italy)

Plan now to participate

The Organising Committee of the ninth SPIE Security+Defence invites you to submit papers to this exciting meeting: this event crosses the divide between fundamental optical science and the application of the underpinning technologies in advanced defence and security systems. This symposium will be co-located with the 19th SPIE Remote Sensing Symposium, which enhances opportunities to identify new partners for collaboration from related fields of activity.

Showcase your multi-disciplinary research in a major international forum. New challenges continue to emerge as strategies such as network-enabled capability/network-centric warfare evolve. Similarly, the problems posed by asymmetric warfare, by military operations in the urban theatre and in peacekeeping are changing the way that the fundamental and emerging technology base is likely to be exploited in the future.

This unique symposium will offer many opportunities to network with colleagues from a variety of disciplines in academia, industry, and government from all over the world, whilst still maintaining a distinctly European focus.

SPIE Security+Defence Symposium will consider all aspects of this evolving field of optics and photonics:
- Materials
- Optical devices
- Enabling technologies
- Advanced concepts
- Sensors (including their design, fabrication and exploitation)
- Silicon micro-systems
- Nanotechnology
- Bio-inspiration and biomimetics
- Signal processing and control
- Laser technologies and their application
- Electro-optic systems and concepts
- Modelling and simulation
- Quantum Cryptography.

Other relevant topics are also welcome to ensure a vibrant meeting. Engineers and researchers from government, military, academia and the commercial sector will discuss current status and future directions of a wide range of R&D projects. Participation from academic institutes is especially encouraged; graduate and undergraduate student researchers are invited to submit their work and interact with international leaders. All papers presented at this event will appear in the SPIE Digital Library.

We look forward to seeing you at Security+Defence 2012, where opportunities abound for combining cutting-edge science and technology with the beauty of the historic city of Edinburgh.

David H. Titterton
Defence Science and Technology Lab. (United Kingdom)

2012 Symposium Chair

Reinhard Ebert
Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

2012 Symposium Co-Chair

Unmanned/Unattended Sensors and Sensor Networks (SD101)

Conference Chair: **Edward M. Carapezza**, General Atomics and Carnegie Mellon Univ. (United States)

Programme Committee: **James S. Albus**, National Institute of Standards and Technology (United States); **A. F. Mehdi Anwar**, Univ. of Connecticut (United States); **Mark E. Campbell**, Cornell Univ. (United States); **Pierre J. Corriveau**, Naval Undersea Warfare Ctr. (United States); **Sachi V. Desai**, U.S. Army Armament Research, Development and Engineering Ctr. (United States); **John M. Dolan**, Carnegie Mellon Univ. (United States); **Grant R. Gerhart**; **Todd M. Hintz**, Space and Naval Warfare Systems Command (United States); **Myron E. Hohil**, U.S. Army Armament Research, Development and Engineering Ctr. (United States); **Ivan Kadar**, Interlink Systems Sciences, Inc. (United States); **Tariq Manzur**, Naval Undersea Warfare Ctr. (United States); **George C. McNamara**, Naval Undersea Warfare Ctr. (United States); **Nino Srour**, U.S. Army Research Lab. (United States); **Huub A. van Hoof**, TNO Defence, Security and Safety (Netherlands)

This conference will offer an opportunity to explore and promote advances in all aspects of unmanned and unattended sensors and potential uses and benefits for peacetime and wartime scenarios. The objectives of this conference are to foster interest by the potential customer community, and partnerships, and technology sharing by the research, development, and acquisition communities.

Papers are solicited related to unattended ground and ocean sensors in the following areas:

- application concepts for unattended ground and ocean sensors (e.g. force protection, counter and nonproliferation, treaty verification, cooperative monitoring, drug/law enforcement, counter-terrorism, border protection, replacement for explosive mine systems, etc.)
- unattended and micro-unattended ground sensor technologies for both ground (built up and open terrain) and ocean/littoral environments including imaging (visible and IR), seismic, acoustic, magnetic, turbulence, chemical and biological sensors and related sensor systems.
- environmental models (seismic, acoustic, etc) and signal source models and characterizations (aircraft, ground vehicles, humans, animals, facilities, etc), unattended and micro-unattended ground sensor technologies for both ground (built up and open terrain) and littoral environments including imaging, seismic, acoustic, magnetic, turbulence, chemical and biological sensors and related sensor systems
- smart sensor, computationally efficient signal and data processing algorithms (e.g. detection, classification, ID, tracking, data fusion, data compression, array initialization and organization, and power management) and related intelligent processing technologies mobile unattended and micro-unattended ground and ocean sensors
- sensor exfiltration and command and control technologies including communications and tag related technologies for systems of unattended ground sensors (e.g. mobile and implanted devices including control, information transmission, and multi-platform and sensor networking approaches and technologies)
- ground and ocean sensor platform developments and system-level technologies and concepts (e.g. modularity, concealment, power management and storage, platform management, emplacement, countermeasures, and tamper proofing). unattended sensor deployment technologies (e.g. air delivery, wall attachment, wall climbing, submerged attachments)
- systems' integration
- biologically inspired sensors
- novel power and energy conversion systems for sensors (e.g. solar, wind, ocean, microbial, motion parasitic).

Papers are solicited related to unmanned ground, air and ocean sensor systems, vehicles and associated sensor networks in the following topic areas:

- intelligent vehicle systems including embedded world and vehicle realtime control models and architectures
- machine perception, path planning and navigation
- intelligent vehicle collaboration and co-ordination with other vehicles and fixed sensor systems
- vehicle mobility, motion control, and novel mobility platforms
- sensor deployment and recovery technologies for unmanned vehicle operations
- vehicle payloads and mission execution
- operator interface, human-robot interactions, man/machine interface
- biologically inspired air, ground and undersea robotic and sensor systems
- vehicle sensor configurations for enhanced mobility, collaboration, and perception
- sensor fusion, sensor field management, and integration
- sensor and vehicle communication systems (e.g. underwater acoustic comms, RF, laser, etc)
- system performance modeling and simulation
- government Programmes: technical and performance challenges
- commercial and civilian UAVs, UGVs, and UUVs.

Electro-Optical and Infrared Systems: Technology and Applications (SD102)

Conference Chairs: **David A. Huckridge**, Malvern Innovations (United Kingdom);
Reinhard R. Ebert, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

Programme Committee: **Christopher C. Alexay**, StingRay Optics, LLC (United States); **Jan Y. Andersson**, Acreo AB (Sweden); **Rainer Breiter**, AIM INFRAROT-MODULE GmbH (Germany); **Gordon A. Cain**, Vision4ce Ltd. (United Kingdom); **David J. Clarke**, SELEX Galileo Ltd. (United Kingdom); **Gérard L. Destéfanis**, CEA-LETI (France); **Jean-Claude L. Fontanella**, Thales Optronique S.A. (France); **Natan S. Kopeika**, Ben-Gurion Univ. of the Negev (Israel); **José M. López-Alonso**, Univ. Complutense de Madrid (Spain); **John F. Parsons**, Thales Optronics Ltd. (United Kingdom); **Stanley R. Rotman**, Ben-Gurion Univ. of the Negev (Israel); **Armin L. Schneider**, Institut Franco-Allemand de Recherches de Saint-Louis (France)

Developments in electro-optic and infrared systems are key to providing enhanced capability to military forces. Advances in these technologies have been aimed not only at increasing system performance but also in making the systems accessible to more users through reductions in size, weight, and cost. These improvements will produce operational benefits in current applications as well as opening up new applications for E-O and IR systems in both the military and commercial environments.

EO and IR systems are also likely to benefit from recent advances in material research, for example new carbon based materials, nano-materials and metamaterials. These new materials promise new EO properties that could significantly change the way EO and IR systems are designed and built, e.g. new detector systems with enhanced properties or negative refractive index materials which could radically change the way optics are designed.

Computational Imaging, e.g. Pupil Plane Encoding, Coded Aperture Imaging, Compressive Imaging, etc, is another family of emerging technologies that will radically alter the way sensor systems are designed. These techniques combine optics and processing to provide a useable output from the sensor and can provide functionality not possible or practical with conventional system designs. Computational Imaging will require developments in specialist sub-components, non standard optics design and algorithm development to reconstruct the image.

Advanced technology by itself is not sufficient to give new and/or advanced capabilities, systems have to be designed and developed in a way that will enable their reliable and cost effective manufacture. This will involve adopting rigorous development and system engineering techniques. These are as crucial for the successful exploitation of sensor technology as the detector, optics and electronics.

This conference is aimed at bringing together researchers in the fields of E-O and IR sensor technologies, including related materials technologies, and those developing systems for defence and dual-use applications. Systems and technologies of interest cover the wavebands from UV to LWIR. Papers are solicited in the following areas:

- advanced materials for EO/IR, e.g metamaterials, nano-materials, carbon based materials
- focal plane array detector technologies
- passive imaging: modelling, design, and hardware
- active imaging: modelling, design, and hardware
- applications of EO and/or IR systems
- novel sensor techniques
- integrated and miniaturized sensors
- computational imaging: techniques, components, designs and algorithms
- multiband and hyperspectral sensors
- polarisation sensitive sensors
- reduced-cost optics and novel optical techniques
- imaging through the atmosphere
- signal and image processing
- defence and security applications
- system integration design and development issues
- system engineering approaches.

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Electro-Optical Remote Sensing (SD103)

Conference Chairs: **Gary W. Kamerman**, FastMetrix, Inc. (United States); **Ove Steinvall**, Swedish Defence Research Agency (Sweden)

Programme Committee: **Robert J. Grasso**, Northrop Grumman Electronic Systems (United States); **Laurent Hespel**, ONERA (France); **Dennis K. Killinger**, Univ. of South Florida (United States); **Martin Laurenzis**, Institut Franco-Allemand de Recherches de Saint-Louis (France); **Peter Lutzmann**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Kenneth J. McEwan**, Defence Science and Technology Lab. (United Kingdom); **Vasyl Molebny**, National Taras Shevchenko Univ. of Kyiv (Ukraine); **Peter N. Randall**, QinetiQ Ltd. (United Kingdom); **Philippe Réfrégier**, Institut Fresnel (France); **Philip J. Russell**, Max Planck Institute for the Science of Light (Germany); **Klamer Schutte**, TNO Defence, Security and Safety (Netherlands); **Monte D. Turner**, Defense Advanced Research Projects Agency (United States); **Maria J. Yzuel**, Univ. Autònoma de Barcelona (Spain)

Over the last half century, electro-optical remote sensing has developed into an essential military technology. The efficiency and efficacy of thermal imagers, light amplification sights, laser designators and rangefinders, and video trackers have been well established. New technologies now permit thermal imaging systems to operate in new spectral domains with improved efficiency. Passive RF devices can image through walls, and laser systems have moved past simple rangefinders to permit high-fidelity, three-dimensional imaging at extended ranges. Synthetic aperture optical radar has the potential to significantly extend the range of three-dimensional imaging. Laser Doppler vibrometry can now identify vehicles well beyond visual ranges. Passive hyperspectral imaging and remote laser spectroscopy can identify material types and even detect the presence of specific chemical species.

Meanwhile, fully automatic target detection, recognition, and identification have been highly desirable, but equally elusive objectives. The development of advanced and affordable signal and high-speed data processing, coupled with these new sensing technologies, now opens the opportunity for both automatic and autonomous target detection, recognition and identification. High-speed digital processing and advanced algorithms enable the fusion of the data from multiple sensors having different resolutions, perspectives and modes of operation at the pixel, feature or detection level to enhance the recognition and identification process.

These advances are coming available at a very opportune time. Low-intensity conflicts, unconventional warfare, urban combat, border security and the continued rise in terrorism has created a need for new and innovative application of these technologies in very unconventional ways. As a result, these technologies are finding their way into civil defense, law enforcement and counterterrorism efforts.

This conference will focus on new and improved methods, techniques, and applications of electro-optical remote sensing. Recent advances which make electro-optical remote sensing technically or economically viable for an even wider variety of applications will be emphasised. However, the development of technology cannot be effective without serious consideration of the applications of that technology. Papers on military, industrial, and commercial applications are solicited, including:

- robotics, 2D and 3D machine vision, autonomous land vehicle navigation and control, spacecraft docking system, collision avoidance for aircraft and marine vessels
- remote detection and analysis of chemical explosives, mine-like objects, weapons of mass destruction, water and air pollution
- automatic target detection, recognition and identification, signal and data processing, image segmentation, machine vision and information processing
- non-contact metrology, vibrometry, dynamics, and microdynamics measurement
- modeling, simulation and model validation
- calibration standards, testing standards and quality assurance procedures
- surveillance sensors, short and long distance ranging systems, topographic mapping and bathymetry systems, remote sensing of vegetation, surveying and image building emergency response (disaster management) as well as component technology and novel system architectures and applications
- security issues such as border control, remote explosive detection, general dangerous materials, person recognition at distance, weapon detection, see-through media (vegetation, water, smoke and fire) etc.

The objective of this conference is to bring together engineers and scientists from academia, industry and government from around the world to exchange results and ideas for future advancement of electro-optical remote sensing. Oral papers may be from 5 to 20 minutes each. Authors should indicate the amount of time desired for their presentation with the submission of the abstract.

Technologies for Optical Countermeasures (SD104)

Conference Chairs: **David H. Titterton**, Defence Science and Technology Lab. (United Kingdom); **Mark A. Richardson**, Cranfield Univ. (United Kingdom)

Programme Committee: **Brian Butters**, Chemring Countermeasures Ltd. (United Kingdom); **Zahir Daya**, Defence Research and Development Canada, Atlantic (Canada); **Marc Eichhorn**, Institut Franco-Allemand de Recherches de Saint-Louis (France); **Ian F. Elder**, SELEX Galileo Ltd. (United Kingdom); **Robert J. Grasso**, Northrop Grumman Electronic Systems (United States); **Helena Jelinková**, Czech Technical Univ. in Prague (Czech Republic); **Espen Lippert**, Norwegian Defence Research Establishment (Norway); **Stephen P. McGeoch**, Thales Optronics Ltd. (United Kingdom); **Benoit Mellier**, DGA/DCE/CELAR (France); **Ric H. M. A. Schleijpen**, TNO Defence, Security and Safety (Netherlands); **Dirk P. Seiffer**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Ove Steinvall**, Swedish Defence Research Agency (Sweden); **Mark R. Taylor**, Defence Science and Technology Organisation (Australia); **Hans Dieter Tholl**, Diehl BGT Defence GmbH & Co. KG (Germany)

The purpose of this conference is to provide a technical forum to enable increased awareness of optical countermeasure techniques and technologies. Optical countermeasure techniques have been used for thousands of years to provide a force multiplier on the battlefield. The use of optical techniques is attractive for a range of military activities as they often offer a simple and cost-effective method of defence.

The advent of the laser offered dramatic changes to all aspects of warfare, but other technologies have proved to be invaluable. This conference offers the opportunity to consider the impact of laser technology and other optical systems on operations on the battlefield. Moreover, this conference brings together the optical community at large and enables a discussion of novel applications of emerging techniques and technologies. Optical devices and technologies are often “dual-use” technologies as they may be used in medicine, manufacture and detection and identification of illegal items. There are a wide range of technologies for consideration at this conference:

- optical sources
- optical techniques
- optical methods.

Papers are solicited in the following broad categories of optical device and techniques/ technology:

- lasers (all types)
- pyrotechnic and flare devices
- smokes and obscurants
- lamps
- propagation
- beam steering and guiding
- aberration issues and compensation methods
- modelling and simulation
- applications (military and commercial)
- multi-mode/multi-functional operation
- component technology and methods
- “Homeland Defence” issues including: illegal migration, border security and urban operations
- other civil applications.

Plus many more.

Critical Dates

Abstract Due Date: 2 April 2012

Manuscript Due Date: 27 August 2012

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 for publication in the conference proceedings.

Military Applications in Hyperspectral Imaging and High Spatial Resolution Sensing (SD105)

Conference Chairs: **Gary J. Bishop**, BAE Systems (United Kingdom); **John Gonglewski**, European Office of Aerospace R&D (United Kingdom)

Programme Committee: **David C. Dayton**, Applied Technology Associates (United States); **Detlev M. Even**, NovaSol (United States); **Michael M. Myers**, Air Force Research Lab. (United States); **Michael F. Reiley**, H-Nu Photonics (United States)

The purpose of this conference is to provide a technical forum for discussions in the latest developments in the military applications of hyperspectral and airborne high spatial resolution scanning techniques. It has been demonstrated that hyperspectral sensing has the potential to detect low contrast targets which are spectrally only marginally different to the background against which they observed. There are, however, still many challenges in developing this technology to a position where it can provide accurate robust information to the warfighter. Of particular interest is the use of these systems in providing discriminating battlefield information from a UAV platform.

There is increasing need on the battlefield to provide wide area persistent surveillance at high spatial resolution for both unmanned and manned. A requirement therefore exists to develop electro optical systems which will provide ISR (Intelligence, Surveillance and Reconnaissance) for wide area persistent monitoring that can continuously detect and track the presence of a large number of targets over a wide target area. This will potentially require the development of compact multi-gigapixel systems with wide field of view optics. It will also need high bandwidth airborne processing.

Original papers are sought on, but not restricted to the following topics.

- design of compact hyperspectral sensors operating in the UV, VIS/NIR,SWIR, MWIR and LWIR
- installation of hyperspectral sensors in UAV platforms
- stabilisation techniques for hyperspectral sensors on moving platforms to provide registered imagery
- pre- and post-processing techniques to provide well characterised hyperspectral data
- development of novel hyperspectral algorithms for anomaly and matched filter detection techniques
- development of spectral unmixing techniques for detection of sub-pixel targets in hyperspectral data
- techniques for shadow removal and compensation for atmospheric illumination in hyperspectral data
- airborne collection of hyperspectral data including processed results
- techniques for creation of gigapixel camera systems including creation of composite focal plan arrays
- correction of inflight electro optic data (e.g. correction for atmospheric haze, turbulence, auto focus and auto exposure techniques)
- super pixel resolution enhancement
- high bandwidth airborne processing techniques
- example of data collection from airborne EO sensors.

Advanced Free-Space Optical Communication Techniques and Applications (SD106)

Conference Chairs: **Leslie Laycock**, BAE Systems (United Kingdom); **Henry J. White**, BAE Systems (United Kingdom)

Programme Committee: **Ivan Andonovic,** Univ. of Strathclyde (United Kingdom); **Shlomi Arnon**, Ben-Gurion Univ. of the Negev (Israel); **Charmaine Gilbreath**, U.S. Naval Research Lab. (United States); **Andrew R. Harvey,** Heriot-Watt Univ. (United Kingdom); **Dominic C. O'Brien,** Univ. of Oxford (United Kingdom); **Andrew M. Scott**, QinetiQ Ltd. (United Kingdom); **Zoran Sodnik**, European Space Research and Technology Ctr. (Netherlands); **Ian Underwood,** The Univ. of Edinburgh (United Kingdom)

Free-space optical communication provides high-capacity data links for defence and security. This conference will provide a forum for all professionals involved with both short and long range free-space optical techniques for communications and sensing. Subjects covered include research and technology advances in components and sub systems, requirements and analysis of present and future systems, and reviews of government and commercial programmes.

The conference will provide an overview useful to laser specialists as well as communication and optical system engineers, scientists, and managers.

Original papers are encouraged on, but are not limited to, the following topics:

- space-based systems
- terrestrial and airborne links
- short range optical interconnects
- modulated retroreflective communications
- sensor network communications
- free space optical sensing including identification of friend or foe
- modulation techniques and formats
- pointing, acquisition, and tracking
- atmospheric effects and compensation techniques
- transmitters, receivers, and subsystems
- laboratory demonstration hardware
- present and future systems.

Emerging Technologies (SD107)

Conference Chairs: **Keith L. Lewis**, Sciovis Ltd. (United Kingdom); **Richard C. Hollins**, Defence Science and Technology Lab. (United Kingdom); **Thomas J. Merlet**, Thales Air Systems S.A. (France)

Programme Committee: **Helen Bennett**, QinetiQ Ltd. (United Kingdom); **Tibor Berceli**, Budapest Univ. of Technology and Economics (Hungary); **Gerald S. Buller**, Heriot-Watt Univ. (United Kingdom); **Béatrice Cabon**, Institut National Polytechnique de Grenoble (France); **John P. R. David**, The Univ. of Sheffield (United Kingdom); **Didier J. Decoster**, Univ. des Sciences et Technologies de Lille (France); **Hugh D. Griffiths**, Univ. College London (United Kingdom); **Dominique Hamoir**, ONERA (France); **Eddie L. Jacobs**, The Univ. of Memphis (United States); **Steven R. Jost**, BAE Systems (United States); **Robert A. Lamb**, SELEX Galileo Ltd. (United Kingdom); **Chris R. Lawrence**, QinetiQ Ltd. (United Kingdom); **Javier Marti**, Univ. Politécnica de Valencia (Spain); **Stephen P. McGeoch**, Thales Optronics Ltd. (United Kingdom); **Miguel A. Piqueras**, DAS Photonics (Spain); **Julien Poette**, Institut National Polytechnique de Grenoble (France); **Ian K. Proudler**, Malvern Innovations (United Kingdom); **Kevin Ridley**, Malvern Innovations (United Kingdom); **Alwyn J. Seeds**, Univ. College London (United Kingdom); **Béla Szentpáli**, Research Institute for Technical Physics and Materials Science (Hungary); **Ian A. W. Vance**, Photonics Leadership Group (United Kingdom); **Mauro G. Varasi**, Crisel Instruments, s.r.l. (Italy); **Jean-Pierre Vilcot**, Institut d'Electronique, de Microélectronique, et de Nanotechnologie (France)

This conference brings together emerging activities in photonic technologies, including discriminative imaging, computational imaging, micro- and nano-technology sensors, photonic micro-devices, spectroscopic technologies, energy harvesting techniques and their associated defence applications.

Challenges posed when sensing under the difficult conditions presented in military environments lie at the heart of many applications of photonics. Techniques to understand and improve target discrimination, to enable more accurate target tracking and provide vision through turbulent atmospheres are emerging with both pre-detector and post-detector processing techniques making rapid progress. There are also requirements to support these with enablers for exploiting biometric signatures.

Many of the components within sensor systems can be miniaturised by exploiting novel microscale and nanoscale device concepts. The understanding of plasmonics and sub-wavelength scale metallo-dielectric structures is advancing, as is the realization of metamaterials at optical wavelengths. New approaches exploiting micro and nano-technologies can potentially provide for unprecedented advance in the ability to control the propagation of light and provide the basis of devices capable of being exploited in adaptive optics.

Improved active and passive components are required, including laser sources, modulators and photodetectors. New optical techniques and devices are showing promise for the processing of RF signals as well as the integration, hybridisation at chip level and packaging for microwave photonics. New functionalities are expected from this technology such as high-speed analogue to digital conversion and optical synthesis of microwave clock signals and advanced modulation techniques.

In the area of chemical and biological sensing, many of the underlying capabilities exploit photonic devices such as quantum cascade lasers in the search for improved techniques for the detection of concealed energetic materials and the remote sensing of precursor materials.

Advanced photon-counting technologies provide the basis for quantum communications, quantum sensing and quantum ghost imaging, especially when there are requirements for operating in covert environments. New approaches in the area of avalanche photodiode array technologies are emerging which allow operation across wide spectral ranges, but there are still shortfalls, especially in the SWIR band.

As interests shift towards the exploitation of small autonomous platforms and unmanned sensors, there are requirements to develop more effective solutions for reducing the reliance on battery technologies. This is driving research into different ways of energy harvesting by the exploitation of photovoltaic cells, fuel cells and advanced thermo-electric devices.

The conference seeks papers ranging from the underlying physics associated with photonic device technologies through to the exploitation of devices in defence applications including the application of embedded software to reduce adverse impact on communication channels in networked environments. Papers are solicited for this broad-ranging conference, including the following areas of activity:

- high-speed lasers, modulators, switches, filters and detectors
- microwave photonic devices including integration and interconnect techniques
- optical sampling and A to D converters
- metamaterials and plasmonics, both for the microwave and optical regimes
- optical signal processing including optical spectra synthesis
- microwave photonics modeling and simulation
- advanced focal plane detector concepts, including on-chip optics and processing
- architectures and techniques for discriminative imaging, including active imaging and imaging through turbulence
- computational imaging techniques and compressive sensing
- micro-optical-electro-mechanical systems
- algorithms and software for improving sensor exploitation
- novel approaches to micro- and nano-photonics
- devices for chemical and biological sensing exploiting photonic techniques
- optical components including coatings, films, polarisation control
- materials and material-property relationships relevant to photonic device performance
- bio-optics, bioinspiration and biometric techniques
- techniques for energy harvesting.

Millimetre Wave and Terahertz Sensors and Technology (SD108)

Conference Chairs: **Neil A. Salmon**, The Univ. of Manchester (United Kingdom); **Eddie L. Jacobs**, The Univ. of Memphis (United States)

Programme Committee: **Amir Abramovich**, Ariel Univ. Ctr. of Samaria (Israel); **Nicholas J. Bowring**, Manchester Metropolitan Univ. (United Kingdom); **Markus Peichl**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Douglas T. Petkie**, Wright State Univ. (United States); **Christopher A. Schuetz**, Phase Sensitive Innovations, Inc. (United States)

This conference provides a technical forum for increased awareness of enabling component technology developments, new and novel sensors, signal and image processing, and specific applications in the spectral band from 30GHz to 10THz.

Heretofore, most imaging has been done at optical and infrared wavelengths. In those bands, there are practical, affordable technologies which have been available for many years. However, at longer wavelengths, in the mmW and Thz bands, components and systems architectures are still emerging, offering new and complementary sensing modalities in terms of radiation propagation characteristics and information content sensed.

Passive millimeter wave imaging (1 millimeter to 10 millimeters) offers the opportunity to image in both fair and poor weather conditions. Furthermore the ability to penetrate dielectrics has given rise to new applications in security scanning where hidden weapons or contraband can be detected under clothing or hidden packages

Terahertz sensing, in the range between 300 GHz to 10 THz (1 millimeter to 30 micrometers), is attracting increased interest from military and security fields. This has to a large degree been stimulated by developments in novel detector and source technologies. These have lead to many new potential applications. There has also been exciting progress and new results in THz chemical and biological signature sensing and in the field of medicine. The conference plans to hold a joint session on terahertz sensing with the Optics and Photonics for Counterterrorism, Crime Fighting and Defence Conference (SD110).

Papers are solicited in the following broad areas of component technologies, sensors and applications:

- component technology: receivers, amplifiers, detectors, heterodyne mixers, sources, transmission lines and the associated packaging
- enabling technology: compressive sensing, MEMS, nanostructure and nanotechnology and photonic and optoelectronic technologies
- modeling, simulation and phenomenology
- imaging systems
- aircraft landing in poor/no visibility and ground taxiing
- concealed weapons and contraband detection
- handheld, portal and stand-off screening systems
- adverse weather intelligence, surveillance and reconnaissance imaging
- biomedical imaging
- driving/navigation on land and sea
- image and signal processing
- resolution enhancement/super-resolution
- spectroscopy and signatures
- non-imaging military applications
- ballistic missile (launch)/warhead detection/tracking
- stand off mmW threat warning systems
- mmW radar
- civil/commercial remote sensing
- oil spill detection/tracking
- earth observation
- natural disaster assessment.

Critical Dates

Abstract Due Date: 2 April 2012

Manuscript Due Date: 27 August 2012

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 for publication in the conference proceedings.

Optical Materials and Biomaterials in Security and Defence Systems Technology (SD109)

Conference Chairs: **Roberto Zamboni**, Consiglio Nazionale delle Ricerche (Italy); **François Kajzar**, Univ. d'Angers (France); **Attila A. Szep**, Air Force Research Lab. (United States)

Programme Committee: **Chantal Andraud**, Ecole Normale Supérieure de Lyon (France); **André-Jean Attias**, Univ. Pierre et Marie Curie (France); **Carrie M. Bartsch**, Air Force Research Lab. (United States); **Werner J. Blau**, Trinity College Dublin (Ireland); **Fabrice Charra**, Commissariat à l'Énergie Atomique (France); **Larry R. Dalton**, Univ. of Washington (United States); **Manfred Eich**, Technische Univ. Hamburg-Harburg (Germany); **Patrick Feneyrou**, Thales Research & Technology (France); **Barrett Flake**, European Office of Aerospace Research and Development (United States); **Emily M. Heckman**, Air Force Research Lab. (United States); **Charles Y. C. Lee**, Air Force Office of Scientific Research (United States); **Antoni C. Mitus**, Wroclaw Univ. of Technology (Poland); **Dieter Neher**, Univ. Potsdam (Germany); **Robert L. Nelson**, Air Force Research Lab. (United States); **Fahima Ouchen**, Air Force Research Lab. (United States); **Ullrich Pietsch**, Univ. Siegen (Germany); **Ileana Rau**, Polytechnical Univ. of Bucharest (Romania); **Marina Saphiannikova Grenzer**, Leibniz-Institut für Polymerforschung Dresdene e.V. (Germany); **Niyazi Serdar Sariciftci**, Johannes Kepler Univ. Linz (Austria); **Renato Seeber**, Univ. degli Studi di Modena e Reggio Emilia (Italy); **Kenneth D. Singer**, Case Western Reserve Univ. (United States)

This conference will highlight state of the art and emerging nano-bio materials and devices and their role in the development of new security and defence systems. The aim is to review materials and device R&D, in progress, in both Europe and the USA, based on nano-bio materials technologies for photonic, electronic and optoelectronic applications and to promote closer collaboration and awareness of common objectives and potential advances. It will also seek to bring together researchers from different materials science, physics, chemistry, biology and engineering areas. The conference should be of interest to research scientists and engineers, project managers, senior scientific staff, materials producers and device manufacturers in Europe and the USA.

Papers should focus on short technology reviews or recent results of new materials processes and devices, with particular application to security and defence technologies. The materials and devices may be based on nano-, bio- and metamaterials-based technologies including inorganics, organics, biopolymers, and hybrids as well as devices that take advantage of these materials technologies. Papers may address practical, theoretical and modeling aspects of the subject. Fields of study will include:

- organic, inorganic and hybrid-based photonics and optoelectronics
- organic inorganic and hybrid-based laser and amplifier materials
- smart materials, systems and devices for sensing and diagnostic
- organic and inorganic-based photodetectors
- organic and inorganic-based displays
- nanophotonic and nano-optoelectronics structures
- photonic bandgap materials
- biomolecular recognition materials
- biopolymer-based photonics
- biotronics
- biomaterials
- plasmonic structures and applications
- metamaterials and metamaterials-based devices
- nonlinear optical materials and devices
- predictive modeling of materials parameters for specific applications
- electroluminescent materials and devices
- photorefractive and photochromic materials and processes
- polymer optical waveguides and fibres
- multiphoton processes
- charge transport in organic materials
- simulation of physical processes in molecular media.

Optics and Photonics for Counterterrorism, Crime Fighting and Defence (SD110)

Conference Chairs: **Colin Lewis**, Ministry of Defence (United Kingdom); **Douglas Burgess**, Burgess Consulting (United Kingdom)

Programme Committee: **David A. Atkinson**, Pacific Northwest National Lab. (United States); **Benedicte Bascle**, Thales Optronique S.A. (France); **Richard R. Botten**, Ministry of Defence (United Kingdom); **Antonio A. Cantu**, System Planning Corp (United States); **David J. Clarke**, SELEX Galileo Ltd. (United Kingdom); **Giovanni Cocca**, SELEX Galileo Ltd. (United Kingdom); **Howard J. Cummins**, Her Majesty's Government Communications Ctr. (United Kingdom); **Bruno Desruelle**; **Brian E. Foulger**, Ministry of Defence (United Kingdom); **Gillian F. Marshall**, QinetiQ Ltd. (United Kingdom); **Niamh NicDaeid**, Univ. of Strathclyde (United Kingdom); **Svante C. Ödman**, Swedish Defence Research Agency (Sweden); **Harbinder S. Rana**, Defence Science and Technology Lab. (United Kingdom); **Salman Rosenwaks**, Ben-Gurion Univ. of the Negev (Israel); **Andrew M. Scott**, QinetiQ Ltd. (United Kingdom); **Neil C. Shand**, Defence Science and Technology Lab. (United Kingdom); **Robert J. Stokes**, Univ. of Strathclyde (United Kingdom); **Mauro G. Varasi**, Finmeccanica (Italy); **Peter W. Yuen**, Cranfield Univ. (United Kingdom)

This conference brings together emerging technologies in the field of optics and photonics to counter terrorism and crime, and to provide support to defence forces. It includes both remote detection and local identification of explosives, narcotics and chemical and biological warfare agents. Early warning sensors must provide an alert with fast, wide area coverage. They must offer accurate detection and low false alarm rate, using minimal consumables and with little or no operator involvement.

The conference is also concerned with people: assessing suspicious behavior from CTV imagery and determining contamination and prognosis of patients exposed to hazardous materials.

Technical developments in passive and active sensing open up the vision of more affordable instruments. Being smaller, lighter, and with a greater discriminating power, they are expected to make an increasing contribution to counter developing threats against homeland and overseas forces. Optical sensing is now extending from UV, through visible and infrared, into terahertz wavelengths, offering novel imaging systems with increased penetration through barriers, and spectroscopic techniques that can help characterize suspicious materials. The conference plans to hold a joint session on terahertz sensing with the Millimetre Wave and Terahertz Sensors and Technology Conference (SD108).

Increased computing power and advanced algorithms are expected to help in difficult scenarios such as the identification of people in crowded environments using face and iris recognition or other biometrics, and long range imagery through turbulent atmospheres.

The objective of this conference is to provide a forum for researchers, product engineers, military and government officials and system developers to present and discuss the latest developments in optically-based sensor and diagnostic technologies and their applications.

Original papers are sought on, but not restricted to, the following topics:

- optical design for small, lightweight systems
- optical tagging
- opto and semiconductor components
- lab on a chip concepts
- threats and background characteristics
- spectroscopy and imaging techniques
- active laser sensing and imaging
- multispectral sensing from UV to mm and THz wavelengths
- fusion of technologies
- chem/bio agents and explosives detection
- pathogen imaging techniques
- point and stand-off detection
- alerting, confirmatory and forensic sensors
- automation for medical diagnosis
- false alarm reduction
- system concepts
- integrated and/or automated solutions
- algorithms and processing for pattern recognition
- simulation for modeling sensor performance
- protective security devices
- biometrics for security screening
- techniques for longer range surveillance.

Quantum-Physics-Based Information Security (SD111)

Conference Chairs: **Mark T. Gruneisen**, Air Force Research Lab. (United States); **Miloslav Dusek**, Palacky Univ. Olomouc (Czech Republic); **John G. Rarity**, Univ. of Bristol (United Kingdom)

Programme Committee: **Jan Bouda**, Masaryk Univ. (Czech Republic); **Robert W. Boyd**, Univ. of Ottawa (Canada); **Gerald S. Buller**, Heriot-Watt Univ. (United Kingdom); **John Gonglewski**, European Office of Aerospace R&D (United Kingdom); **Richard J. Hughes**, Los Alamos National Lab. (United States); **Gregory S. Kanter**, NuCrypt LLC (United States); **Prem Kumar**, Northwestern Univ. (United States); **Norbert Lütkenhaus**, Univ. of Waterloo (Canada); **Vadim V. Makarov**, Norwegian Univ. of Science and Technology (Norway); **Ronald E. Meyers**, U.S. Army Research Lab. (United States); **Jane E. Nordholt**, Los Alamos National Lab. (United States); **Miles J. Padgett**, Univ. of Glasgow (United Kingdom); **Momtchil Peev**, Austrian Research Ctrs. GmbH - ARC (Austria); **Renato Renner**, ETH Zurich (Switzerland); **Andrew J. Shields**, Toshiba Research Europe Ltd. (United Kingdom); **Rupert Ursin**, Univ. Wien (Austria)

The purpose of this conference is to provide a technical forum for discussions in the latest developments in quantum-physics-based information security. Traditional approaches to information security rely on mathematical relationships associated with encryption keys and encryption algorithms to achieve practical security. Quantum computing is considered to be an emerging threat to these classical techniques. In principle, quantum key distribution with a one-time pad cipher provides a solution in the form of on-demand key generation and encryption that is indistinguishable from randomness and therefore fundamentally secure. Information-theory-based analyses consider both fundamental and practical issues to quantify the true security of such systems.

Quantum cryptography technologies have become sufficiently mature to experience commercialization in recent years, particularly for fiber network applications. There are, however, many challenges in developing this technology to a position where it can provide practical and provable security in defence applications. Quantum bit rates and fiber-link distances are presently small relative to those achieved in classical optical communications. The implications of non-ideal photon sources and detectors are to be considered and implementation over free-space quantum channels creates new challenges associated with unguided propagation, atmospheric turbulence, and background noise.

Original papers are sought on, but not restricted to the following categories and topics.

Applications
- quantum key distribution and quantum data encryption
- earth-satellite and satellite-satellite links
- quantum networks.

Security and Performance Analysis
- finite-key security analysis for general attacks
- device-independent security proofs
- security proofs for DV and CV QKD systems
- analysis of side-channel attacks and other loopholes.

Quantum Hacking
- implementation loopholes
- quantum computing threats to cryptography.

Enhanced Quantum Channels
- multi-channel and multi-level encoding techniques
- photon orbital angular momentum
- spatial, temporal, and frequency encoding and multiplexing techniques.

Mathematics
- quantum algorithms
- quantum cryptography primitives and protocols.

Technologies
- single-photon sources, detectors, and filters
- entanglement sources and detection
- random number generation
- probabilistic qubit amplifiers and their use in QKD
- quantum memories, gates, relays, and repeaters
- signals processing and computer architectures for quantum cryptographic systems.

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High-Power Lasers: Technology and Systems (SD112)

Conference Chairs: **Harro Ackermann**, High Energy Laser Joint Technology Office (United States); **Willy L. Bohn**, BohnLaser Consult (Germany)

The purpose of this conference is to provide a technical forum for the exchange of information related to aspects of high power laser research and development, and for the discussion of latest demonstrations of laser systems in militarily relevant scenarios. Numerous demonstrations have shown the capability of laser weapon systems in negating targets of military interest with the standard attributes of lasers preserved, such as precision, timelines, and minimal collateral damage. Many challenges remain and are being addressed to bring laser weapon systems to the maturity required for military field applications. Among these are power scaling, energy conversion efficiency, wavelength control, beam quality, thermal and power management, a variety of optical issues, as well as packaging and ruggedization.

A viable laser weapon will provide the battlefield commander with new engagement options and capabilities in defensive or offensive scenarios, and in a variety of environments. It can potentially provide improved standoff range, cause covert effects, handle extremely short time-line engagements, and enable precise control of damage in the target area. The requirement exists to develop efficient, effective laser weapon systems capable of depositing required amounts of energy on selected stationary or mobile targets to affect their negation.

Papers are solicited in the following broad areas of laser technology and laser development:

Lasers and Laser Architectures Suitable for Power Scaling
- gas, slab, disk, fiber
- efficiencies and thermal control
- beam combination - coherent, spectral, other
- packaging - size, weight, ruggedness.

Components
- diode pumps -efficiency, wavelength, linewidth, stability, cost
- optics, coatings
- couplers, combiners, isolators
- beam directors & adaptive optics.

Novel Design in Fiber and Slab Lasers
- photonic crystal fibers, other
- eye-safe fibers, Er, other
- single, multi-mode, gain, transport
- thermal management.

Laser Materials
- optical/mechanical/thermal
- ceramics
- manufacturing.

Edinburgh, Scotland's inspiring Capital, is one of the most beautiful cities in Europe, where stunning cultural heritage fuses with the best of modern, dynamic city life to create the perfect destination. The city and its surrounding area to the South and West have a high concentration of photonics related industries, along with a large number of educational institutes furthering research and training students.

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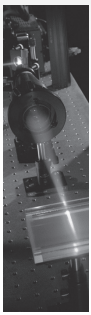

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Technical Programme

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