

TECHNICAL  
PROGRAMME

EXHIBITION  
GUIDE

# SPIE. SENSORS+ IMAGING

SPIE Remote Sensing | SPIE Security + Defence

16-19 SEPTEMBER 2024 | EICC | EDINBURGH, UNITED KINGDOM



# SPIE. SENSORS+ IMAGING

Conferences: 16–19 September 2024  
Exhibition: 17–18 September 2024  
EICC | Edinburgh, United Kingdom

## SPIE Remote Sensing | SPIE Security + Defence

The premier annual European event that showcases the latest sensor and photonic technologies for imaging and monitoring the Earth's atmosphere and environment, as well as sensor technologies that address homeland security, defence, and counterterrorism.



## Download the SPIE Conference and Exhibition App

Download the free mobile app to enrich your meeting experience. View events, exhibitors and connect with participants all in the palm of your hand. The app is free, easy to use, and loaded with features designed for planning and connecting on the go.

Make the most of your time with these app features:

- » Real-time programme updates
- » Customize your schedule
- » Organize your meeting notes
- » Add new connections to your contacts
- » Plan exhibitor visits
- » Navigate the venue
- » Bookmark specific research
- » Create meeting reports
- » And a whole lot more.

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### 2024 Symposium Chairs



#### **Ric Schleijsen**

2024 Security + Defence Chair  
TNO Defence, Security and Safety  
(Netherlands)



#### **Lorenzo Bruzzone**

2024 Remote Sensing Chair  
Univ. degli Studi di Trento  
(Italy)

### 2024 Symposium Co-Chairs



#### **Chantal Andraud**

2024 Security + Defence Co-Chair  
Ecole Normale Supérieure de Lyon  
(France)



#### **Claudia Notarnicola**

2024 Remote Sensing Co-Chair  
Eurac Research  
(Italy)



#### **Robert A. Lamb**

2024 Security + Defence Co-Chair  
Leonardo MW Ltd.  
(United Kingdom)





# Experience the energy of Sensors + Imaging

Get ready to enjoy real conversations, hear the latest breakthroughs, and make important connections in person. Hear cutting-edge research in the latest sensor and photonic technologies for imaging and monitoring the Earth's atmosphere and environment, as well as sensor technologies that address homeland security, defence, counterterrorism, and more. Attend technical presentations, free exhibition, plenary presentations, and a variety of networking activities.



## Remote Sensing Technical Conference Overview—PAGES 12-17

### Technical Conferences—Pages 32-72

Emerging sensor and photonic technologies that enable satellite-based atmospheric monitoring and observation of the Earth's ecosystems.



## Security + Defence Technical Conference Overview—PAGES 18-23

### Technical Conferences—Pages 73-110

The development of sensors and photonic technologies for defence, security, and counterterrorism applications.

### Plenary Sessions—PAGE 7

### Photonics Marketplace—PAGE 8-9

### Technical Events—PAGE 97

### Social and Networking Events—PAGE 10

### EXHIBITION—PAGES 24-29

The free exhibition will run 17-18 September 2024 offering a look at innovative technologies from detectors and sensors to lasers and imaging equipment.

Facility Map—PAGES 2-4

General Information—PAGE 6

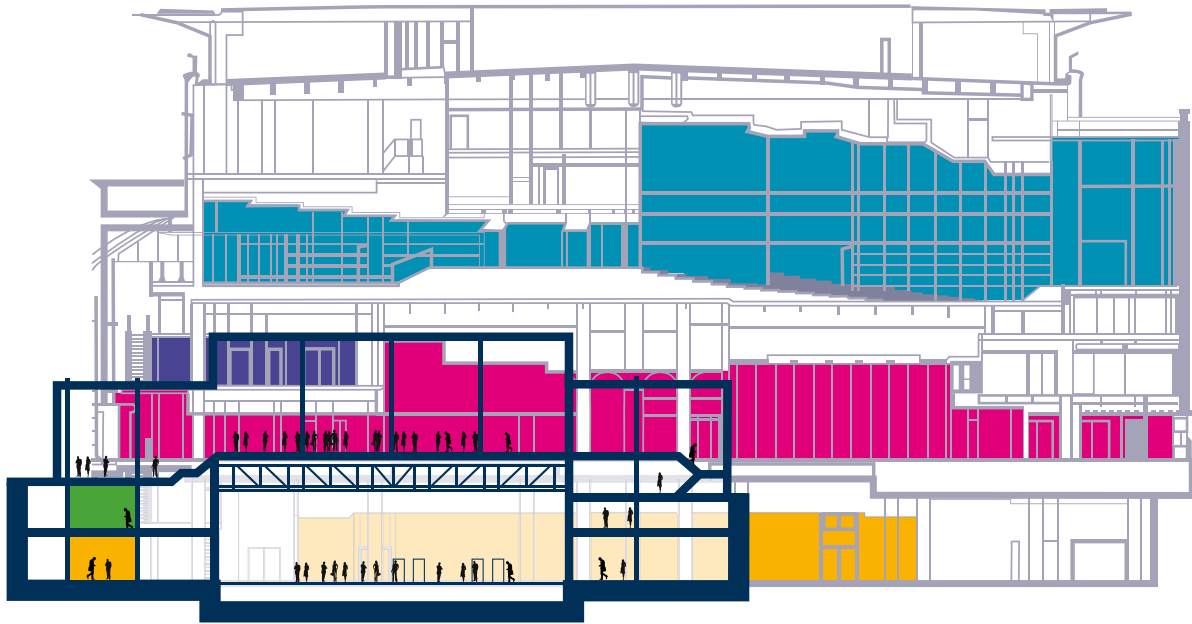
SPIE Corporate Members—PAGES 30-31

SPIE Policies—PAGES 111-112

[spie.org/esi](https://spie.org/esi)  
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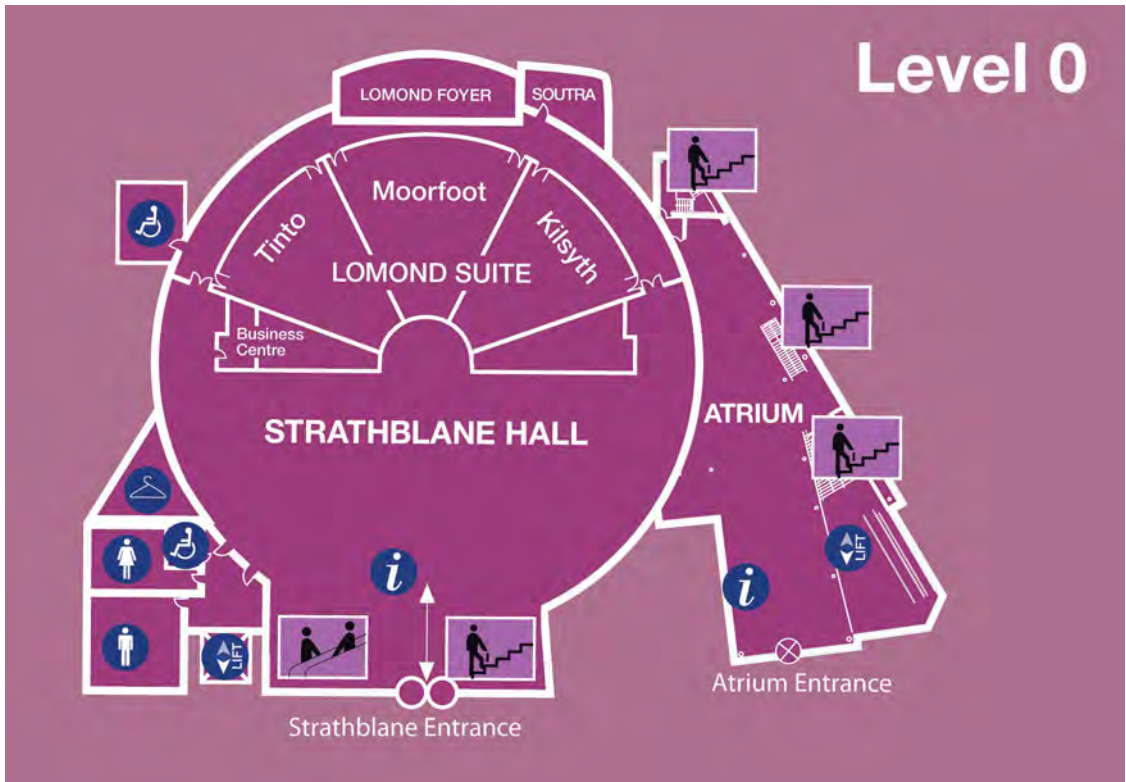


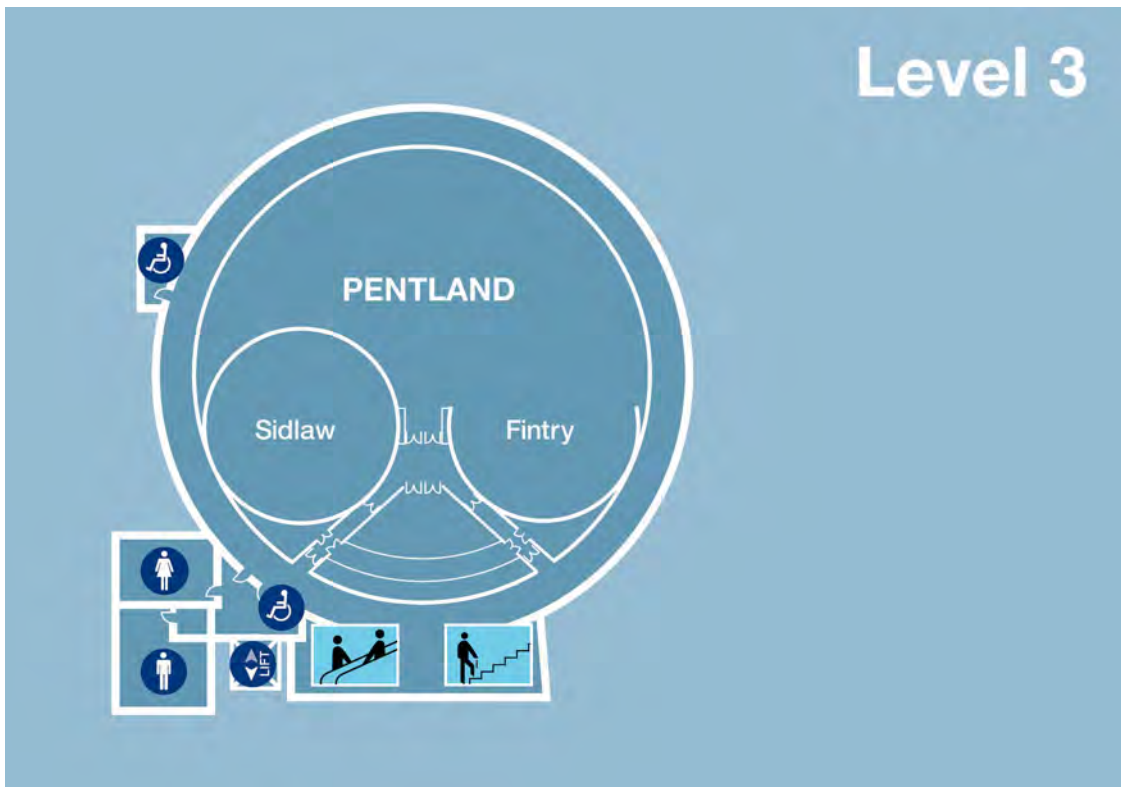
# EICC FLOOR PLANS



- Level 3: The Pentland Suite
- Level 1: The Galloway Suite & Atrium Café
- Level 0: Main Entrance, The Strathblane Hall, The Atrium & The Lomond Suite
- Level -1: Conference Organiser's Room, Menteith & Lowther
- Level -2: The Cromdale Hall, The Lennox Suite, Moffat & Lammermuir





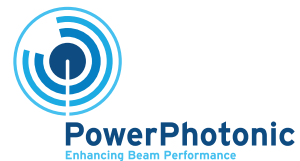


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Event Sponsor 

## General Sponsors



## Cooperating Organisations



# GENERAL INFORMATION

## Badge pick up and registration hours

Location: The Atrium, Lennox Entrance

|                         |               |
|-------------------------|---------------|
| Sunday, 15 September    | 15.00 - 17.00 |
| Monday, 16 September    | 07.45 - 17.00 |
| Tuesday, 17 September   | 08.00 - 17.00 |
| Wednesday, 18 September | 08.00 - 16.00 |
| Thursday, 19 September  | 08.00 - 16.00 |

## Exhibition hours

Location: Lennox Suite

|                         |               |
|-------------------------|---------------|
| Tuesday, 17 September   | 10.00 - 17.00 |
| Wednesday, 18 September | 10.00 - 16.00 |

## SPIE Cashier

Location: The Atrium, Lennox Entrance

Open during registration hours

### Receipt and Certificate of Participation

Preregistered attendees who need an SPIE-stamped receipt or attendees who need a Certificate of Participation may obtain those at the Cashier.

### Badge Corrections

Badge corrections can be made at the Cashier. Please mark your badge with your changes before approaching the counter.

## Speaker check-in and preview station

Location: Lomond Foyer

|                          |               |
|--------------------------|---------------|
| Sunday through Wednesday | 07:30 - 17:00 |
|--------------------------|---------------|

Speakers are not able to present using their own devices. All conference rooms are equipped with a computer workstation, projector, screen, lapel microphone, and laser pointer.

SPIE will record the audio plus screen content of all presentations; Recordings will be published on the SPIE Digital Library.

## SPIE Conference and Exhibition App

This useful tool allows you to search and browse the programme, special events, participants, exhibitors, and more. It is free and available for iPhone and Android phones. If you don't already have it, you can download the SPIE app.

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## Internet access

Complimentary wireless internet access will be available and login details will be available onsite; connection speed depends on the number of users. Please read the SPIE Wireless Service Policy.

Login details and password are available at the Registration Desk.

## SPIE luggage and coat check

Location: Cloakroom, Level-1

Open during registration hours.

Complimentary luggage, package, and coat storage are available. Please note opening hours.

## Business Center Office

### Copyprint Edinburgh

22 - 22a Morrison Street, Edinburgh EH3 8BJ

|                         |               |
|-------------------------|---------------|
| Sunday through Thursday | 07:30 - 17:00 |
|-------------------------|---------------|

Services include printing and scanning, pignage, laminating, digital and litho printing, large format printing.

[www.copyprintedinburgh.com](http://www.copyprintedinburgh.com)

## Child care services

This listing by SPIE does not imply an endorsement or recommendation of these services. They are provided on an "information only" basis for your further analysis and decision. Other services may be available.

To find childcare services, google City of Edinburgh Council - Find a childminder

## Mothers' Room

Location: Please request a key from the Registration Desk

The Mothers' Room is a lockable room intended for nursing mothers. There is no storage, running water, or refrigeration available in this space.

## Quiet Room

Location: Please request a key from the Registration Desk

The Quiet Room is intended for silent meditation, reflection, and prayer. No mobile devices or computer use is allowed, and no food or beverages are allowed.

## Lost and found

Location: SPIE Cashier

Found items will be kept at the SPIE Cashier in the Registration area during the meeting and available only during registration hours.

## Urgent message line

Messages for attendees can be left by calling +44 29 2089 4747. Message will be taken during registration hours Sunday - Thursday. It is the attendees' responsibility to check with the registration desk if they expect a message.

## Beverage services

### Coffee Breaks

Complimentary coffee

|                       |                   |
|-----------------------|-------------------|
| Monday and Thursday   | Conference Foyers |
| Tuesday and Wednesday | Lennox Suite      |

## Food and refreshments for purchase

There are snacks and cold drinks for sale in the Strathblane Foyer (Monday and Thursday) and the Lennox Suite (Tuesday and Wednesday). Please note that these are payment by card only, and no cash accepted. Other restaurants are in within walking distance of the EICC, as well as a short walk away at Haymarket.



# PLENARY SESSION

Hear from world-class speakers on research challenges and breakthroughs

Open to all paid conference attendees.

## Sensors + Imaging Plenary Session 16 September 2024 • 15:30 - 17:55 | Pentland Auditorium

Join us for exciting plenary lectures featuring presentations from a wide range of leaders in the field, highlighting design, fabrication, and defence and security system integration.

15:30 to 15:40

### Welcome and Introduction

15:40 to 16:25 hrs



#### Tracking Earth's ice from space

**Andrew Shepherd**

Northumbria Univ. and NERC Ctr. for Polar Observation and Modelling (United Kingdom)

Climate change has caused dramatic reductions in Earth's ice cover, which has in turn affected almost all other elements of the environment including global sea level, ocean currents, marine ecosystems, atmospheric circulation, weather patterns, freshwater resources, and the planetary albedo. Here, I show how satellite measurements have allowed us to quantify global ice losses over the past three decades across the principal components of Earth's cryosphere, and I explain which signals are beyond the capability of satellite remote sensing.

Ice is being lost from every corner of our planet, including Arctic sea ice, Southern Ocean sea ice, Antarctic ice shelves, mountain glaciers, the Greenland ice sheet, and the Antarctic ice sheet. Just over half of the ice loss was from the Northern Hemisphere, and the remainder was from the Southern Hemisphere. The rate of ice loss has risen since the 1990s, owing to increased melting from mountain glaciers, Antarctica, Greenland and from Antarctic ice shelves. During this period, the loss of grounded ice from the Antarctic and Greenland ice sheets and mountain glaciers raised the global sea level by more than 3.5 centimetres and has tracked the IPCC's worst case scenario. Earth's ice losses are being driven by atmospheric and oceanic warming, and monitoring them is key to improved predictions of our future.

16:25 to 17:10



#### Sensing in the second quantum revolution

**Francesco Saverio Cataliotti**

Univ. of Florence and National Institute of Optics, CNR (Italy)

Quantum Mechanics has revolutionized not only our understanding of Nature but also, being the foundation of electronics and lasers, virtually all the instruments we use every day. Then again, we have not yet been able to harness the consequences of the most profoundly quantum phenomena such as state superpositions and particle entanglement. The Second Quantum Revolution has the ambition of building novel "quantum machines" able to fully exploit the properties of both microscopic and macroscopic quantum states.

Quantum sensors, making use of the phenomenon of entanglement in systems promise to reach the fundamental measurement limits determined by the laws of physics and correspondingly improve the current performance of the sensors by orders of magnitude in terms of precision and accuracy, with important application implications in the scientific, industrial, and commercial fields. They can measure with unprecedented precision a wide class of physical quantities, such as magnetic, electric, and inertial fields, times, frequencies, temperatures and pressures.

17:10 to 17:55



#### Imaging and sensing that delivers operational advantage

**Jason Field**

Defence Science and Technology, Ministry of Defence (United Kingdom)

In a world of significant technological disruption, Defence's ability to mitigate future threats is underpinned by a strong science and technology base. I will provide examples of how we are working across UK academia and industry to develop and exploit key sensing and imaging technologies that will deliver future operational advantage to UK forces.

Our interests range from understanding fundamental novel optical and quantum phenomena to working in partnership with universities and industrial partners to demonstrate key concepts. I'll provide examples from the area of quantum sensing, where there is a real drive to test prototype technologies in relevant environments on airborne and maritime platforms. At a systems level I'll talk about how MOD is leading the development of architectures like Sapien - a key enabler for future integrated ISTAR systems. As we seek to continually adapt to new opportunities, I'll also talk about emerging themes such as distributed coherent sensing.

I'll close on one of the most important assets for the future of UK defence - a skilled UK workforce which we support through the funding of PhDs, including the recently announced the Sensing, Processing and AI for Defence (SPADS) Centre for Doctoral Training, jointly with EPSRC. Through such collaborations and our work with UK industry we are ensuring the UK armed forces can remain at the cutting edge of science and technology.



# PHOTONICS MARKETPLACE

Hear presentations from companies on the latest industry insights and directions for the optics and photonics community.

## Scottish Photonics Sector Capabilities

17 September 2024 • 08:15 - 09:45  
EICC, Moffat Room

Come and join us for coffee and breakfast rolls to learn more about some of the capabilities of the Photonics Scotland cluster of organisations! The session will start with a short introduction on the Scottish sector and be followed by short 3-minute pitches from a number of our members.

## Photonics Marketplace I

17 September 2024 • 10:00 - 17:00  
EICC, Lennox Suite

10:55 - 12:15

### SESSION 1: Making the Most of Opportunities in Defence

10:55 - 11:15

#### Global trends in export control



**John Lincoln**  
Director Strategy Europe,  
SPIE (United Kingdom)

11:15 - 11:35

#### UK/Fr EO seeker technology research



**Stephen Porter**  
Principal Scientist, MBDA (United Kingdom)



**Rianna Chandler**  
Leonardo UK (United Kingdom)



**Kwong Man**  
EO Technical Expert, MBDA (United Kingdom)

The Complex Weapons Innovation Technology Partnership (CW ITP) is a joint UK/French framework that supports research on a range of technologies relevant for future Generation After Next (GAN) UK and French missile systems. The framework is keen on supporting low-TRL technologies and encouraging collaboration between UK and French participants, including industry, SMEs and academia.

This presentation focuses on CWITP research on EO Seeker technology areas including; window materials, detector technologies, signal processing and survivability. Key technology challenges are discussed with highlights of recent projects.

11:35 - 11:55

#### Defence and security accelerator: why you might be interested in our funding

##### DASA Innovation Partner Scotland (United Kingdom)

The Defence and Security Accelerator (DASA) finds, funds and fast tracks innovative ideas benefiting HM Armed Forces and National Security. DASA runs competitions: Themed and an Open Call. We fund 100% FEC, do not take IP and do not take equity in companies. DASA also supplied a wrap-around business support service, assisting businesses wishing to work with Defence and National Security and offers some alternative funding sources. In this presentation, DASA will provide an overview of how it can help innovators.

11:55 - 12:15

#### MBDA vision: challenges and opportunities for photonics in Defence



**Gareth Hesketh**  
MBDA (United Kingdom)

MBDA is a unique multi-national European group, a world-leader in the field of complex weapons, playing a key role in keeping nations safe. This talk will give an overview of current and future challenges for photonics in defence, to address the full range of current and future operational requirements of the armed forces. The talk will also cover some of the opportunities for addressing those challenges through photonic technologies.

12:15 - 12:45

### SESSION 2: European Funding: Briefing from Photonics21

12:15 - 12:25

#### Photonics21 workgroup on Safety, Security, Space & Defence



**Eric T. Belhaire**  
Chair WG 5, Thales, Elancourt (France)

The talk will briefly overview the priority topics described in the Strategic Research Agenda for Safety, Security, Space & Defence. Therefore, we will present the priority for the call of the years to come which has been defined by the working group.

12:25 - 13:00

#### Funding opportunities from Photonics21 related to climate, mobility, and energy and agriculture & food



**Santiago Royo**  
Vice Chair WG4, Universitat Politecnica de Catalunya, Terrassa (Spain)

The talk will briefly overview the priority topics described in the Strategic Research Agenda for Climate, Mobility and Energy, while presenting the procedure and the main calls related to the topic. Furthermore, we'll introduce the coming calls expected for the coming years and explore cooperative calls linked to other partnerships.

13:00 – 13:45

### SESSION 3: UK Funding and Legal Support

13:00 – 13:15

#### Scoping our planet: funding opportunities at the intersection of optics and climate science



**Sarah Bohndiek**

Advanced Research and Invention Agency ARIA (United Kingdom)

In this talk, I will briefly introduce ARIA, a new UK R&D funding agency built to unlock scientific and technological breakthroughs for the benefit of everyone. I will introduce the opportunity space Scoping our Planet and our latest funding call on Forecasting climate tipping points, highlighting where the optics and photonics community can contribute.

13:15 – 13:30

#### Funding opportunities in Horizon Europe



**Craig Sharp**

Innovate UK, National Contact Point Horizon Europe (United Kingdom)

Horizon Europe is the EU's research and innovation programme and under associated status, the UK can lead and partner in projects across the programme. The 2025 calls are currently in development, and I will give an early indication on the themes that will be covered as well as actions for your organisation to prepare for these collaborative opportunities.

13:30 – 13:45

#### IP and patents: a practical guide for business



**Michael Street**

Principal, Marks & Clerks LLP (United Kingdom)

The presentation will address the following questions:

- What is intellectual property (IP) and why do I want it?
- What is a patent?
- How do I get a patent?
- What to protect, when to protect and where to protect?
- Patent ownership
- Infringement vs validity
- Practical advice for managing patents

13:45 – 15:15

### SESSION 4: Innovate UK Landscape and Funding Overview

Sensing and imaging technologies have applications in a wide variety of fields, each with its own landscape and funding opportunities.

This session will provide an overview of the Innovate UK activity and funding opportunities in:

- Space (Andy Bennett)
- AgriFood (Cathryn Lambourne)
- Security and Defence (Hazel Biggs)
- and others (Matthew Wasley)

Additionally, there will be the opportunity for companies and universities to pitch their capabilities and seek partners for collaboration.

If you are interested in pitching, please contact Matthew Wasley [matthew.wasley@iuk.ktn-uk.org](mailto:matthew.wasley@iuk.ktn-uk.org).

## Photonics Marketplace II

18 September 2024 • 10:00 - 16:00  
EICC, Lennox Suite

10:00 - 10:30

### COMPANY PRESENTATION

#### The OPAL test bench series: ultra-compact and versatile visible to thermal collimators



**Hoda Moustaid**

HGH (France)

Discover OPAL & OPALIN, new portable and ultra-light collimators, specifically crafted to perform essential tests for the proper functioning of thermal and day light weapon sights.

10:45 - 12:15

### PHOTONICS FOR SPACE NETWORK MEETING

#### Photonics Scotland (United Kingdom)

In this meeting of Technology Scotland's Photonics for Space Special Interest Group, which explores ways to highlight and expand the role of photonics in the space sector, we shall delve into opportunities in photonics and quantum technologies for space for the UK. The session will start with an overview of the landscape, and case study from an organisation which has taken part in European Space Agency projects. We will then have a panel session talking to stakeholders from across the UK to better understand the barriers and opportunities within the space sector for photonics and quantum technologies.

### Lunch Break

13:30 - 14:00

### COMPANY PRESENTATION

#### Latest developments in snapshot, hyper- and multi-spectral imaging



**Nick Barnett**

Pro-Lite Technology Ltd, (United Kingdom)

This presentation reviews some of the latest developments in snapshot spectral cameras that enable hyper- and multi-spectral imaging to capture 2D images at video rates with real-time classification.

14:00 - 14:30

### COMPANY PRESENTATION

#### Advances in LIDAR systems



**Arthur David**

Laser Components (UK) Ltd. (United Kingdom)

This talk will detail the critical components that determine the overall performance of LiDAR systems for various applications such as aerospace & defence, automotive and atmospheric LiDAR.

14:30 - 15:00

### COMPANY PRESENTATION

#### Meet Moku



**John Miller**

Liquid Instruments (United States)

John Miller, will share how to configure complex test setups and deploy custom capabilities with Moku, a reconfigurable suite of test instruments integrated into a single, FPGA-based device.



## TECHNICAL EVENTS

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Connect with your colleagues and explore topics in depth. Events may include technical networking sessions, workshops, and poster sessions.



### Poster Session

17 September 2024 • 17:30 - 19:00 | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. Authors of poster papers will be present to answer questions concerning their papers. Attendees are required to wear their conference registration badges to the poster sessions.

**Poster Setup: Tuesday 10:00 - 16:00**

Poster authors, view poster presentation guidelines and set-up instructions at <https://spie.org/ESI/poster-presentation-guidelines>.

## SOCIAL AND NETWORKING EVENTS

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Connect with colleagues in variety of ways throughout the week.



### Welcome Reception

16 September 2024 • 18:00 - 20:00

EICC, The Atrium

Open to all registered attendees.

All attendees are invited to the Welcome Reception. Relax, socialize, enjoy the refreshments, and explore this year's "Light Interference" Art-Science Exhibition. Please remember to wear your registration badge. Dress is casual.

**SPIE.**

## **digitally connected...**

It remains vitally important to stay fully connected with your customers.

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# TECHNICAL CONFERENCE OVERVIEW

## SPIE Remote Sensing

| TIME  | Conference 13191<br><b>Remote Sensing for Agriculture, Ecosystems, and Hydrology XXVI</b><br>Chairs: Christopher M. U. Neale; Antonino Maltese; Charles R. Bostater Jr.; Caroline Nichol<br><br>Location: Menteith  | Conference 13192<br><b>Sensors, Systems, and Next-Generation Satellites XXVIII</b><br>Chairs: Sachidananda R. Babu; Arnaud Hélière; Toshiyoshi Kimura<br><br>Location: Sidlaw | Conference 13193<br><b>Remote Sensing of Clouds and the Atmosphere XXIX</b><br>Chairs: Evgueni I. Kassianov; Simone Lolli<br><br>Location: Carrick | Conference 13194<br><b>Environmental Effects on Light Propagation and Adaptive Systems VII</b><br>Chairs: Karin Stein; Szymon Gladysz<br><br>Location: Carrick |
|---|---|---|--|--|
| <b>Monday 16 September 2024</b>                   |   |   |  |  |
| MORNING   | 9:10 - 10:20<br>Session 1: Marine Waters Sensing I  | 09:00 - 10:10<br>Session 1: US Missions and Technology I  |  |  |
|   | 10:20 - 10:50<br>Coffee Break   | 10:10 - 10:40<br>Coffee Break   |  |  |
|   | 10:50 - 12:00<br>Session 2: Marine Waters Sensing II  | 10:40 - 11:50<br>Session 2: US Missions and Technology II   |  |  |
| AFTERNOON   | 12:00 - 13:30<br>Lunch/Exhibition Break   | 11:50 - 13:40<br>Lunch/Exhibition Break   |  |  |
|   | 13:30 - 14:40<br>Session 3: Marine Waters Sensing III   | 13:40 - 15:00<br>Session 3: NASA PACE Mission I   |  |  |
|   | 14:40 - 15:30<br>Coffee Break   | 15:00 - 15:30<br>Coffee Break   |  |  |
| 15:30 - 17:55<br>Location:<br>Pentland Auditorium | <b>Sensors + Imaging Plenary Session</b><br>15:30 - 15:40: <b>Welcome and Introduction</b><br>15:40 - 16:25: <b>Tracking Earth's ice from space</b> , Andrew Shepherd, Northumbria Univ. (United Kingdom)<br>16:25 - 17:10: <b>Sensing in the second quantum revolution</b> , Francesco Saverio Cataliotti, LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy)<br>17:10 - 17:55: <b>Imaging and sensing that delivers operational advantage</b> , Jason Field, Ministry of Defence (United Kingdom) |   |  |  |

### SPIE. DIGITAL LIBRARY

INCLUDED WITH REGISTRATION

#### Presentations on the Digital Library

The SPIE Sensor + Imaging conference proceedings papers and presentations are published in the SPIE Digital Library. All paid conference registrations include 50 downloads for ongoing access.



|   |  |  |  |
|---|--|--|--|
| Conference 13195<br><b>Microwave Remote Sensing: Data Processing and Applications III</b><br>Chairs: Fabio Bovenga; Claudia Notarnicola; Nazzareno Pierdicca; Emanuele Santi<br>Location: Tinto | Conference 13196<br><b>Artificial Intelligence and Image and Signal Processing for Remote Sensing XXX</b><br>Chairs: Lorenzo Bruzzone; Francesca Bovolo<br>Location: Tinto | Conference 13197<br><b>Earth Resources and Environmental Remote Sensing/GIS Applications XXIX</b><br>Chairs: Lorenzo Bruzzone; Francesca Bovolo; Jon Atli Benediktsson<br>Location: Moorfoot | Conference 13198<br><b>Remote Sensing Technologies and Applications in Urban Environments IX</b><br>Chairs: Thilo Erbertseder; Nektarios Chrysoulakis; Ying Zhang<br>Location: Carrick |
|   |  |  | 09:00 - 10:20<br>Session 1: Urban Resilience and Planning  |
|   |  |  | 10:20 - 10:40<br>Coffee Break  |
|   |  | 10:45 - 11:00<br>Welcome and Opening Remarks   | 10:40 - 11:40<br>Session 2: Smart Cities and Infrastructure  |
|   |  | 11:00 - 12:00<br>Session 1: Environmental Monitoring Concepts I  |  |
|   |  | 12:00 - 13:50<br>Lunch/Exhibition Break  | 11:40 - 13:00<br>Lunch/Exhibition Break  |
|   | 13:30 - 13:40<br>Welcome and Introduction  | 13:50 - 15:00<br>Session 2: Environmental Monitoring Concepts II: Net Zero Transition  | 13:00 - 14:00<br>Session 3: Urban Air Quality and Climate I  |
|   | 13:40 - 15:00<br>Session 1: Pansharping, Superresolution, and Image Pre-processing   |  | 14:00 - 15:00<br>Session 4: Urban Air Quality and Climate II   |
|   | 15:00 - 15:30<br>Coffee Break  | 15:00 - 15:30<br>Coffee Break  | 15:00 - 15:30<br>Coffee Break  |



See full details and updates at [spie.org/esi](https://spie.org/esi) or on the **SPIE App**

# TECHNICAL CONFERENCE OVERVIEW

## SPIE Remote Sensing

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|---|--|---|--|--|
| <b>Tuesday 17 September 2024</b>        |  |   |  |  |
| MORNING                                 |  | 08:30 - 10:10<br>Session 4: NASA PACE Mission II  | 09:00 - 10:20<br>Session 1: Remote Sensing of Clouds, Aerosols, Trace Gases and Meteorological Parameters I                                    |  |
|   |  | 10:10 - 10:40<br>Coffee Break   | 10:20 - 10:50<br>Coffee Break  |  |
|   |  | 10:10 AM - 10:40<br>Session 5: Japanese Missions and Technology   | 10:50 - 12:10<br>Session 2: Remote Sensing of Clouds, Aerosols, Trace Gases and Meteorological Parameters II                                   |  |
| AFTERNOON                               |  | 12:10 - 13:20<br>Lunch/Exhibition Break   | 12:10 - 13:20<br>Lunch/Exhibition Break  |  |
|   | 13:30 - 15:30<br>Session 4: Machine Learning and Artificial Intelligence   | 13:20 - 15:10<br>Session 6: European Missions and Technology I  | 13:40 - 15:00<br>Session 3: Technologies, Techniques and Algorithms for Active and Passive Remote Sensing I                                    |  |
|   | 15:30 - 16:00<br>Coffee Break  | 15:30 - 15:40<br>Coffee Break   | 15:00 - 15:30<br>Coffee Break  |  |
|   | 16:00 - 17:00<br>Session 5: UAV Applications   | 15:40 - 17:30<br>Session 7: European Missions and Technology II   | 15:30 - 17:30<br>Session 4: Technologies, Techniques and Algorithms for Active and Passive Remote Sensing II                                   |  |
| 17:30 - 19:00<br>Location: Lennox Suite | <b>Posters-Tuesday</b><br>Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. |   |  |  |
| <b>Wednesday 18 September 2024</b>      |  |   |  |  |
| MORNING                                 | 08:50 - 10:20<br>Session 6: Surface Energy Balance and Micrometeorology  | 08:30 - 10:20<br>Session 9: Calibration and Validation I  |  | 09:35 - 09:40<br>Opening Remarks   |
|   | 10:20 - 10:50<br>Coffee Break  | 10:20 - 10:50<br>Coffee Break   |  | 09:40 - 10:20<br>Session 1: Characterization and Modelling of the Propagation Environment I  |
|   | 10:50 - 12:10<br>Session 7: SAR-based Flood and Vegetation Mapping: Joint Session with Conference 13195  | 10:50 - 12:30<br>Session 7: Calibration and Validation II   |  | 10:20 - 10:50<br>Coffee Break  |
|   |  |   |  | 10:50 - 11:30<br>Session 1 continued   |

|   |  |  |  |
|---|--|--|--|
| Conference 13195<br><b>Microwave Remote Sensing: Data Processing and Applications III</b><br>Chairs: Fabio Bovenga; Claudia Notarnicola; Nazzareno Pierdicca; Emanuele Santi<br>Location: Tinto | Conference 13196<br><b>Artificial Intelligence and Image and Signal Processing for Remote Sensing XXX</b><br>Chairs: Lorenzo Bruzzone; Francesca Bovolo<br>Location: Tinto | Conference 13197<br><b>Earth Resources and Environmental Remote Sensing/GIS Applications XXIX</b><br>Chairs: Lorenzo Bruzzone; Francesca Bovolo; Jon Atli Benediktsson<br>Location: Moorfoot | Conference 13198<br><b>Remote Sensing Technologies and Applications in Urban Environments IX</b><br>Chairs: Thilo Erbertseder; Nektarios Chrysoulakis; Ying Zhang<br>Location: Carrick |
| <b>Tuesday 17 September 2024</b>  |  |  |  |
|   | 08:50 - 10:10<br>Session 2: Image Analysis and Onboard Data Processing   | 09:10 - 10:10<br>Session 3: Infrastructures and Urban Area   |  |
|   | 10:10 - 10:40<br>Coffee Break  | 10:10 - 10:40<br>Coffee Break  |  |
|   | 10:40 - 12:00<br>Session 3: Deep Learning for Image Classification and Analysis I  | 10:40 - 12:00<br>Session 4: EO using GEE   |  |
|   | 12:00 - 14:00<br>Lunch/Exhibition Break  | 12:00 - 13:40<br>Lunch/Exhibition Break  |  |
|   | 14:00 - 15:20<br>Session 4: Deep Learning for Image Classification and Analysis II   | 13:40 - 15:20<br>Session 5: Hazard Mitigation Geologic Applications I  |  |
|   | 15:20 - 16:50<br>Coffee Break  | 15:20 - 16:50<br>Coffee Break  |  |
|   | 15:50 - 17:30<br>Session 5: Deep Learning for Image Classification and Analysis III  | 15:50 - 17:30<br>Session 6: Hazard Mitigation Geologic Applications II   |  |
| <b>Wednesday 18 September 2024</b>  |  |  |  |
|   | 08:30 - 10:10<br>Session 6: Data Analysis and Applications   | 09:20 - 10:20<br>Session 7: Processing Methodologies I   |  |
|   | 10:10 - 10:40<br>Coffee Break  | 10:20 - 10:50<br>Coffee Break  |  |
| 10:50 - 12:10<br><b>NOTE ROOM CHANGE Room Menteith</b><br>Session 1: SAR-based Flood and Vegetation Mapping; Joint Session with Conference 13191  | 10:40 - 12:20<br>Session 7: Radar and SAR Data Analysis  | 10:50 - 11:50<br>Session 8: Processing Methodologies II  |  |



# TECHNICAL CONFERENCE OVERVIEW

## SPIE Remote Sensing

| TIME                              | Conference 13191<br><b>Remote Sensing for Agriculture, Ecosystems, and Hydrology XXVI</b><br>Chairs: Christopher M. U. Neale; Antonino Maltese; Charles R. Bostater Jr.; Caroline Nichol<br>Location: Menteith | Conference 13192<br><b>Sensors, Systems, and Next-Generation Satellites XXVIII</b><br>Chairs: Sachidananda R. Babu; Arnaud Hélière; Toshiyoshi Kimura<br>Location: Sidlaw | Conference 13193<br><b>Remote Sensing of Clouds and the Atmosphere XXIX</b><br>Chairs: Evgueni I. Kassianov; Simone Lolli<br>Location: Carrick | Conference 13194<br><b>Environmental Effects on Light Propagation and Adaptive Systems VII</b><br>Chairs: Karin Stein; Szymon Gladysz<br>Location: Carrick |
|-----------------------------------|--|---|--|--|
| AFTERNOON                         | 12:10 - 13:30<br>Lunch/Exhibition Break  |   |  | 11:30 - 13:10<br>Lunch/Exhibition Break  |
|                                   | 13:30 - 15:10<br>Session 8: Monitoring Surface- and Groundwater Hydrology  |   |  | 13:10 - 15:20<br>Session 2: Characterization and Modelling of the Propagation Environment II   |
|                                   | 15:10 - 15:40<br>Coffee Break  |   |  | 15:20 - 15:50<br>Coffee Break  |
|                                   | 15:40 - 17:00<br>Session 9: Hyperspectral Remote Sensing and Spectroscopy  |   |  | 15:50 - 17:10<br>Session 3: Adaptive Optics and Alternatives for Mitigation of Atmospheric Effects   |
| <b>Thursday 19 September 2024</b> |  |   |  |  |
| MORNING                           |  |   |  | 08:30 - 09:30<br>Session 4: Laser Beam Propagation   |
|                                   | 09:00 - 10:30<br>Session 10: Irrigation Monitoring and Yield Estimation  |   |  | 09:30 - 11:50<br>Session 5: Channel Propagation Challenges in Laser Satellite Communications   |
|                                   | 10:30 AM - 11:00<br>Coffee Break   |   |  |  |
|                                   | 11:00 - 12:40<br>Session 11: Monitoring Agriculture and Land-Use Change  |   |  |  |
| AFTERNOON                         |  |   |  | 11:50 AM - 13:00<br>Lunch Break  |
|                                   |  |   |  | 13:00 - 16:30<br>Session 6: Channel Propagation Challenges in Free-Space Quantum Key Distribution  |

|   |  |  |  |
|---|--|--|--|
| Conference 13195<br><b>Microwave Remote Sensing: Data Processing and Applications III</b><br>Chairs: Fabio Bovenga; Claudia Notarnicola; Nazzareno Pierdicca; Emanuele Santi<br>Location: Tinto | Conference 13196<br><b>Artificial Intelligence and Image and Signal Processing for Remote Sensing XXX</b><br>Chairs: Lorenzo Bruzzone; Francesca Bovolo<br>Location: Tinto | Conference 13197<br><b>Earth Resources and Environmental Remote Sensing/GIS Applications XXIX</b><br>Chairs: Lorenzo Bruzzone; Francesca Bovolo; Jon Atli Benediktsson<br>Location: Moorfoot | Conference 13198<br><b>Remote Sensing Technologies and Applications in Urban Environments IX</b><br>Chairs: Thilo Erbertseder; Nektarios Chrysoulakis; Ying Zhang<br>Location: Carrick |
| 12:10 - 13:40<br>Lunch/Exhibition Break   | 12:20 - 13:50<br>Lunch/Exhibition Break  | 11:50 - 13:40<br>Lunch/Exhibition Break  |  |
| 13:50 - 14:50<br>Session 2: SAR Data Processing: Joint Session with Conference 13196  | 13:50 - 14:50<br>Session 8: SAR Data Processing: Joint Session with Conference 13195   | 13:40 - 15:00<br>Session 9: Satellite RS and Ground-based Nondestructive Technologies in Civil and Environmental Engineering I   |  |
|   |  | 15:00 - 15:30<br>Coffee Break  |  |
|   |  | 15:30 - 17:10<br>Session 10: Satellite RS and Ground-based Nondestructive Technologies in Civil and Environmental Engineering II   |  |
| <b>Thursday 19 September 2024</b>   |  |  |  |
| 08:40 - 10:30<br>Session 3: Hydrological Cycle  |  |  |  |
|   |  | 10:30 - 12:10<br>Session 11: Remote Sensing for Archaeology, Preservation of Cultural and Natural Heritage   |  |
| 10:30 - 11:00<br>Coffee Break   |  |  |  |
| 11:00 - 12:20<br>Session 4: Natural Hazards   |  |  |  |
| 12:20 - 13:30<br>Lunch Break  |  |  |  |
| 13:30 - 15:10<br>Session 5: Data Processing and Techniques  |  |  |  |



See full details and updates at [spie.org/esi](https://spie.org/esi) or on the **SPIE App**

# TECHNICAL CONFERENCE OVERVIEW

## SPIE Security + Defence

| TIME   | Conference 13199<br><b>Target and Background Signatures X: Traditional Methods and Artificial Intelligence</b><br>Chairs: Karin Stein; Ric Schleijsen<br>Location: Kilsyth  | Conference 13200<br><b>Electro-optical and Infrared Systems: Technology and Applications XXI</b><br>Chairs: Duncan L. Hickman; Helge Bürsing; Ove Steinvall; Philip J. Soan<br>Location: Fintry | Conference 13201<br><b>High-Power Lasers and Technologies for Optical Countermeasures II</b><br>Chairs: Willy L. Bohn; Marc Eichhorn; Gareth D. Lewis<br>Location: Ochil | Conference 13202<br><b>Quantum Technologies for Defence and Security</b><br>Chairs: Giacomo Sorelli; Sara Ducci; Sylvain Schwartz<br>Location: Kilsyth |  |
|--|---|---|--|--|--|
| <b>Monday 16 September 2024</b>                |   |   |  |  |  |
| MORNING  |   | 08:30 - 10:10<br>Session 1: Active and Passive Sensing  | 08:40 - 09:00<br>Welcome Address   |  |  |
|  |   |   | 09:00 - 10:20<br>Session 1: Laser and Beam Combination   |  |  |
|  |   | 10:10 - 10:40<br>Coffee Break   | 10:20 - 10:50<br>Coffee Break  |  |  |
|  | 10:45 - 10:50<br>Welcome and Opening Remarks  | 10:40 - 12:00<br>Session 2: Lidar Systems and Applications  | 10:50 - 12:10<br>Session 1: Continued  |  |  |
|  | 10:50 - 12:20<br>Session 1: AI Countering Camouflage and Vice Versa   |   |  |  |  |
| AFTERNOON                                      | 12:20 - 13:40<br>Lunch Break  | 12:00 - 13:10<br>Lunch Break  | 12:10 - 13:30<br>Lunch Break   |  |  |
|  | 13:40 - 14:50<br>Session 2: Detection, Recognition, Identification  | 13:10 - 15:10<br>Session 3: Detectors and Signal Processing   | 13:30 - 15:00<br>Session 2: Architecture and Power Scaling I   |  |  |
|  | 14:50 - 15:30<br>Coffee Break   | 15:10 - 15:30<br>Coffee Break   | 15:00 - 15:30<br>Coffee Break  |  |  |
| 15:30 - 17:55<br>Location: Pentland Auditorium | <b>Sensors + Imaging Plenary Session</b><br>15:30 - 15:40: <b>Welcome and Introduction</b><br>15:40 - 16:25: <b>Tracking Earth's ice from space</b> , Andrew Shepherd, Northumbria Univ. (United Kingdom)<br>16:25 - 17:10: <b>Sensing in the second quantum revolution</b> , Francesco Saverio Cataliotti, LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy)<br>17:10 - 17:55: <b>Imaging and sensing that delivers operational advantage</b> , Jason Field, Ministry of Defence (United Kingdom) |   |  |  |  |
| <b>Tuesday 17 September 2024</b>               |   |   |  |  |  |
| MORNING  | 08:30 - 10:40<br>Session 3: Scene and Signature Simulation  | 08:50 - 09:00<br>Electro-optical and Infrared Systems: Welcome and Opening Remarks  | 08:50 - 10:00<br>Session 3: Architecture and Power Scaling II  |  |  |
|  |   | 09:00 - 10:30<br>Session 4: UK Technology I   |  |  |  |
|  | 10:40 - 11:10<br>Coffee Break   | 10:30 - 11:00<br>Coffee Break   | 10:00 - 10:30<br>Coffee Break  |  |  |
|  | 11:10 - 12:00<br>Session 4: Testing and Validation  | 11:00 - 12:30<br>Session 5: UK Technology II  | 10:30 - 12:40<br>Session 4: Laser Effects and Simulations I  |  |  |

### SPIE. DIGITAL LIBRARY

INCLUDED WITH REGISTRATION

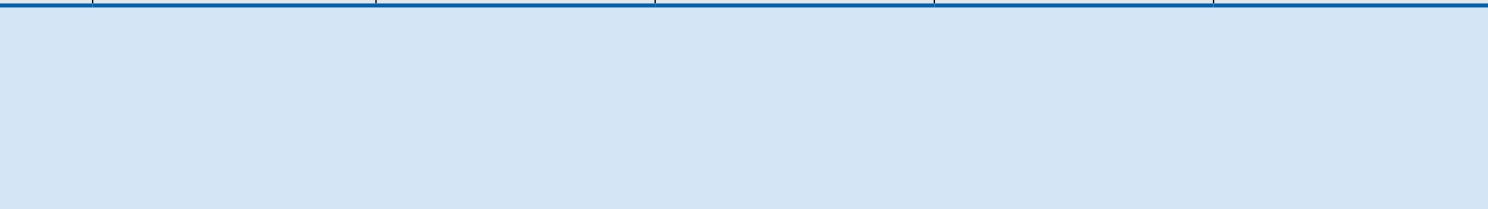
#### Presentations on the Digital Library

The SPIE Sensor + Imaging conference proceedings papers and presentations are published in the SPIE Digital Library. All paid conference registrations include 50 downloads for ongoing access.

|   |   |   |   |  |
|---|---|---|---|--|
| <b>Conference 13203<br/>Sensors and Communication Technologies in the 1 GHz to 10 THz Band</b><br>Chairs: Neil A. Salmon; Wladislaw Michailow<br><br>Location: Harris | <b>Conference 13204<br/>Emerging Imaging and Sensing Technologies for Security and Defence IX</b><br>Chairs: Gerald S. Buller; Robert A. Lamb; Martin Laurenzis<br><br>Location: Harris | <b>Conference 13205<br/>Advanced Materials, Biomaterials, and Manufacturing Technologies for Security and Defence II</b><br>Chairs: Chantal Andraud; Roberto Zamboni; Andrea Camposeo; Luana Persano<br><br>Location: Ochil | <b>Conference 13206<br/>Artificial Intelligence for Security and Defence Applications II</b><br>Chairs: Henri Bouma; Radhakrishna Prabhu; Yitzhak Yitzhaky<br><br>Location: Lowther | <b>Conference 13207<br/>Autonomous Systems for Security and Defence</b><br>Chairs: Judith Dijk; Jose Luis Sanchez-Lopez<br><br>Location: Carrick |
|---|---|---|---|--|

**Monday 16 September 2024**

|  |  |  |  |  |  |
|--|--|--|--|--|--|
|  |  |  |  |  |  |
|  |  |  |  |  | 09:30 - 02:20<br>Session 1: Applications and Use Cases         |
|  |  |  |  |  | 10:20 - 10:50<br>Coffee Break                                  |
|  |  |  |  |  | 10:50 - 12:20<br>Session 1: Continued                          |
|  |  |  |  |  | 12:20 - 13:30<br>Lunch/Exhibition Break                        |
|  |  |  |  |  | 13:30 - 15:00<br>Session 2: Autonomous Planning and Navigation |
|  |  |  |  |  | 15:00 - 15:30<br>Coffee Break                                  |



**Tuesday 17 September 2024**

|  |  |   |  |  |  |
|--|--|---|--|--|--|
|  |  | 08:30 - 10:20<br>Session 1: Advanced Imaging    |  |  | 08:50 - 10:10<br>Session 3: Object Detection and Classification I  |
|  |  | 10:20 - 10:40<br>Coffee Break                   |  |  | 10:10 - 10:40<br>Coffee Break                                      |
|  |  | 10:40 - 12:30<br>Session 2: Single-Photon Lidar |  |  | 10:40 - 12:10<br>Session 4: Object Detection and Classification II |



See full details and updates at [spie.org/esi](https://spie.org/esi) or on the **SPIE App**



# TECHNICAL CONFERENCE OVERVIEW

## SPIE Security + Defence

| TIME                                    | Conference 13199<br><b>Target and Background Signatures X: Traditional Methods and Artificial Intelligence</b><br>Chairs: Karin Stein; Ric Schleijpen<br>Location: Kilsyth   | Conference 13200<br><b>Electro-optical and Infrared Systems: Technology and Applications XXI</b><br>Chairs: Duncan L. Hickman; Helge Bürsing; Ove Steinvall; Philip J. Soan<br>Location: Fintry | Conference 13201<br><b>High-Power Lasers and Technologies for Optical Countermeasures II</b><br>Chairs: Willy L. Bohn; Marc Eichhorn; Gareth D. Lewis<br>Location: Ochil | Conference 13202<br><b>Quantum Technologies for Defence and Security</b><br>Chairs: Giacomo Sorelli; Sara Ducci; Sylvain Schwartz<br>Location: Kilsyth |  |
|---|--|---|--|--|--|
| AFTERNOON                               |  | 12:30 - 13:40<br>Lunch/Exhibition Break   | 12:40 - 14:00<br>Lunch/Exhibition Break  |  |  |
|   |  | 13:40 - 15:10<br>Session 6: Active Sensors and Laser Systems  | 14:00 - 15:00<br>Session 5: Laser Effects and Simulations II   | 13:10 - 15:20<br>Session 1: Atom-based Quantum Sensing for Navigation  |  |
|   |  | 15:10 - 15:40<br>Coffee Break   | 15:00 - 15:30<br>Coffee Break  | 15:20 - 15:50<br>Coffee Break  |  |
|   |  | 15:40 - 17:40<br>Session 7: Modelling and Simulation  | 15:30 - 17:30<br>Session 6: Laser Applications   | 15:50 - 17:30<br>Session 2: Quantum Optonics I   |  |
| 17:30 - 19:00<br>Location: Lennox Suite | <b>Posters-Tuesday</b><br>Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field. |   |  |  |  |
| <b>Wednesday 18 September 2024</b>      |  |   |  |  |  |
| MORNING                                 |  | 08:30 - 10:30<br>Session 8: Detectors and Focal Plane Technology I  |  | 09:10 - 10:30<br>Session 3: Quantum Optonics II  |  |
|   |  | 10:30 - 11:00<br>Coffee Break   |  | 10:30 - 11:00<br>Coffee Break  |  |
|   |  | 11:00 - 12:30<br>Session 9: Detectors and Focal Plane Technology II   |  | 11:00 - 12:40<br>Session 4: RF Sensing with Rydberg Atoms  |  |
| AFTERNOON                               |  | 12:30 - 13:40<br>Lunch/Exhibition Break   |  | 12:40 - 14:20<br>Lunch/Exhibition Break  |  |
|   |  | 13:40 - 15:20<br>Session 10: Optical Components and Design  |  | 14:20 - 15:10<br>Session 5: Quantum Computing and Simulation I   |  |
|   |  | 15:20 - 15:60<br>Coffee Break   |  | 15:10 - 15:50<br>Coffee Break  |  |
|   |  | 15:50 - 17:20<br>Session 11: DEBELA (DEtect BEfore LAunch) Project  |  | 15:50 - 17:20<br>Session 6: Quantum Computing and Simulation II  |  |
|   |  | 17:20 - 17:40<br>Session 12: Image and Data Processing I  |  |  |  |
|   |  |   |  |  |  |
|   |  |   |  |  |  |



See full details and updates at [spie.org/esi](https://spie.org/esi) or on the **SPIE App**

|   |   |   |   |  |
|---|---|---|---|--|
| <p><b>Conference 13203<br/>Sensors and Communication Technologies in the 1 GHz to 10 THz Band</b><br/>Chairs: Neil A. Salmon; Wladislaw Michailow</p> <p>Location: Harris</p> | <p><b>Conference 13204<br/>Emerging Imaging and Sensing Technologies for Security and Defence IX</b><br/>Chairs: Gerald S. Buller; Robert A. Lamb; Martin Laurenzis</p> <p>Location: Harris</p> | <p><b>Conference 13205<br/>Advanced Materials, Biomaterials, and Manufacturing Technologies for Security and Defence II</b><br/>Chairs: Chantal Andraud; Roberto Zamboni; Andrea Camposeo; Luana Persano</p> <p>Location: Ochil</p> | <p><b>Conference 13206<br/>Artificial Intelligence for Security and Defence Applications II</b><br/>Chairs: Henri Bouma; Radhakrishna Prabhu; Yitzhak Yitzhaky</p> <p>Location: Lowther</p> | <p><b>Conference 13207<br/>Autonomous Systems for Security and Defence</b><br/>Chairs: Judith Dijk; Jose Luis Sanchez-Lopez</p> <p>Location: Carrick</p> |
|   | 12:30 - 13:40<br>Lunch/Exhibition Break   |   |   |  |
|   | 13:40 - 15:30<br>Session 3: mmWave Sensing  |   | 13:40 - 15:20<br>Session 1: AI-based Localization, Fusion and Robot Surveillance  |  |
|   | 15:20 - 16:00<br>Coffee Break   |   | 15:20 - 15:50<br>Coffee Break   |  |
|   | 16:00 - 17:50<br>Session 4: Advanced Detectors and Processing   |   | 15:50 - 17:30<br>Session 2: AI and Maritime Surveillance  |  |
| <b>Wednesday 18 September 2024</b>  |   |   |   |  |
| 09:15 - 09:20<br>Welcome and Introduction   |   |   | 08:50 - 10:10<br>Session 3: AI-based Identification, Authentication and Privacy, and Vision-based AI  |  |
| 09:20 - 12:00<br>Session 1: Microwave and Terahertz Sensors and Applications  |   |   |   |  |
| 10:30 - 11:00<br>Coffee Break   |   |   | 10:10 - 10:40<br>Coffee Break   |  |
| 11:00 - 12:00<br>Session 1: Continued   |   |   | 10:40 - 12:20<br>Session 4: AI-based Detection, Classification and Matching   |  |
| 12:00 - 13:30<br>Lunch/Exhibition Break   |   |   | 12:20 - 13:40<br>Lunch/Exhibition Break   |  |
| 13:30 - 15:00<br>Session 2: THz Detectors, Focal Plane Arrays and Communication Technologies  |   | 13:20 - 15:20<br>Session 1: Metamaterials and Nanostructures  | 13:40 - 15:00<br>Session 5: AI and Synthetic Data Generation I  |  |
| 15:00 - 15:30<br>Coffee Break   |   | 15:20 - 15:50<br>Coffee Break   | 15:00 - 15:30<br>Coffee Break   |  |
| 15:30 - 17:00<br>Session 3: Metasurfaces, Imaging and Communication Technologies  |   | 15:50 - 17:40<br>Session 2: Additive Manufacturing Technologies for Advanced Applications   | 15:30 - 17:10<br>Session 6: AI and Synthetic Data Generation II   |  |
| 09:10 - 10:00<br>Session 4: THz Detectors, Microwave Radar Systems, and NDT Systems   |   |   |   |  |
| 10:00 - 10:30<br>Coffee Break   |   |   |   |  |
| 10:30 - 11:20<br>Session 4: Continued   |   |   |   |  |

# TECHNICAL CONFERENCE OVERVIEW

## SPIE Security + Defence

| TIME                              | Conference 13199<br><b>Target and Background Signatures X: Traditional Methods and Artificial Intelligence</b><br>Chairs: Karin Stein; Ric Schleijpen<br><br>Location: Kilsyth | Conference 13200<br><b>Electro-optical and Infrared Systems: Technology and Applications XXI</b><br>Chairs: Duncan L. Hickman; Helge Bürsing; Ove Steinvall; Philip J. Soan<br><br>Location: Fintry | Conference 13201<br><b>High-Power Lasers and Technologies for Optical Countermeasures II</b><br>Chairs: Willy L. Bohn; Marc Eichhorn; Gareth D. Lewis<br><br>Location: Ochil | Conference 13202<br><b>Quantum Technologies for Defence and Security</b><br>Chairs: Giacomo Sorelli; Sara Ducci; Sylvain Schwartz<br><br>Location: Kilsyth |  |
|-----------------------------------|--|---|--|--|--|
| <b>Thursday 19 September 2024</b> |  |   |  |  |  |
| MORNING                           |  | 09:00 - 10:20<br>Session 13: Image and Data Processing II   |  | 08:30 - 10:20<br>Session 7: NV Centers   |  |
|                                   |  | 10:20 - 10:50<br>Coffee Break   |  | 10:20 - 10:30<br>Coffee Break  |  |
|                                   |  | 10:50 - 12:50<br>Session 14: Infrared Systems and Applications  |  | 10:50 - 12:10<br>Session 8: Detectors and Sources  |  |
|                                   |  |   |  | 12:10 - 13:20<br>Lunch/Exhibition Break  |  |
| AFTERNOON                         |  |   |  | 13:20 - 15:30<br>Session 9: Quantum Communication  |  |



See full details and updates at [spie.org/esi](https://spie.org/esi) or on the **SPIE App**

|   |   |   |   |  |  |
|---|---|---|---|--|--|
| <p>Conference 13203<br/><b>Sensors and Communication Technologies in the 1 GHz to 10 THz Band</b><br/>Chairs: Neil A. Salmon; Wladislaw Michailow</p> <p>Location: Harris</p> | <p>Conference 13204<br/><b>Emerging Imaging and Sensing Technologies for Security and Defence IX</b><br/>Chairs: Gerald S. Buller; Robert A. Lamb; Martin Laurenzis</p> <p>Location: Harris</p> | <p>Conference 13205<br/><b>Advanced Materials, Biomaterials, and Manufacturing Technologies for Security and Defence II</b><br/>Chairs: Chantal Andraud; Roberto Zamboni; Andrea Camposeo; Luana Persano</p> <p>Location: Ochil</p> | <p>Conference 13206<br/><b>Artificial Intelligence for Security and Defence Applications II</b><br/>Chairs: Henri Bouma; Radhakrishna Prabhu; Yitzhak Yitzhaky</p> <p>Location: Lowther</p> | <p>Conference 13207<br/><b>Autonomous Systems for Security and Defence</b><br/>Chairs: Judith Dijk; Jose Luis Sanchez-Lopez</p> <p>Location: Carrick</p> |  |
| <b>Thursday 19 September 2024</b>   |   |   |   |  |  |
|   |   | <p>08:50 - 10:30<br/>Session 3: Emerging Materials for Defence and Security</p>   | <p>08:50 - 10:30<br/>Session 7: AI-based Detection and Adversarial AI</p>   |  |  |
|   |   | <p>10:30 - 11:00<br/>Coffee Break</p>   | <p>10:30 - 11:00<br/>Coffee Break</p>   |  |  |
|   |   | <p>11:00 - 12:10<br/>Session 4: Novel Architectures and Materials for Light-Source Detectors and Sensors</p>  | <p>11:00 - 12:40<br/>Session 8: AI-based Image Enhancement, and Novel AI Directions</p>   |  |  |





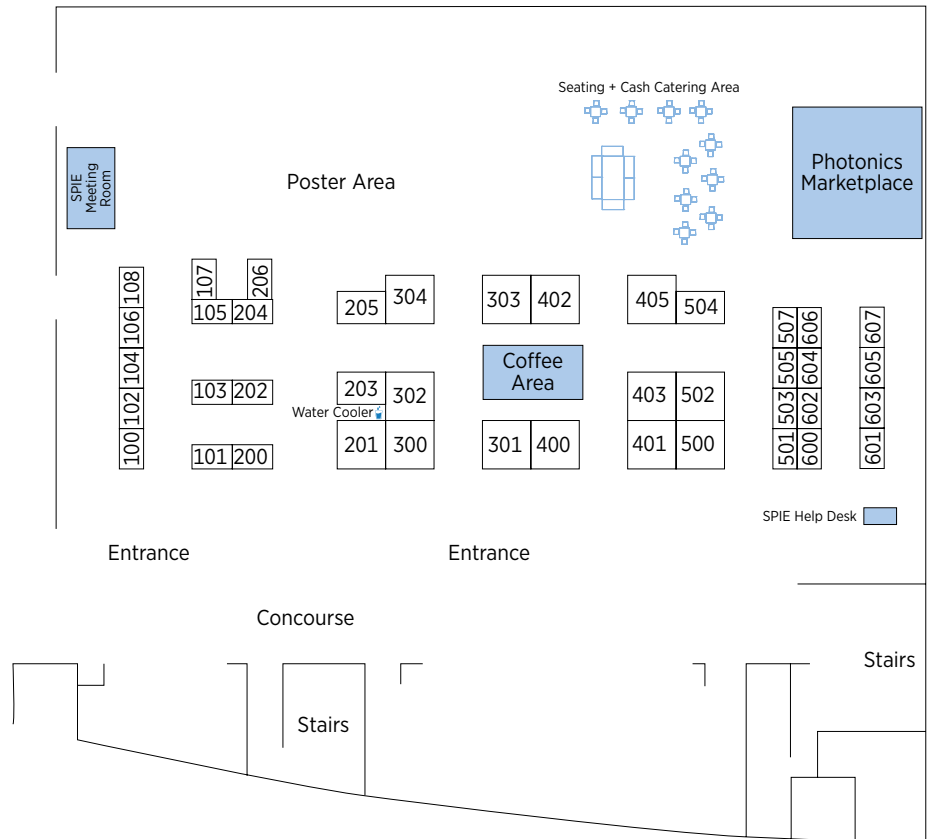
# Exhibitor Directory

Tuesday 17 September . . . . . 10:00-17:00  
 Wednesday 18 September . . . . . 10:00-16:00

Booth numbers provided in the Exhibition Guide may be cross-referenced with the floor plan below. The address of each exhibitor is also listed, making this Exhibition Guide an excellent reference tool.

## BOOTH # / EXHIBITOR

- 100 Everix, Inc.
- 101 Quantum Security Defense Working Group Limited
- 102 Innovate UK
- 103 Pyramid Engineering Services
- 104 UK Astronomy Technology Centre (UKRI)
- 105 Helia Photonics Ltd.
- 106 UKQuantum
- 107 Andover Corporation
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- 607 Hinalea Imaging Corp.



# EXHIBITOR LISTING

## 3D MicroPrint GmbH

#601

Technologie-Campus 1, Chemnitz, 09126 Germany  
+49 371 836521 16  
info@3dmicroprint.com; www.3dmicroprint.com

Small in size, but big in detail! 3D MicroPrint GmbH manufactures high-precision micro metal components using Micro Laser Sintering technology. We offer a comprehensive service from product design and prototype development through to series production.

## Andover Corporation

#107

**SPIE.** CORPORATE MEMBER

4 Commercial Dr., Salem, New Hampshire, 03079-2800, United States  
+1 603 893 6888; fax +1 603 895 6808  
info@andcorp.com; www.andovercorp.com

Andover Corporation is a leader in the design and manufacture of optical filters and coatings, excelling in first-surface hard coat, assembled coatings, and hybrid solutions, with superior quality and short lead times. As a vertically integrated company, we manage every step from design and fabrication to metrology, ensuring seamless project execution. We offer custom-crafted solutions with no minimum order quantities, serving diverse markets such as defense, medical devices, and astronomy.

## Brinell Vision Ltd.

#200

Netherton Kirk, Bridge of Cally, Blairgowrie, PH10 7JN United Kingdom  
+44 161 408 0040  
info@brinellvision.com; www.brinellvision.com

**Featured Product: BV-NVIS A1000K Precision Night Vision filter**

Brinell Vision is a UK manufacturer of precision optical & laser filters with optical production in both Blairgowrie & Manchester. Brinell Vision products protect and enhance the performance of some of the World's most demanding optical applications and are qualified to operate in harsh environments on the ground, air and space. These include Astronomy, IR imaging/sensors for geostationary weather monitoring, medical laser surgery, night-vision (NVIS) & daylight readable display for aircraft.

## Caeleste BV

#606

**SPIE.** CORPORATE MEMBER

Business Development, Hendrik Consciencestraat 1B, Mechelen, 2800 Belgium  
+32 15 71 05 03  
sales@caeleste.be; www.caeleste.be

**Featured Product: Custom designed CMOS image sensors for scientific, industrial and medical applications.**

Caeleste is a full turn-key supplier of custom designed image sensors for a wide range of applications. Our experience ranges from high energy particle detection over gamma & x-ray, UV, visible to NIR wavelengths ranges. Caeleste additionally designs and supplies read-out circuits for direct detection x-ray detectors and for infrared focal planes. Caeleste has also developed a rad-hard library of mixed signal components, available in various technologies and foundries.

## CI Systems FRANCE

#304

**SPIE.** CORPORATE MEMBER

44 rue Maurice de Broglie, AULNAY SOUS BOIS, 93600 France  
+33-1-4819-9797  
marketing@ci-systems.com; www.ci-systems.com

CI Systems has been a worldwide supplier of a wide range of electro-optical test and measurement equipment for nearly four decades. The company's presence with offices in three continents and network of experienced representatives in many regions of the globe provide our customers with the highest quality service possible. We present variety of products from the world's broadest selection of thermal and visible sources to sophisticated threat simulators.

## ElFys Inc.

#301

**SPIE.** CORPORATE MEMBER

Tekniikantie 12, Espoo, 02150 Finland  
+358 40 120 9111  
info@elfys.fi; www.elfys.fi

**Featured Product: Black Silicon Photodiodes**

ElFys, Inc. was founded in 2017 and is located in Espoo, Finland. The company is based on long-term research work on photodetector technologies at Aalto University. Our core team consists of former senior researchers, engineering leaders and business professionals. The company utilizes the state-of-the-art processing facilities at Micronova Nanofabrication Center in Espoo, Finland: 2600 square meters of CMOS compatible facilities suitable for both R&D and semi-mass production. Contact: Juha Toivanen, VP Business Development, juha.toivanen@elfys.fi; Mikko Rasa, Sales Manager, Mikko.rasa@elfys.fi

## Everix, Inc.

#100

**SPIE.** CORPORATE MEMBER

1468 N Goldenrod Rd Ste 200, Orlando, FL, 32807-8369 United States  
+1 407 637 2987  
info@everix.co; www.everix.co

**Featured Product: Ultra-Thin Optical Filters, including shortpass, longpass, single & multi-notch and bandpass filters**

At Everix, we employ a novel and cost-effective manufacturing process to produce a wide range of optical filters for AR/VR, consumer electronics, biomedical and industrial applications. We do not rely on traditional deposition coating techniques to make our filters, thus we can design and produce the worlds' thinnest optical filters with near zero angular shift optical performance. Our filters are available in flexible or rigid designs and can be cut to the customers' desired form factor.

## FiberBridge Photonics GmbH

#303

**SPIE.** CORPORATE MEMBER

Hollerithallee 17, Hannover, 30419 Germany  
+49 511 22018260  
info@fb-photonics.com; www.fiberbridge-photonics.com

FBP provides optical fiber components for material processing, quantum technology and aerospace industries. Key products are high-power capable fiber arrays for coherent and incoherent beam combining. We also offer kW-class pump combiner, cladding power stripper and fiber end caps. We offer tailored solutions for fiber optic components and assemblies, from design to volume production – including harsh environment applications, e.g. in the aerospace industry. Made in Germany / ISO 9001-Certified

## First Contact Polymers

#502

**SPIE.** CORPORATE MEMBER

Bldgs 1 & 2, 1895 Short Ln, Platteville, WI, 53818 United States  
+1 608 770 0565  
sales@photonicleaning.com; www.photonicleaning.com

**Featured Product: First Contact Polymers® Apply. Dry. Peel. For atomically clean optics and substrates. No residue!**

Manufacturer of First Contact Polymers®. THE Cleaning and Protection System. Apply liquid polymer and peel the dried film leaving the surface nearly atomically clean. Independent XPS/ESCA and Laser Damage Threshold testing shows no residue to the molecular level! Safe with high power laser optics. Remove Dust & Fingerprints. Reduce waste: non-toxic inert polymers. Clean Nanostructures, Gratings & Phase Masks! Protect and clean microscope objectives & CCD Sensors. Safe. Low Adhesion. No residue.

# EXHIBITOR LISTING

## Fraunhofer UK Research Ltd. #205

**SPIE** CORPORATE MEMBER

Level 5 Technology and Innovation Ctr, 99 George Street,  
Glasgow, G1 1RD United Kingdom  
+44 141 548 4667  
photonics@fraunhofer.co.uk; www.fraunhofer.co.uk

Fraunhofer UK Research Ltd is a not-for-profit Research and Technology Organisation providing professional applied R&D services to benefit UK industry. Through the Fraunhofer Centre for Applied Photonics it provides applied research and prototyping services for a wide variety of novel laser sources and their applications across a wide range of markets.

## Helia Photonics Ltd. #105

Rosebank Park, Kirkton Campus, Livingston West Lothian,  
EH54 7EJ United Kingdom  
+44 150 641 4800  
enquiries@helia-photonics.com; www.helia-photonics.com

Helia was founded in 2002 to offer back end of line wafer services for III-V materials and silicon photonics. Today, capabilities span wafer to die processes for devices operating in the UV to the LWIR. Services include wafer lapping, backmetal, cleaving, sawing, facet polishing, precision optical coatings, automated test, and inspection. From product inception to volume production Helia Photonics is happy to support your requirements.

**SPONSOR**

## HGH #402

10 rue Maryse Bastié, Igny, 91430 France  
+33 1 69 35 47 70  
marketing@hgh-infrared.com; www.hgh-infrared.com

**Featured Product: New OPALIN transportable optical bench for weapon sights maintenance**

HGH provides leading-edge electro-optical test solutions: blackbodies, visible to SWIR sources, high-performance collimators and customized test benches for cameras, detectors and other EO systems. At SPIE Sensors + Imaging 2024, HGH will showcase a new transportable collimator, specifically crafted to perform essential tests for the proper functioning of thermal and day light weapon sights.

## Hinalea Imaging Corp. #607

**SPIE** CORPORATE MEMBER

Engineering Ctr, 2200 Powell St Ste 1035, Emeryville, CA,  
94608 United States  
+1 510 879 6408  
klynch@hinalea.ai; www.hinaleaimaging.com

**Featured Product: New VSWIR (500 - 1700nm) full frame hyperspectral camera.**

Full frame hyperspectral imaging based on front-staring Fabry Perot technology: UV, VNIR, VSWIR, SWIR, XSWIR. Front-staring systems offer advantages over line-scanning technologies for environmental monitoring applications, most notably more versatile viewing geometry options. Hinalaea's cameras are exceptionally small and lightweight and feature band selectivity. This assures manageable data cubes and fast data transfer. Hinalaea's systems can be deployed on any static or moving application. Contact: Kevin Lynch, Sales Director, klynch@hinalea.ai

## HySpex, Norsk Elektro Optikk AS #203

**SPIE** CORPORATE MEMBER

Østensjøveien 34, Oslo, 0667 Norway  
+47 40 00 18 58  
hyspex@neo.no; www.hyspex.com

**Featured Product: HySpex hyperspectral cameras**

Norsk Elektro Optikk (NEO) was established in 1985 as a privately owned research-oriented company within the field of electro-optics. NEO has grown to be the largest independent research and development organization in electro-optics in Norway, and has in addition established itself as a manufacturer of advanced electro-optical products for an international market. HySpex, NEO's line of hyperspectral cameras, are compact, high performance and versatile instruments for a multitude of applications.

## Innovate UK #102

Suite 218 Business Design Centre, 52 Upper St, London, N1  
OQH United Kingdom  
+44 (0)333 403250  
enquiries@iuk.ktn-uk.org; www.iuk.ktn-uk.org

Innovate UK, part of UK Research and Innovation, is the UK's innovation agency. Innovate UK works to create a better future by inspiring, involving and investing in businesses developing life-changing innovations. Contact: Matthew Wasley, Photonics lead, matthew.wasley@iuk.ktn-uk.org; Matt Jones, Quantum lead, matthew.jones@iuk.ktn-uk.org

## Laser Components (UK) Ltd. #202

Goldlay House, 114 Parkway, Chelmsford Essex, CM2 7PR  
United Kingdom  
+44 1245 491499; fax +44 1245 491801  
info@lasercomponents.co.uk; www.lasercomponents.co.uk

We are a global, family-run company employing about 280 people at seven locations worldwide. These include three production sites. Our range includes components for the creation, guidance and detection of light - everything optoelectronics-related at the components level, serving many different industries such as laser industry, medical, military, and automotive. As a manufacturer, we have specialised in delivering custom solutions.

**SPONSOR**

## Leonardo UK Ltd. #403

Crewe Toll, Edinburgh, EH5 2XS  
United Kingdom  
+44 131 332 2411  
www.uk.leonardocompany.com/en/about-us/uk-locations/  
edinburgh



Leonardo's Edinburgh site employs approximately 2400 employees who specialise in the provision of multi-role surveillance radars and counter-measure systems. Originally built in 1943, the site has a rich heritage of innovation, and today it produces world leading technology, including lasers for the US Army's Apache helicopter, IRCM systems to protect airborne assets and both surveillance and fire control radar systems.

## LightTrans International GmbH #204

**SPIE** CORPORATE MEMBER

Kahlaische Str 4, Jena, 07745 Germany  
+49 36 41 5312950; fax +49 36 41 5312901  
marketing@lighttrans.com; www.lighttrans.com

**Featured Product: Optical Modeling and Design Software "VirtualLab Fusion"**

LightTrans International is the general distributor of the optical modeling and design software VirtualLab Fusion and offers software licenses, technical support, and training. VirtualLab Fusion software provides a pool of interoperable modeling techniques and a platform to connect them. By that it ensures an unsurpassed control of the balance between accuracy and speed and an amazing flexibility to model a great variety of sources, components, and detectors.

## Liquid Instruments #500

**SPIE** CORPORATE MEMBER

12526 High Bluff Dr Ste 150, San Diego, CA, 92116 United States  
+1 619 332 6230  
info@liquidinstruments.com; www.liquidinstruments.com

Liquid Instruments' reconfigurable Moku is the only test solution that is engineered and optimized for friction-free customization in both simple tests and complex multi-instrument environments. In hundreds of labs around the world, Moku has accelerated the timeline of crossing from idea to implementation by an order of magnitude, reducing the time and cost of advanced research and development. Experience Moku cost-free by requesting a demo today at liquidinstruments.com.



## MBDA

Six Hills Way, Stevenage, SG1 2DA, United Kingdom  
+44 1438 752000; [www.mbda-systems.com/](http://www.mbda-systems.com/)

MBDA is a unique multi-national European group, a world-leader in the field of complex weapons, playing a key role in keeping nations safe. Created in the spirit of international co-operation, MBDA employees work together to support the national sovereignty of its customers worldwide. As an accelerator for innovation, MBDA is the only European group capable of designing and manufacturing complex weapons to meet the full range of current and future operational requirements of the armed forces.

## NEW IMAGING TECHNOLOGIES #604

**SPIE** CORPORATE MEMBER

1 impasse de la noisette, Verrières le Buisson, 91370 France  
+33 1 64 47 88 58

[info@new-imaging-technologies.com](mailto:info@new-imaging-technologies.com);  
[www.new-imaging-technologies.com](http://www.new-imaging-technologies.com)

### Featured Product: In-house designed & manufactured SWIR InGaAs sensors & cameras

New Imaging Technologies (NIT) is a French SME pioneer in SWIR & Wide Dynamic Range solutions in the field of sensors and camera engineering. With over 15 years of academic research and patented technologies, NIT masters all the steps from image sensor design to complete camera engineering. NIT offers a complete range of SWIR InGaAs & HDR CMOS cameras & sensors, for a variety of applications where performance, cost, quality, and reliability are of premium choice.

## Photon Force Ltd. #602

**SPIE** CORPORATE MEMBER

Murchison House, 10 Max Born Crescent, Edinburgh, EH9 3BF  
United Kingdom  
+44 1316517944

[enquiries@photon-force.com](mailto:enquiries@photon-force.com); [www.photon-force.com](http://www.photon-force.com)

### Featured Product: SPAD sensors, ROICs, and Time-Resolved Single-Photon Camera Systems

Photon Force is an award-winning company on a mission to provide innovative single-photon sensitive detector technologies to accelerate industrial and research applications, in areas including remote sensing, LiDAR, quantum tech and DCS. We are the leading commercial developer of CMOS single-photon sensitive time-resolved SPAD array cameras and sensors, offering the world's highest throughput. We are also developing several next generation SPAD-based technologies and processing capabilities.

### SPONSOR

## Photon Lines Ltd #600

**SPIE** CORPORATE MEMBER

Magenta, 2 Brookhill Way, Banbury, OX16 3ED United Kingdom  
+44 333 2427905; fax +44 1295 724226

[info-uk@photonlines.com](mailto:info-uk@photonlines.com); [www.photonlines.co.uk](http://www.photonlines.co.uk)

### Featured Product: Resonon hyperspectral push broom benchtop imaging system

Photon Lines supplies a wide range of products such as AO modulators & deflectors, microspectrometers, back illuminated sCMOS, hyperspectral cameras and systems including benchtop, outdoor and airborne based units, laser light engines, ultrafast femtosecond lasers from EUV to IR, advanced microscopy solutions including STED, confocal and multiphoton microscopes for bioimaging applications. Contact: Jason Marvin, Technical Sales Manager, [ja-marvin@photonlines.com](mailto:ja-marvin@photonlines.com); Martyn Reynolds, Managing Director, [ma-reynolds@photonlines.com](mailto:ma-reynolds@photonlines.com)

#201

## Photonic Solutions

#400

Unit 2.2 Quantum Crt, Heriot-Watt University Research Park,  
Edinburgh, EH14 4AP United Kingdom  
+44 131 664 8122

[elaine.blackwood@photonicsolutions.co.uk](mailto:elaine.blackwood@photonicsolutions.co.uk);  
[www.photonicsolutions.co.uk](http://www.photonicsolutions.co.uk)

We provide the technologies to make your ideas come to life. Photonic Solutions is a leading supplier of photonics and associated technologies to the UK scientific market. Since 1999, we have provided the highest quality photonic products backed up by the highest quality service and support thanks to our partnership with the leading manufacturers of scientific-grade laser systems, cutting-edge imaging systems and research-grade spectroscopy solutions. Contact: Nicholas Webb, Marketing Executive, [nick.webb@photonicsolutions.co.uk](mailto:nick.webb@photonicsolutions.co.uk); Elaine Blackwood, Sales & Marketing Director, [Elain.Blackwood@photonicsolutions.co.uk](mailto:Elain.Blackwood@photonicsolutions.co.uk)

### SPONSOR

## POWERPHOTONIC LTD #401

**SPIE** CORPORATE MEMBER

5A St. David's Dr, Dalgety Bay, KY11 9PF United Kingdom  
+44 1383 825910

[sales@powerphotonic.com](mailto:sales@powerphotonic.com); [www.powerphotonic.co.uk](http://www.powerphotonic.co.uk)

### Featured Product: Coherent Beam Combining Assembly

PowerPhotonic designs, manufactures & validates beam shaping and image enhancing optics for the most demanding applications in Industrial Laser Material Processing (Additive Manufacturing, Cutting, Welding & Marking); Ophthalmology and microscopy-based Imaging; Directed Energy; Laser projection displays. PowerPhotonic uses proprietary freeform processes that have been developed over 15 years, and is now an established leading manufacturer of precision, high power optical components.

### SPONSOR

## Pro-Lite Technology Ltd. #302

Cranfield Innovation Ctr, University Way,  
Cranfield Bedfordshire, MK43 0BT  
United Kingdom

+44 1234 436 110; fax +44 1234 436 111  
[info@pro-lite.co.uk](mailto:info@pro-lite.co.uk); [www.pro-lite.co.uk](http://www.pro-lite.co.uk)

**PRO-LITE**  
TECHNOLOGY

Pro-Lite Technology Ltd is a supplier of specialist optical equipment and services into many sectors including defence, industry, research, remote sensing and many others. Pro-Lite offers a wide range of equipment for optical spectroscopy, detectors, image sensors, lasers and laser safety along with optical test equipment for image quality and electro-optical IR testing. Contact: Preetesh Mistry, Sales Manager - Photonics, [preetesh.mistry@pro-lite.co.uk](mailto:preetesh.mistry@pro-lite.co.uk); Russell Bailey, Product Manager - Light Metrology, [russell.bailey@pro-lite.co.uk](mailto:russell.bailey@pro-lite.co.uk)

## Pyramid Engineering Services #103

**SPIE** CORPORATE MEMBER

Unit 5 M2M Park, Rochester, ME1 3DQ United Kingdom  
+44 20 8320 9590

[enquiries@pyramideng.com](mailto:enquiries@pyramideng.com); [www.pyramideng.com](http://www.pyramideng.com)

Pyramid Engineering Services specialize in advanced hermetic welding equipment for the semiconductor industry. Parallel electrode seam sealers (980 pumps, hybrid packages, etc). Projection welders (TO devices, sensors, etc). CW Fibre laser welders. Vacuum Gas Bake ovens for pre-processing of parts. Integrated and customised atmosphere control gloveboxes. Etc.

## Quantum Security Defense Working Group Limited #101

Sunny Nook, Barhatch Road, Surrey, GU6 7DJ United Kingdom

+33786050726; [www.quantumsecuritydefence.com](http://www.quantumsecuritydefence.com)

The world's leading security experts, quantum physicists, and other thought leaders use the Quantum Security and Defence platform for active collaboration. With a focus on "Working," our community defines these threats, understands them, and communicates them. As a vendor-agnostic platform, our purpose is to ensure that the Quantum Safe' world's cyber security remains secure, robust and aware. [www.qsecdef.com](http://www.qsecdef.com)



# EXHIBITOR LISTING

## QDI systems

#505

**SPIE** CORPORATE MEMBER

Rozenburglaan 15, Groningen, 9727 DL Netherlands  
+ 31 (0)634524460  
info@qdisystems.com; www.qdisystems.com

QDI systems develops and manufactures quantum dot material and image sensors for both the X-ray and short-wave infrared (SWIR) domains. QDI systems is based in the Netherlands and has an in-house capacity to process both CMOS and TFT image sensors. Our quantum dots material and sensors are suitable for a variety of applications such as medical imaging, machine vision, defence/security, inspection, and consumer electronics.

## Raptor Photonics Ltd.

#405

**SPIE** CORPORATE MEMBER

Unit C4-C5, Willowbank Business Park, Larne, Co. Antrim, BT40 2SF United Kingdom  
+44 2828 270141; fax +44 2828 275685  
sales@raptorphotonics.com; www.raptorphotonics.com

Raptor launches the best HD VIS-SWIR camera in the world. The Owl 1280 is available with a HD-SDI SMPTE-274M interface to provide full HD resolution 1080p/30.

## Sandvik Osprey Ltd.

#504

Red Jacket Works, Millands Rd, Neath W Glamorgan, SA11 1NJ United Kingdom  
+44 1639 634121  
cealloys.osprey@sandvik.com; www.cealloys.sandvik

Sandvik provides lightweight, high modulus products made from controlled expansion alloys (CE alloys). Osprey CE alloy products are manufactured according to custom design in the form of, for example, thermal management products and electronic packaging modules as well as structural products for optical systems, electronics assembly and semiconductor processing equipment. Contact: Stuart Sillars, Group Manager, stuart.sillars@sandvik.com; Shazi Sheikh, Sales & Marketing Manager, shazi.sheikh@sandvik.com

## SET

#501

131 Impasse Barteudet, Saint-Jeoire, 74490 France  
+33 450 353814  
info@set-sas.fr; www.set-sas.fr

### Featured Product: High accuracy Flip-Chip Bonders

SET is a world leading supplier of high accuracy Flip-Chip Bonders. Since 1975, we have been designing and manufacturing semiconductor equipment dedicated to high precision applications. We accompany laboratories and industries, which look for a high precision and an important reliability in the assembly of their components. With Flip-Chip Bonders installed worldwide, SET is globally renowned for the unsurpassed sub-micron accuracy and the flexibility of its equipment.

## Spectrogon UK Ltd.

#605

**SPIE** CORPORATE MEMBER

Whitworth Rd, Southfield Industrial Estate, Glenrothes, Fife, KY6 2TF United Kingdom  
+44 1592 770 000  
sales.uk@spectrogon.com; www.spectrogon.com

Spectrogon is an independent manufacturer of Thin Film Optical Coatings, Filters and Holographic Diffraction Gratings. Our filters span the full range from the UV, through the visible, near infrared, and out to approximately 20 µm in the IR. Low defect coating manufacture and measurement. Custom manufacture for integration into cooled and uncooled thermal imagers – Coating on wafers up to 200 mm (8") diameter – Excellent dicing capability, down to 1x1 mm, delivery on tape available.

## Technology Scotland

#108

Systems House, 99 George Street, Glasgow, G1 1RD United Kingdom  
info@technologyscotland.scot; www.technologyscotland.scot

Photonics Scotland, a community for all photonics and photonics-enabled organisations in Scotland, is managed by Technology Scotland, the representative body for the Enabling Technology Sector in Scotland. Originally founded as the Scottish Optoelectronics Association in 1994, Photonics Scotland, is one of the oldest national photonics organisations in the world and remains one of the largest technology communities in Scotland.

### SPONSOR

## Thales

#300

1 Linthouse Road, Glasgow, G51 4BZ United Kingdom  
+0141 440 4000  
sales.optronics@uk.thalesgroup.com; www.thalesgroup.com

Thales is a global leader in advanced technologies, specialized in three business domains: Defence & Security, Aeronautics & Space, and Cyber-security & Digital Identity. It develops products and solutions that help to make the world safer, greener, and more inclusive. Thales has been designing and manufacturing optronic solutions for the defence sector for over one hundred years, supporting land, sea and air forces to see more clearly, understand more deeply and control more precisely.

## ThermoAnalytics

#603

Schopenhauerstr 71, Munich, 80807 Germany  
+49 160 93907848  
sales@thermoanalytics.com; www.thermoanalytics.com

### Featured Product: MuSES™ | EO/IR Signature Simulation Software

ThermoAnalytics, headquartered in Michigan's Upper Peninsula, is the leading developer of thermal, fluid-flow, and infrared modeling software. Specializing in defense industry applications, our software helps engineers optimize product designs early, improving quality and reducing development time and costs. With over 25 years of experience, we provide advanced thermal analysis tools for military vehicles, electronics cooling, and infrared signature management.

## Thorlabs GmbH

#503

Muenchner Weg 1, Bergkirchen, 85232 Germany  
+49 (0) 8131-5956-2; fax +49 (0) 8131-5956-99  
europe@thorlabs.com; www.thorlabs.com

THORLABS is a vertical integrated photonics products manufacturer serving the Photonics Industry from research to industrial, life science, medical, and defense segments. Its manufacturing assets include fabrication facilities for semiconductors, optical fibers, epitaxial wafer growth, glass and metal shops, thin film deposition, and optomechanical as well as optoelectronic shops.

## UK Astronomy Technology Centre (UKRI)

#104

Royal Observatory Edinburgh, Blackford Hill, Edinburgh, EH9 3HJ United Kingdom  
+44 131 668 8100  
donald.macleod@stfc.ac.uk; www.ukatc.stfc.ac.uk

### Featured Product: Astronomical Instrumentation and Testing Facilities

The UK Astronomy Technology Centre at STFC's Royal Observatory Edinburgh is the national centre of excellence in the development of instrumentation for ground & space-based astronomy. UK ATC projects are typically multi-disciplinary & international in nature, working in collaboration with leading institutes across the world. The UK ATC also hosts the Higgs Centre for Innovation, providing business incubation, facilities & laboratories for startups, SMEs and wider industry.

| WEDNESDAY 18 SEPTEMBER |  |
|------------------------|--|
| 10:00                  | <p><b>HGH</b><br/>The OPAL test bench series: ultra-compact and versatile visible to thermal collimators<br/><i>Presenter: Hoda Moustaid</i></p> <p>Discover OPAL &amp; OPALIN, new portable and ultra-light collimators, specifically crafted to perform essential tests for the proper functioning of thermal and day light weapon sights.</p>         |
| 13:30                  | <p><b>Pro-Lite Technology</b><br/>Latest developments in snapshot hyper and multi-spectral imaging<br/><i>Presenter: Nick Barnett</i></p> <p>This presentation reviews some of the latest developments in snapshot spectral cameras that enable hyper- and multi-spectral imaging to capture 2D images at video rates with real-time classification.</p> |
| 14:00                  | <p><b>Laser Components</b><br/>Advances in LiDAR systems<br/><i>Presenter: Arthur David</i></p> <p>This talk will detail the critical components that determine the overall performance of LiDAR systems for various applications such as aerospace &amp; defence, automotive and atmospheric LiDAR.</p>   |
| 14:30                  | <p><b>Test Instruments</b><br/>Liquid Instruments<br/><i>Presenter: John Miller</i></p> <p>John Miller, Ph.D., will share how to configure complex test setups and deploy custom capabilities with Moku, a reconfigurable suite of test instruments integrated into a single, FPGA-based device.</p>   |

## UKQuantum

71-75 Shelton Street, Covent Garden, London, WC2H 9JQ  
United Kingdom  
info@UKQuantum.org; www.ukquantum.org

UKQuantum's mission is to unite the UK quantum industry with one voice, champion within Government and internationally, advising on interventions and policies that will advance the UK quantum industry, and promote the adoption and benefits of quantum technologies across the UK economy.

#106

## Wideblue

Block 7, Kelvin Campus, West of Scotland Science Park,  
Glasgow G20 0SP, United Kingdom  
+44 141 945 4111  
info@wide-blue.com; www.wide-blue.com

For full product design and development, come & meet us!

#206

## Vortex Optical Coatings Ltd.

#507

**SPIE** CORPORATE MEMBER

10 Jacknell Road, Dodwells Bridge Industrial Estate, Hinckley,  
LE10 3BS United Kingdom  
+44 1455 613029  
enquires@vortexopticalcoatings.co.uk; www.vortexoc.com

**Featured Product: Infra Red Filters, Beam-splitters, IR Linear Variable Filters, AR Coatings**

Based in Hinckley UK, Vortex are designers and manufacturers of custom optical filters, IR Linear Variable Filters (LVFs) and beam-splitters from 200–6000 nm. We also have a fast turnaround Anti-Reflection Coating service and a fast prototype shop. Come and talk to our MD Ian Reilly on Stand T507.



# Moving technology to market - together.



Moore Nanotechnology Systems  
MPA Crystal  
MPB Communications  
MPS Micro Precision Systems  
Myrias Optics  
n2-Photonics  
Naked Optics  
Nanjing Band-Optics Technology  
Nanjing Rising Opto-Electronic  
Nanomotion  
nanoplus America  
nanoplus Nanosystems and Technologies  
Nanoscribe  
nanosystec  
NANOWORKS  
Nanyang City Jingliang Optical Technology  
National Aperture  
National Institute of Standards and Technology  
Natsume Optical  
Navitar  
Necsel  
New Imaging Technologies  
New Scale Technologies  
New Source Technology  
Newport Corp.  
Newport Spectra-Physics  
NexDome Observatories  
NextCorps  
Nikon Metrology  
NIL Technology  
NKT Photonics  
nLIGHT  
NLM Photonics  
NoIR InSight  
NorPix

North American Coating Labs.  
Novanta  
Novotech  
NP Photonics  
NTFL  
NuFlare Technology  
NUVIEW  
Nüvü Cameras  
O/E Land  
Obducat Technologies  
Obsidian Sensors  
Ocean Optics  
Octave Photonics  
OEWaves  
Officina Stellare  
OFS  
Ohara  
OHTAMA  
Omega Optical Holdings  
Omicron Laserage Laserprodukte  
Ontar Corporation  
Optec  
Optical Engines  
Optical Perspectives Group  
Optical Support  
Optical Systems Design  
Opticology  
OptiColor  
Optics Technology  
Optics Valley  
OptiGrate - IPG Photonics  
Optikos  
Optikron  
Optimax Systems  
OptiPro Systems  
OptiPulse  
Optiwave Systems  
Opto-Alignment Technology  
Optogama  
Optogration  
Opto-Line International  
OPTOMAN  
Optonetic

Optonique  
Optoprofiler  
OptoSigma  
OptoTech  
Optikmaschinen  
optX Imaging Systems  
OSELA  
OSI Optoelectronics  
Oxford Instruments  
Oxxius  
OZ Optics  
Pacific Laser Equipment  
Pacific Lasertec  
Palomar Technologies  
Pantec  
Biosolutions  
Pavilion Integration  
Pecchioli Research  
Perkins Precision Developments  
PFG Precision Optics  
PHASICS  
PHIX Photonics Assembly  
Photon Design  
Photon Engineering  
Photon Etc. Inc  
Photon Force  
PHOTON LINES  
Photonic Cleaning Technologies  
Photonics Foundry  
Photonics Industries International  
Photonics Industry & Technology Development Association  
Photonics Media/Laurin Publishing  
Photonics Technologies  
Photonis Scientific  
PI (Physik Instrumente) L.P.  
PicoGlaze

PicoQuant  
Photonics North America  
PIEZOCOCEPT  
PIKE Technologies  
Pixel Photonics  
Planar JSC  
PlaneWave Instruments  
PlanOpSim  
PLC Industries Pte  
POG Precision Optics Gera  
poLight ASA  
Power Technology  
PowerPhotonic  
Pozzetta  
Precision Glass & Optics  
Precision Optical  
Precitech  
Princeton Infrared Technologies  
Princeton Scientific  
Prior Scientific  
Prizmatix  
Prospective Instruments  
Pure Photonics  
Pureon  
PWY Service  
Pyramid Engineering Services  
QDI Systems  
QED Technologies  
Qingdao Lasence  
QPC Lasers  
Quancool Intelligent Technology  
QuantCAD  
Quartus Engineering  
Qunnect  
QZabre  
R Specialty Optical Fibers  
Radiant Vision Systems  
Raicol Crystals  
Rainbow Research Optics  
Raptor Photonics  
Raysung Photonics  
Redondo Optics  
RedWave Labs  
Reynard  
RICOR USA  
Rigaku Innovative Technologies  
Riverhawk  
Rochester Precision Optics  
RPMC Lasers  
Ruda Optical  
Sacher Lasertechnik  
Santa Barbara Infrared  
Santec USA

Satisloh North America  
SCANLAB America  
ScannerMAX  
Schäfter + Kirchhoff  
Schneider Optical Machines  
Schneider Optics  
SCHOTT  
SCI Engineered Materials  
scia Systems  
Science and Technology Facilities Council  
SCIL Nanoimprint Solutions  
Seattle Photonics Associates  
Seiwa Optical America  
SemiNex  
SemiQon  
Sensalight Technologies  
Sensofar-Tech  
SFC Energy  
Shanghai C-laser Materials Technology  
Shanghai Crylink Technology  
Shanghai Jiaguang - O Store Optics  
Shanghai Optics  
Shanghai PreciLasers Technology  
Sheaumann Laser  
Shenzhen Solar Valley SciTech Development  
Shenzhen Xinghan Laser Technology  
Shincron  
Shin-Etsu MicroSi  
SI Stuttgart Instruments  
SiCART (Zhuhai) Technology  
Sierra Precision Optics  
SILIOS Technologies  
Sill Optics  
Siskiyou Corporation  
SmarAct  
Somos IWT

son-x  
Specim Spectral Imaging  
Spectrogon  
Spectrogon UK  
Spectrogon US  
Spectrum Scientific  
Spica Technologies  
SPO Precision Optics  
SPU Optics  
Stanford Computer Optics  
Sunny Optical Technology  
Sunny Technology  
Super Conductor Materials  
Superlum Diodes  
Surface Optics  
Suzhou Everbright Photonics  
Svenska Laserf riken  
Swabian Instruments USA  
SWIR Vision Systems  
Sydor Optics  
Synopsis  
Syntec Optics  
TAU Systems  
Taylor Hobson  
Technica Optical Components  
Technical Manufacturing  
Tecnisco  
Tecport Optics  
TelAztec  
Teledyne  
Telops  
Tempotec Optics  
TeraXion  
The Aerospace Corp.  
The Institute of Optics Univ. of Rochester

Thermo Fisher Scientific  
Thin Film Service  
ThinFilms  
Thorlabs  
Tibidabo Scientific Industries (USA)  
TLC International World Headquarters  
TOPTICA  
Torrent Photonics  
Tower Optical  
TriLite Technologies  
TRIOPTICS  
TRUMPF  
TruTag Technologies  
Tucsen Photonics  
Turning Point Lasers Corporation  
TwinStar Optics Coatings & Crystals  
Tydex  
Umicore Optical Materials USA  
UNI Optics  
Universal Photonics  
Vermont Photonics Technologies Corp.  
Vertilite  
ViALUX  
Video Scope International  
Video Systems  
Videology Industrial-Grade Cameras  
Vincent Associates  
Visimid Technologies  
Vital Optics Technology  
V-Optics SAS

Vortex Optical Coatings  
VORTRAN Laser Technology  
WaferChina  
Walk Laser Optics  
Wasatch Photonics  
Wavelength Electronics  
Wavelength Opto-Electronic  
WEINERT Fiber Optics  
WINHO Optical Mfg.  
World Star Tech  
Wuhan Union Optic  
Wuxi Janhoo Optoelectronics  
Wyant College of Optical Sciences  
Wyse Light  
WZW-Optic  
Xcimer Energy  
XIMEA  
Xinxin Gem Technology Group  
XONOX Technology  
UNI Optics  
XPANCEO Research on Natural Science  
Youopto Technology  
YSL Photonics  
YSL Photonics  
Z & Z Optoelectronics  
Zaber Technologies  
Zemax  
Zhejiang Lante Optics  
Zhongshan Meisu Technology  
Z-Optics  
Zygo



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Current list as of 8-30-2024



# TECHNICAL CONFERENCES



## Remote Sensing Technical Conference Overview—PAGES 12-17

### Technical Conferences—PAGES 33-72

#### CONFERENCE 13191 . . . . . PAGES 33-39 **Remote Sensing for Agriculture, Ecosystems, and Hydrology XXVI**

Chairs: Christopher M. U. Neale; Antonino Maltese; Charles R. Bostater Jr.; Caroline Nichol

#### CONFERENCE 13192 . . . . . PAGES 40-46 **Sensors, Systems, and Next-Generation Satellites XXVIII**

Chairs: Sachidananda R. Babu; Arnaud Hélière; Toshiyoshi Kimura

#### CONFERENCE 13193 . . . . . PAGES 47-49 **Remote Sensing of Clouds and the Atmosphere XXIX**

Chairs: Evgueni I. Kassianov; Simone Lolli  
**17 September 2024 | Carrick**

#### CONFERENCE 13194 . . . . . PAGES 50-53 **Environmental Effects on Light Propagation and Adaptive Systems VII**

Chairs: Karin Stein; Szymon Gladysz

#### CONFERENCE 13195 . . . . . PAGES 54-57 **Microwave Remote Sensing: Data Processing and Applications III**

Chairs: Fabio Bovenga; Claudia Notarnicola; Nazzareno Pierdicca; Emanuele Santi

#### CONFERENCE 13196 . . . . . PAGES 58-62 **Artificial Intelligence and Image and Signal Processing for Remote Sensing XXX**

Chairs: Lorenzo Bruzzone; Francesca Bovolo

#### CONFERENCE 13197 . . . . . PAGES 63-69 **Earth Resources and Environmental Remote Sensing/ GIS Applications XV**

Chairs: Karsten Schulz; Ulrich Michel; Konstantinos G. Nikolakopoulos

#### CONFERENCE 13198 . . . . . PAGES 70-77 **Remote Sensing Technologies and Applications in Urban Environments IX**

Chairs: Thilo Erbertseder; Nektarios Chrysoulakis; Ying Zhang



## Security + Defence Technical Conference Overview—PAGES 18-23

### Technical Conferences—PAGES 73-110

#### CONFERENCE 13199 . . . . . PAGES 73-75 **Target and Background Signatures X: Traditional Methods and Artificial Intelligence**

Chairs: Karin Stein; Ric Schleijsen

#### CONFERENCE 13200 . . . . . PAGES 76-83 **Electro-optical and Infrared Systems: Technology and Applications XXI**

Chairs: Duncan L. Hickman; Helge Bürsing; Ove Steinvall; Philip J. Soan

#### CONFERENCE 13201 . . . . . PAGES 84-88 **High-Power Lasers and Technologies for Optical Countermeasures II**

Chairs: Willy L. Bohn; Marc Eichhorn; Gareth D. Lewis

#### CONFERENCE 13202 . . . . . PAGES 89-93 **Quantum Technologies for Defence and Security**

Chairs: Giacomo Sorelli; Sara Ducci; Sylvain Schwartz

#### CONFERENCE 13203 . . . . . PAGES 94-96 **Sensors and Communication Technologies in the 1 GHz to 10 THz Band**

Chairs: Neil A. Salmon; Wladislaw Michailow

#### CONFERENCE 13204 . . . . . PAGES 97-99 **Emerging Imaging and Sensing Technologies for Security and Defence IX**

Chairs: Gerald S. Buller; Robert A. Lamb; Martin Laurenzis

#### CONFERENCE 13205 . . . . . PAGES 100-102 **Advanced Materials, Biomaterials, and Manufacturing Technologies for Security and Defence II**

Chairs: Chantal Andraud; Roberto Zamboni; Andrea Camposeo; Luana Persano

#### CONFERENCE 13206 . . . . . PAGES 103-107 **Artificial Intelligence for Security and Defence Applications II**

Chairs: Henri Bouma; Radhakrishna Prabhu; Yitzhak Yitzhaky

#### CONFERENCE 13207 . . . . . PAGES 108-110 **Autonomous Systems for Security and Defence**

Chairs: Judith Dijk; Jose Luis Sanchez-Lopez

# CONFERENCE 13191

## Remote Sensing for Agriculture, Ecosystems, and Hydrology XXVI

16 - 19 September 2024 | Menteith

**Conference Chair(s):** **Christopher M. U. Neale**, Univ. of Nebraska Lincoln (United States); **Antonino Maltese**, Univ. degli Studi di Palermo (Italy); **Charles R. Bostater**, Florida Institute of Technology (United States); **Caroline Nichol**, The Univ. of Edinburgh (United Kingdom)

**Program Committee:** **Alessandra Capolupo**, Politecnico di Bari (Italy); **José L. Chávez**, Colorado State Univ. (United States); **Monica Garcia**, Consejo Superior de Investigaciones Científicas (Spain); **María Patrocinio González-Dugo**, Instituto de Investigación y Formación Agraria y Pesquera (Spain); **Enrico B. Mondino**, Univ. degli Studi di Torino (Italy); **Saleh Taghvaeian**, Utah State Univ. (United States)

### Monday 16 September 2024

#### SESSION 1: MARINE WATERS SENSING I

16 September 2024 • 09:10 AM - 10:20 AM | Menteith

*Session Chair(s):* **Caroline Nichol**, The Univ. of Edinburgh (United Kingdom)

13191-1 • 09:10 AM - 09:30 AM

**Identifying marine oil spills with hyperspectral, thermal and multispectral UAV imagery: capabilities and challenges** (*Invited Paper*)

*Author(s):* **Safaa AlAwadhi**, **Caroline Nichol**, The Univ. of Edinburgh (United Kingdom)

13191-2 • 09:30 AM - 09:50 AM

**All-weather sea surface temperature retrieval based on AHI and ATMS**

*Author(s):* **Hongchang He**, **Wenhan Hu**, **Mei Wang**, **Donglin Fan**, **Cuiqi Liao**, **Xinyue Zhang**, Guilin Univ. of Technology (China)

13191-4 • 09:50 AM - 10:20 AM

**Multispectral and hyperspectral imaging of shallow waters and feature extraction in shallow coastal waters** (*Invited Paper*)

*Author(s):* **Charles R. Bostater**, Florida Institute of Technology (United States)

**Coffee Break 10:20 AM - 10:50 AM**

#### SESSION 2: MARINE WATERS SENSING II

16 September 2024 • 10:50 AM - 12:00 PM | Menteith

*Session Chair(s):* **Pierre-Yves Foucher**, ONERA (France); **Safaa AlAwadhi**, The Univ. of Edinburgh (United Kingdom)

13191-5 • 10:50 AM - 11:20 AM

**Remote sensing of evaporating gases from chemical spills at sea using multispectral thermal infrared camera** (*Invited Paper*)

*Author(s):* **Pierre-Yves Foucher**, **Roland Domel**, **Stephane Langlois**, ONERA (France); **William Giraud**, **Stephane Le Floch**, Cedre (France)

13191-6 • 11:20 AM - 11:40 AM

**Enhancing ocean depth detection through user-interactive retrieval-augmented generation: a dynamic approach to real-time depth mapping**

*Author(s):* **Mohd Mohsin Ali**, **Vasu Jain**, **Manish Raj**, **Anand Chuahan**, Bennett Univ. (India)

13191-7 • 11:40 AM - 12:00 PM

**A novel algorithm for the retrieval of sea surface chlorophyll-a based on the 1D CNN**

*Author(s):* **Hongchang He**, **Tianlong Liang**, **Mei Wang**, **Donglin Fan**, **Cuiqi Liao**, **Xinyue Zhang**, Guilin Univ. of Technology (China)

**Lunch Break 12:00 PM - 01:30 PM**

#### SESSION 3: MARINE WATERS SENSING III

16 September 2024 • 01:30 PM - 02:40 PM | Menteith

Session Chair(s): **Adrian Dzipalski**, Heriot-Watt Univ. (United Kingdom); **Charles R. Bostater**, Florida Institute of Technology (United States)

13191-10 • 01:30 PM - 02:00 PM

**A multiplexed reconfigurable modular optical fibre Bragg grating-based sensor platform for flow and temperature measurements in the North Sea** (*Invited Paper*)

Author(s): **Adrian Dzipalski**, **Jonathan A. S. Morton**, **Nikolitsa Papchristou**, **Robert R. J. Maier**, **William N. MacPherson**, Heriot-Watt Univ. (United Kingdom); **Asko Ristoainen**, **Maarja Kruusmaa**, Tallinn Univ. of Technology (Estonia); **Ben J. Wolf**, **Primož Pirih**, **Sietse M. van Netten**, Univ. of Groningen (Netherlands); **Irina Suhhova**, **Urmars Lips**, Tallinn Univ. of Technology (Estonia); **Nathan McFarlane**, **Robert MacLeod**, Hydrobond PLC (United Kingdom); **Jack Sheehy**, **Mohammed Almoghayer**, **Natalia Rojas**, **Gareth Davies**, **Akmal Hakim**, Aquatera Ltd. (United Kingdom)

13191-11 • 02:00 PM - 02:20 PM

**Comparison of bathymetry estimated from multibeam eco-sounder and optical data**

Author(s): **Antonino Maltese**, Univ. degli Studi di Palermo (Italy); **Valeria Lo Presti**, **Giovanni Andrea Nocera**, Univ. degli studi di Palermo (Italy); **Attilio Sulli**, Univ. degli Studi di Palermo (Italy)

13191-13 • 02:20 PM - 02:40 PM

**Exploring a statistical-based fetch model formulation for water wave glint correction using WorldView-3 imagery**

Author(s): **Charles R. Bostater**, Florida Institute of Technology (United States)

**Coffee 02:40 PM - 03:30 PM**

## SESSION PL: SENSORS + IMAGING PLENARY SESSION

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium

15:30 to 15:40 hrs

**Welcome and Introduction**

**Ric Schleijpen**

TNO Defence, Security and Safety (Netherlands)

**Lorenzo Bruzzone**

Univ. degli Studi di Trento (Italy)

*2024 Symposium Chairs*

13191-500 • 03:40 PM - 04:25 PM

**Tracking Earth's ice from space** (Plenary Presentation)

Author(s): **Andrew Shepherd**, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

**Sensing in the second quantum revolution** (Plenary Presentation)

Author(s): **Francesco Saverio Cataliotti**, LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

**Imaging and sensing that delivers operational advantage** (Plenary Presentation)

Author(s): **Jason Field**, Ministry of Defence (United Kingdom)

## Tuesday 17 September 2024

### SESSION 4: MACHINE LEARNING AND ARTIFICIAL INTELLIGENCE

17 September 2024 • 01:30 PM - 03:30 PM | Menteith

Session Chair(s): **Christopher M. U. Neale**, Daugherty Water for Food Global Institute (United States)

13191-19 • 01:30 PM - 01:50 PM

**Prediction of rice yield under climate change using satellite image and AI**

Author(s): **Jaewung Sim**, Pukyong National Univ. (Korea, Republic of); **Yangwon Lee**, Pukyong National Univ. (Kiribati, Republic of)

13191-20 • 01:50 PM - 02:10 PM

**Invariant learning as a pathway to robust potato yield prediction**

*Author(s):* **Stelios P. Neophytides**, ERATOSTHENES Ctr. of Excellence (Cyprus), Cyprus Univ. of Technology (Cyprus); **Ilias Tsoumas**, National Observatory of Athens (Greece), Wageningen Univ. & Research (Netherlands); **Andria Tsalakou**, **Michalis Christoforou**, Cyprus Univ. of Technology (Cyprus); **Michalis Mavrouniotis**, **Marinos Eliades**, **Christiana Papoutsas**, ERATOSTHENES Ctr. of Excellence (Cyprus), Cyprus Univ. of Technology (Cyprus); **Charalampos Kontoes**, National Observatory of Athens (Greece); **Diofantos G. Hadjimitsis**, Cyprus Univ. of Technology (Cyprus)

13191-21 • 02:10 PM - 02:30 PM

**A comparative analysis of machine learning and vegetation index-based modeling approaches for durum wheat yield assessment using Sentinel-2 imagery**

*Author(s):* **Maria Bempi**, **Aris Kyparissis**, Univ. of Thessaly (Greece)

13191-22 • 02:30 PM - 02:50 PM

**Spatio-temporal predictive learning for time-series vegetation index**

*Author(s):* **Geunah Kim**, Pukyong National Univ. (Korea, Republic of); **Yangwon Lee**, Pukyong National Univ (Korea, Republic of)

13191-17 • 02:50 PM - 03:10 PM

**A machine learning model for mapping methane concentration on the paddy rice fields using meteorological data in South Korea**

*Author(s):* **Jiah Jang**, **Yangwon Lee**, Pukyong National Univ. (Korea, Republic of)

13191-65 • 03:10 PM - 03:30 PM

**Surface water extraction from remote sensing images of arid regions in Africa using a deep learning approach combining multiscale information**

*Author(s):* **Yong Li**, Hohai University (China), University of Leicester (United Kingdom); **Xiuhui Liu**, Hohai University (China)

**Coffee Break 03:30 PM - 04:00 PM**

**SESSION 5: UAV APPLICATIONS**

17 September 2024 • 04:00 PM - 05:00 PM | Menteith

*Session Chair(s):* **Antonino Maltese**, Univ. degli Studi di Palermo (Italy)

13191-24 • 04:00 PM - 04:20 PM

**Image analysis system for unmanned aerial spraying system performance evaluation**

*Author(s):* **Chun-Gu Lee**, **Seung-Hwa Yu**, **Ilsu Choi**, **Sangbong Lee**, **Seok Pyo Moon**, **Seok-Joon Hwang**, **Kyeong Sik Choi**, National Institute of Agricultural Sciences (Korea, Republic of); **Se-Woon Hong**, **Jeekeun Lee**, Chonnam National Univ. (Korea, Republic of)

13191-26 • 04:20 PM - 04:40 PM

**Enhancing crop type mapping in smallholder farms through image fusion of Sentinel-2 and UAV imagery**

*Author(s):* **Geoffrey Kimani**, **Gustave Bwirayesu**, **Alice Umuhoza**, **Moise Busogi**, Carnegie Mellon Univ. (Rwanda)

13191-27 • 04:40 PM - 05:00 PM

**Spectral discrimination and separability analysis of beach macroplastic litter from high-resolution RPAS images**

*Author(s):* **Alessandra Capolupo**, **Eufemia Tarantino**, Politecnico di Bari (Italy); **Antonino Maltese**, Univ. degli Studi di Palermo (Italy); **Marco Lonero**, Politecnico di Bari (Italy)

**POSTERS-TUESDAY**

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 16:00 hrs, Lennox Suite

View poster presentation guidelines and set-up instructions at

<https://spie.org/ESI/poster-presentation-guidelines>

13191-8 • 05:30 PM - 07:00 PM

**Cloud filling of oceanic chlorophyll-a concentration remote sensing products by DINEOF methodology**

*Author(s):* **Wanjiao Song**, **Lin Sun**, National Satellite Meteorological Ctr. (China)

13191-12 • 05:30 PM - 07:00 PM

**Assessment of mosses in Antarctica and Bulgaria based on remote sensing and chlorophyll fluorescence**

*Author(s):* **Temenuzhka Spasova**, Space Research and Technology Institut (Bulgaria)

13191-53 • 05:30 PM - 07:00 PM

**Development of sustainable management technology for rural stream tributaries using AI and drones**

*Author(s): Jong-Hwa Park, Seung-Hwan Go, Chungbuk National Univ. (Korea, Republic of)*

13191-54 • 05:30 PM - 07:00 PM

**BRDF and solar irradiance adjustment using UAV multispectral image correction for precision agriculture**

*Author(s): Chansol Kim, Pukyong National Univ. (Korea, Republic of)*

13191-55 • 05:30 PM - 07:00 PM

**Deep learning-based wildfire detection and transferability verification**

*Author(s): Seonyoung Park, Seoul National Univ. of Science and Technology (Korea, Republic of); Jung-ho Im, Ulsan National Institute of Science and Technology (Korea, Republic of)*

13191-56 • 05:30 PM - 07:00 PM

**Land cover classification using data fusion to support sustainable coffee certification processes**

*Author(s): Manuela Ramos Ospina, Catalina Rodríguez, Alejandro Marulanda-Tobón, Univ. EAFIT (Colombia)*

13191-57 • 05:30 PM - 07:00 PM

**Remote sensing of potato and sweet potato for growth monitoring and yield prediction**

*Author(s): Yanbo Huang, Agricultural Research Service (United States)*

13191-58 • 05:30 PM - 07:00 PM

**LIBS: a rapid nutrition monitoring tool for hydroponic crops and nutrient supply**

*Author(s): Keerthi Kanneeram, Maria Merin Antony, Sreekanth Perumbilavil, Murukeshan Vadakke Matham, Nanyang Technological Univ. (Singapore)*

13191-59 • 05:30 PM - 07:00 PM

**Deforestation in some areas of Romania: a study in MATLAB**

*Author(s): Mihai-Stefan Duma, Univ. Politehnica Timisoara (Romania); Virgil-Florin Duma, Univ. Politehnica Timisoara (Romania), Univ. "Aurel Vlaicu" din Arad (Romania)*

13191-60 • 05:30 PM - 07:00 PM

**Application of satellite data for monitoring eutrophication in glacial lakes of Rila mountain, Bulgaria**

*Author(s): Andrey Stoyanov, Temenuzhka Spasova, Space Research and Technology Institute (Bulgaria)*

13191-61 • 05:30 PM - 07:00 PM

**Monitoring of plant leaf growth based on 3D point cloud data**

*Author(s): Muneki Uchida, Hiroshi Okumura, Munehiro Tanaka, Osamu Fukuda, Nobuhiko Yamaguchi, Wen Liang Yeoh, Saga Univ. (Japan)*

13191-62 • 05:30 PM - 07:00 PM

**Exploring the correlation between NDVI and agronomic parameters in banana crops. A case study in Tenerife, Canary Islands**

*Author(s): Osvaldo J. Renz-Gonzalez, Cabildo de Tenerife (Spain); Domingo J. Rios-Mesa, Univ. de La Laguna (Spain), Cabildo de Tenerife (Spain); Enrique Casas, Univ. de La Laguna (Spain); Clemente Mendez, Cabildo de Tenerife (Spain); Manuel Arbelo, Univ. de La Laguna (Spain)*

13191-63 • 05:30 PM - 07:00 PM

**Territory characterization of cooperative breeder birds using remote sensing and species distribution models**

*Author(s): Alejandro Alaman, Bar-Ilan Univ. (Israel); Enrique Casas, Manuel Arbelo, Univ. de La Laguna (Spain); Osvaldo J. Renz-Gonzalez, Cabildo de Tenerife (Spain); Oded Keynan, The Dead Sea-Arava Science Ctr. (Israel); Lee Koren, Bar-Ilan Univ. (Israel)*

13191-64 • 05:30 PM - 07:00 PM

**Exploring colloidal stability and migration dynamics through integrated photonic into aqueous black carbon dispersion**

*Author(s): Jordan Gastebois, Institut d'Electronique et de Télécommunications de Rennes (France); Anthony Szymczyk, Institut des Sciences Chimiques de Rennes (France); Gilles Paboeuf, Véronique Vié, Arnaud Saint-Jalmes, Institut de Physique de Rennes (France); Hervé Lhermite, Institut d'Electronique et de Télécommunications de Rennes (France); Hervé Cormerais, Institut d'Electronique et de Télécommunications de Rennes (France), CentraleSupélec (France); Fabienne Gauffre, Institut des Sciences Chimiques de Rennes (France); Bruno Bêche, Institut d'Electronique et de Télécommunications de Rennes (France)*

## Wednesday 18 September 2024

### SESSION 6: SURFACE ENERGY BALANCE AND MICROMETEOROLOGY

18 September 2024 • 08:50 AM - 10:20 AM | Menteith

*Session Chair(s): Antonino Maltese, Univ. degli Studi di Palermo (Italy)*



13191-28 • 08:50 AM - 09:20 AM

**Estimation of Water Requirements for an irrigated Hazelnut (*Corylus avellana* L.) Orchard using Landsat Satellite Images** (*Invited Paper*)

*Author(s):* **Samuel Orlando Ortega-Farias, Daniel de la Fuente-Sáiz**, Univ. de Talca (Chile); **Eloy Huerta**, Ferrero Hazelnut Company Division, Ferrero Trading Luxembourg (Luxembourg); **Maria José Lisperger**, Fruticola Agrichile S.A., (Chile); **Samuel Ortega-Salazar**, School of Natural Resources and Civil Engineering, University of Nebraska-Lincoln (United States)

13191-30 • 09:20 AM - 09:40 AM

**Evaluation of the effects of direct sunlight on fiber-based distributed temperature sensing system**

*Author(s):* **Zhizhi Yang, Pieter Sanczuk, Louise Terryn, Pieter De Frenne, Hans Verbeeck, Emma Van de Walle, Kim Calders, Bart Kuyken, Roel Baets, Yanlu Li**, Univ. Gent (Belgium)

13191-31 • 09:40 AM - 10:00 AM

**Using the hybrid SETMI model to estimate soil water content and conduct irrigation scheduling**

*Author(s):* **Christopher M. U. Neale**, Daugherty Water for Food Global Institute (United States)

13191-32 • 10:00 AM - 10:20 AM

**Surface energy balance in olive groves affected by *Xylella fastidiosa***

*Author(s):* **Antonino Maltese**, Univ. degli Studi di Palermo (Italy); **Annarita D'Addabbo**, Istituto di Studi sui Sistemi Intelligenti per l'Automazione (Italy); **Raffaella Matarrese**, Istituto di Ricerca sulle Acque (Italy)

**Coffee Break 10:20 AM - 10:50 AM**

### SESSION 7: SAR-BASED FLOOD AND VEGETATION MAPPING: JOINT SESSION

18 September 2024 • 10:50 AM - 12:10 PM | Menteith

*Session Chair(s):* **Claudia Notarnicola**, Eurac Research (Italy)

Joint Session between Conference 13191, RS for Agriculture, Ecosystems, and Hydrology, and Conference 13195 Microwave Remote Sensing. Session will be held in room Menteith.

13195-1 • 10:50 AM - 11:10 AM

**Linking the structural parameters of a priority Natura 2000 grassland to SAR and optical data**

*Author(s):* **Alessandro Sebastiani, Teodoro Semeraro, Flavio Monti, Jessica Titocci, Lorenzo Liberatore**, Consiglio Nazionale delle Ricerche (Italy); **Alberto Basset**, Univ. del Salento (Italy); **Carlo Calfapietra, Dario Papale, Gaia Vaglio Laurin**, Consiglio Nazionale delle Ricerche (Italy)

13191-33 • 11:10 AM - 11:30 AM

**Monitoring of climate-change induced floods and impact analysis on agricultural systems in the Mojana region of Colombia through automatic change detection and machine learning**

*Author(s):* **Wilson Andres Velasquez Hurtado**, Sapienza Univ. di Roma (Italy); **Armando Marino**, Univ. of Stirling (United Kingdom); **Deodato Tapete**, Agenzia Spaziale Italiana (Italy)

13195-2 • 11:30 AM - 11:50 AM

**Urban flood extent mapping using Sentinel-1 intensity and coherence data: 2023 Greek floods**

*Author(s):* **Rasheeda Soudagar, Alok Bhardwaj**, Indian Institute of Technology Roorkee (India)

13191-34 • 11:50 AM - 12:10 PM

**SAR-FM: SAR based Flood Rapid Mapping using Multi-Modal Data Fusion**

*Author(s):* **Krishna Kanth Rakkam, Smriti Rani, Kriti Kumar, Anil Kumar Achanna, Balamuralidhar Purushothaman, Arpan Pal**, Tata Consultancy Services, Ltd. (India)

**Lunch/Exhibition Break 12:10 PM - 01:30 PM**

### SESSION 8: MONITORING SURFACE- AND GROUNDWATER HYDROLOGY

18 September 2024 • 01:30 PM - 03:10 PM | Menteith

*Session Chair(s):* **Christopher M. U. Neale**, Daugherty Water for Food Global Institute (United States)

13191-35 • 01:30 PM - 01:50 PM

**Satellite-based monitoring of groundwater utilization for irrigation: a case study in southern Italy**

*Author(s):* **Oscar Rosario Belfiore**, Univ. degli Studi di Napoli Federico II (Italy); **Stefania Cavallo**, Istituto Zooprofilattico Sperimentale del Mezzogiorno (Italy); **Alessandro Aquino**, Univ. degli Studi di Napoli Federico II (Italy); **Salvatore Falanga Bolognesi, Carlo De Michele, Camilla Della Monica, Qotada Alali, Ileana Mula**, Ariespace s.r.l. (Italy); **Antonio Pizzolante**, Istituto Zooprofilattico Sperimentale del Mezzogiorno (Italy); **Guido D'Urso**, Univ. degli Studi di Napoli Federico II (Italy)

13191-36 • 01:50 PM - 02:10 PM

**Spatio-temporal analysis of wetlands status: a case study for Bulgaria**

Author(s): **Kameliya Radeva**, Space Research and Technology Institute (Bulgaria); **Silvia Kirilova**, Univ. of Architecture, Civil Engineering and Geodesy (Bulgaria); **Georgi Jeleu**, Space Research and Technology Institute (Bulgaria)

13191-37 • 02:10 PM - 02:30 PM

**Assessing riverine transformations impacted by barrages and dams in the Mahanadi Basin**

Author(s): **Rohit Sharma**, **Zulfequar Ahmad**, **Rahul Dev Garg**, **Pradeep Kumar Garg**, Indian Institute of Technology Roorkee (India)

13191-38 • 02:30 PM - 02:50 PM

**Detecting algal scum in an inland river using Planet and Sentinel-2 multispectral imagery**

Author(s): **Marco Herrmann**, **Tobias Brehm**, **Julia Kleinteich**, **Franziska Klotz**, **Björn Baschek**, Bundesanstalt für Gewässerkunde (Germany)

13191-39 • 02:50 PM - 03:10 PM

**Prediction of groundwater level using satellite image and multivariate GRU**

Author(s): **Park JaeSeong**, Pukyong National Univ. (Korea, Republic of)

**Coffee Break 03:10 PM - 03:40 PM**

**SESSION 9: HYPERSPECTRAL REMOTE SENSING AND SPECTROSCOPY**

18 September 2024 • 03:40 PM - 05:00 PM | Menteith

Session Chair(s): **Christopher M. U. Neale**, Daugherty Water for Food Global Institute (United States)

13191-40 • 03:40 PM - 04:00 PM

**Assessment of vis-NIR spectroscopy capabilities for the classification of olive cultivars**

Author(s): **Valeria Ancona**, Istituto di Ricerca sulle Acque, Consiglio Nazionale delle Ricerche (Italy); **Annarita D'Addabbo**, Istituto per il Rilevamento Elettromagnetico dell'Ambiente, Consiglio Nazionale delle Ricerche (Italy); **Raffaella Matarrese**, Istituto di Ricerca sulle Acque, Consiglio Nazionale delle Ricerche (Italy); **Gaetano A. Vivaldi**, Univ. degli Studi di Bari Aldo Moro (Italy)

13191-41 • 04:00 PM - 04:20 PM

**Three-dimensional reconstruction model rendered with hyperspectral images: biomarker monitoring as an example**

Author(s): **Ming-Han Ho**, **Yung-Jhe Yan**, **Yu-Cheng Cheng**, **Cong Yuan Chou**, **Mang Ou-Yang**, National Yang Ming Chiao Tung Univ. (Taiwan)

13191-42 • 04:20 PM - 04:40 PM

**Linking hyperspectral prisma data with ecosystem functional properties at ICOS sites**

Author(s): **Gaia Vaglio Laurin**, **Alessandro Sebastiani**, **Lorenza Nardella**, **Carlo Calfapietra**, CNR IRET (Italy); **Anna Barbati**, Tuscia University - DIBAF (Italy); **Bartolomeo Ventura**, EURAC (Italy); **Dario Papale**, CNR IRET (Italy), Tuscia University - DIBAF (Italy)

13191-43 • 04:40 PM - 05:00 PM

**Mapping stress in submerged aquatic vegetation using multispectral imagery and structure from motion photogrammetry**

Author(s): **Amritha Nair**, **Fleur Visser**, **Ian Maddock**, Univ. of Worcester (United Kingdom); **Jonas Schoelynck**, Univ. Antwerpen (Belgium)

**Thursday 19 September 2024**

**SESSION 10: IRRIGATION MONITORING AND YIELD ESTIMATION**

19 September 2024 • 09:00 AM - 10:30 AM | Menteith

Session Chair(s): **Christopher M. U. Neale**, Daugherty Water for Food Global Institute (United States)

13191-44 • 09:00 AM - 09:20 AM

**Assessing silage maize yield and quality variability using NIRS, Sentinel-2, and PlanetScope multispectral imagery: a precision agriculture approach.**

Author(s): **Daniele Pinna**, **Marco Sozzi**, **Francesco Marinello**, Univ. degli Studi di Padova (Italy)

13191-45 • 09:20 AM - 09:40 AM

**Utilizing optical and synthetically aperture radar (SAR) satellite data for rice yield estimation: case studies in Suphan Buri and Ang Thong, Thailand**

Author(s): **Jatuporn Nontasiri**, Office of Agricultural Economics (Thailand)

13191-46 • 09:40 AM - 10:00 AM

**Expert knowledge-based monitoring of irrigated crops in Portugal using Sentinel-2**

Author(s): **Pedro J. Benevides**, **Rita Soares**, **Francisco D. Moreira**, Direção-Geral do Território (Portugal); **Hugo Costa**, **Mário Caetano**, Direção-Geral do Território (Portugal), NOVA Information Management School (Portugal)

13191-47 • 10:00 AM - 10:30 AM

**Modernization of technological tools for crop monitoring and water use efficiency in LAC agriculture** *(Invited Paper)*

*Author(s):* **Claudio Balbontin, Claudia Bavestrello**, Instituto de Investigaciones Agropecuarias (Chile); **Alfonso Calera**, Instituto de Desarrollo Regional, Univ. de Castilla-La Mancha (Spain); **Jesús Garrido**, Univ. de Castilla-La Mancha (Spain); **Claudio García, Alvaro Otero**, Instituto Nacional de Investigación Agropecuaria (Uruguay); **Roberto Marinez, Fernando Gonzalez**, Instituto Nacional de Tecnología Agropecuaria (Argentina); **Liliana Rios**, AGROSAVIA (Colombia); **Carlos Puertas, Ayelen Montenegro**, Instituto Nacional de Tecnología Agropecuaria (Argentina); **Britt Wallberg**, Instituto de Investigaciones Agropecuarias (Chile); **Guillermo Cúneo**, Dept. General de Irrigación (Argentina)

**Coffee Break 10:30 AM - 11:00 AM**

## SESSION 11: MONITORING AGRICULTURE AND LAND-USE CHANGE

19 September 2024 • 11:00 AM - 12:40 PM | Menteith

*Session Chair(s):* **Antonino Maltese**, Univ. degli Studi di Palermo (Italy)

13191-48 • 11:00 AM - 11:20 AM

**Ultrawide agricultural remote sensing satellite and its multispectral remote sensing applications**

*Author(s):* **Chunling Lu**, Institute of Spacecraft System Engineering (China)

13191-49 • 11:20 AM - 11:40 AM

**Impact of climate change on LULUCF reporting in Bulgaria based on Copernicus data**

*Author(s):* **Kameliya Radeva, Lachezar Filchev**, Space Research and Technology Institute (Bulgaria); **Silvia Kirilova**, Univ. of Architecture, Civil Engineering and Geodesy (Bulgaria); **Ekaterina Bachvarova**, The Climate, Atmosphere and Water Research Institute (Bulgaria)

13191-50 • 11:40 AM - 12:00 PM

**Quantifying the dynamic of cereals and broad leaves plants in semi-arid ranging grasslands using PlanetScope® satellite imaging**

*Author(s):* **Amir Mor-Mussery, Eli Zaady, Lior Blank**, Agricultural Research Organization (Israel)

13191-51 • 12:00 PM - 12:20 PM

**Determining reverse cereal succession processes in arid lands by high-resolution satellite imagery of ravine edges**

*Author(s):* **Amir Mor-Mussery, Eli Zaady, Lior Blank**, Agricultural Research Organization (Israel)

13191-52 • 12:20 PM - 12:40 PM

**High-throughput phenotyping in potato genotypes**

*Author(s):* **Ana-Maria Mendez-Espinoza**, Instituto de Investigaciones Agropecuarias (Chile); **Shawn C. Kefauver**, Univ. de Barcelona (Spain); **Alejandro Del Pozo**, Univ. de Talca (Chile)

# CONFERENCE 13192

## Sensors, Systems, and Next-Generation Satellites XXVIII

16 - 18 September 2024 | Sidlaw

**Conference Chair(s):** **Sachidananda R. Babu**, NASA Earth Science Technology Office (United States); **Arnaud Hélière**, European Space Research and Technology Ctr. (Netherlands); **Toshiyoshi Kimura**, Japan Aerospace Exploration Agency (Japan)

**Program Committee:** **Saeed H. Al Mansoori**, Mohammed Bin Rashid Space Ctr. (United Arab Emirates); **Jerome F. Caron**, TNO (Belgium); **Philippe Martimort**, European Space Research and Technology Ctr. (Netherlands); **Kyriaki Minoglou**, European Space Agency (Netherlands); **Asal Naseri**, NASA (United States); **Josep Rosello**, European Space Research and Technology Ctr. (Netherlands); **Olivier Saint-Pé**, Airbus Defence and Space (France); **Hiroshi Suto**, Japan Aerospace Exploration Agency (Japan); **Xiaoxiong J. Xiong**, NASA Goddard Space Flight Ctr. (United States)

### Monday 16 September 2024

#### SESSION 1: US MISSIONS AND TECHNOLOGY I

16 September 2024 • 08:40 AM - 10:10 AM | Sidlaw

*Session Chair(s):* **Sachidananda R. Babu**, NASA Earth Science Technology Office (United States)

13192-1 • 08:40 AM - 09:10 AM

**The NASA Earth Science Program overview** (*Invited Paper*)

*Author(s):* **Sachidananda R. Babu**, NASA Earth Science Technology Office (United States)

13192-2 • 09:10 AM - 09:30 AM

**Advances in designing, building, and testing intelligent, data-driven sensors for high-resolution microwave sounding and imaging from small satellite platforms**

*Author(s):* **William J. Blackwell**, **Cara Kataria**, **William Moulder**, MIT Lincoln Lab. (United States); **Steven Reising**, **V. Chandrasekar**, Colorado State Univ. (United States)

13192-3 • 09:30 AM - 09:50 AM

**Compact-fire infrared radiance spectral tracker (c-FIRST) for small satellite platforms**

*Author(s):* **Sarath D. Gunapala**, Jet Propulsion Lab. (United States)

13192-4 • 09:50 AM - 10:10 AM

**Flight qualification of the MEM instruments for the EZIE mission**

*Author(s):* **Pekka P. Kangaslahti**, **Sharmila Padmanabhan**, **Sidharth Misra**, **Oliver Montes**, **Hamid Javadi**, **Andy Fung**, **Rick Cofield**, **Isaac Ramos**, **Seth Sin**, Jet Propulsion Lab. (United States); **Jeng-Hwa Yee**, Johns Hopkins Univ. Applied Physics Lab., LLC (United States)

**Coffee Break 10:10 AM - 10:40 AM**

#### SESSION 2: US MISSIONS AND TECHNOLOGY II

16 September 2024 • 10:40 AM - 11:50 AM | Sidlaw

*Session Chair(s):* **Sachidananda R. Babu**, NASA Earth Science Technology Office (United States)

13192-5 • 10:40 AM - 11:10 AM

**NOAA's Joint Polar Satellite System and the Near Earth Observation Network** (*Invited Paper*)

*Author(s):* **Satya Kalluri**, Office of Low Earth Orbit Observations (United States); **Changyong Cao**, **Flavio Iturbide-Sanchez**, **Quanhua Lou**, **Banghua Yan**, NOAA/NESDIS/STAR (United States)

13192-6 • 11:10 AM - 11:30 AM

**Status of the ARGOS (Aerosol Radiometer for Global Observation of the Stratosphere) instrument**

*Author(s):* **Matthew DeLand**, Science Systems and Applications, Inc. (United States); **Matthew Kowalewski**, Goddard Earth Sciences and Technology Ctr. (United States); **Peter Colarco**, **Luis A. Ramos-Izquierdo**, NASA Goddard Space Flight Ctr. (United States)

13192-8 • 11:30 AM - 11:50 AM

**OreSat 0.5: next-generation small satellite for global cirrus cloud detection and mapping**

*Author(s):* **Brent A. McBride, Rachel Smith**, Univ. of Maryland, Baltimore County (United States); **Andrew Greenberg, Scott Dixon**, Portland State Univ. (United States); **Jan-Peter Muller**, Univ. College London (United Kingdom); **Jose Vanderlei Martins**, Univ. of Maryland, Baltimore County (United States)

**Lunch Break 11:50 AM - 01:20 PM**

**SESSION 3: NASA PACE MISSION I**

16 September 2024 • 01:20 PM - 03:00 PM | Sidlaw

*Session Chair(s):* **Robert H. Estep**, NASA Goddard Space Flight Ctr. (United States)

13192-15 • 01:20 PM - 01:40 PM

**The Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission overview: from concept to launch**

*Author(s):* **Robert H. Estep, Andre Dress, Paul J. Werdell, Michelle S. Smith, Mark F. Voyton, Juli A. Lander, Matthew G. Mazur**, NASA Goddard Space Flight Ctr. (United States)

13192-9 • 01:40 PM - 02:00 PM

**On-orbit OCI characterization measurements from the first 6 months of the PACE mission**

*Author(s):* **Gerhard Meister, Joseph J. Knuble, Julia A. Barsi**, NASA Goddard Space Flight Ctr. (United States); **Robert Bousquet**, Genesis Engineering Solutions, Inc. (United States); **Leland H. Chemerys**, Science Systems and Applications, Inc. (United States); **Robert E. Eplee**, SAIC (United States); **Ulrik B. Gliese**, KBR, Inc. (United States); **Samuel Kitchen-McKinley**, Science Systems and Applications, Inc. (United States); **Shihyan Lee**, SAIC (United States); **Jeffrey W. McIntire**, Science Systems and Applications, Inc. (United States); **Frederick S. Patt**, SAIC (United States); **P. Jeremy Werdell**, NASA Goddard Space Flight Ctr. (United States)

13192-26 • 02:00 PM - 02:20 PM

**First in-orbit results of SPEXone, the multi-angle spectropolarimeter of NASA's PACE mission**

*Author(s):* **Jeroen H. H. Rietjens, Raul Laasner**, SRON Netherlands Institute for Space Research (Netherlands); **Marc Oort**, Airbus Netherlands B.V. (Netherlands); **Martijn Smit, Laura van der Schaaf, Paul Tol, Richard van Hees, Mario Vretnar, Jochen Campo, Jochen Landgraf, Otto P. Hasekamp, Aaldert van Amerongen**, SRON Netherlands Institute for Space Research (Netherlands)

13192-10 • 02:20 PM - 02:40 PM

**First results and on-orbit performance of the Hyper-Angular Rainbow Polarimeter (HARP2) on the PACE satellite**

*Author(s):* **Jose Vanderlei Martins, Roberto A. Fernandez-Borda, Noah Sienkiewicz, Xiaoguang Xu, Anin Puthukkudy, Rachel Smith, Brent A. McBride**, Univ. of Maryland, Baltimore County (United States); **Oleg Dubovik**, Univ. de Lille (France); **Lorraine A. Remer**, Univ. of Maryland, Baltimore County (United States)

13192-16 • 02:40 PM - 03:00 PM

**Overview of NASA's Ocean Color Instrument Solar Calibration Architecture, Pre-Launch Tests, and Preliminary On-Orbit Results**

*Author(s):* **Joseph J. Knuble, Gerhard Meister, Daniel Senai-Alemou, Matthew R. Hinkle**, NASA Goddard Space Flight Ctr. (United States); **Frederick S. Patt, Shihyan Lee**, NASA Goddard Space Flight Ctr. (United States), SAIC (United States); **Robert Bousquet**, NASA Goddard Space Flight Ctr. (United States), Genesis Engineering Solutions, Inc. (United States); **William B. Cook**, NASA Goddard Space Flight Ctr. (United States); **Colby Jurgenson**, Ctr. for Astrophysics | Harvard & Smithsonian (United States); **Ulrik B. Gliese**, NASA Goddard Space Flight Ctr. (United States), KBR, Inc. (United States); **Eric T. Gorman**, Northrop Grumman Corp. (United States); **Robert E. Eplee**, NASA Goddard Space Flight Ctr. (United States), SAIC (United States); **Leland H. Chemerys**, NASA Goddard Space Flight Ctr. (United States), Science Systems and Applications, Inc. (United States); **Eugene Waluschka**, Stellar Solutions Inc. (United States); **Luis A. Ramos-Izquierdo**, NASA Goddard Space Flight Ctr. (United States); **Ralph C. Snel, Gerard C. J. Otter**, TNO (Netherlands); **Jinan Zeng**, Earth System Science Interdisciplinary Ctr., Univ. of Maryland, College Park (United States); **P. Jeremy Werdell**, NASA Goddard Space Flight Ctr. (United States); **Jeffrey W McIntire**, Science Systems and Applications (United States)

**Coffee Break 03:00 PM - 03:30 PM**



## SESSION PL: SENSORS + IMAGING PLENARY SESSION

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium

15:30 to 15:40 hrs

### Welcome and Introduction

#### Ric Schleijpen

TNO Defence, Security and Safety (Netherlands)

#### Lorenzo Bruzzone

Univ. degli Studi di Trento (Italy)

### 2024 Symposium Chairs

13191-500 • 03:40 PM - 04:25 PM

#### Tracking Earth's ice from space (Plenary Presentation)

Author(s): **Andrew Shepherd**, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

#### Sensing in the second quantum revolution (Plenary Presentation)

Author(s): **Francesco Saverio Cataliotti**, LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

#### Imaging and sensing that delivers operational advantage (Plenary Presentation)

Author(s): **Jason Field**, Ministry of Defence (United Kingdom)

## Tuesday 17 September 2024

### SESSION 4: NASA PACE MISSION II

17 September 2024 • 08:30 AM - 10:10 AM | Sidlaw

Session Chair(s): **Sachidananda R. Babu**, NASA Earth Science Technology Office (United States)

13192-14 • 08:30 AM - 08:50 AM

#### Life after launch: a snapshot of the first 6 months of NASA's PACE mission

Author(s): **P. Jeremy Werdell**, NASA Goddard Space Flight Ctr. (United States); **Brian Cairns**, NASA Goddard Institute for Space Studies (United States); **Ivona Cetinić**, Morgan State Univ. (United States); **Bryan A. Franz**, NASA Goddard Space Flight Ctr. (United States); **Otto P. Hasekamp**, SRON Netherlands Institute for Space Research (Netherlands); **Amir Ibrahim**, **Kirk D. Knobelspiesse**, **Antonio Mannino**, NASA Goddard Space Flight Ctr. (United States); **Jose Vanderlei Martins**, Univ. of Maryland, Baltimore County (United States); **Lachlan I. McKinna**, Go2Q Pty Ltd. (Australia); **Gerhard Meister**, NASA Goddard Space Flight Ctr. (United States); **Frederick S. Patt**, SAIC (United States); **Jeroen H. H. Rietjens**, SRON Netherlands Institute for Space Research (Netherlands); **Andrew Sayer**, Univ. of Maryland, Baltimore County (United States); **Carina Poulin**, Science Systems and Applications, Inc. (United States); **James Allen**, Morgan State Univ. (United States); **Skyelar Caplan**, **Christopher Proctor**, **Chamara Rajapakshe**, Science Systems and Applications, Inc. (United States); **Inia Soto Ramos**, Morgan State Univ. (United States); **Emerson Sirk**, Science Systems and Applications, Inc. (United States); **Susanne Craig**, Univ. of Maryland (United States); **Meng Gao**, Science Systems and Applications, Inc. (United States)

13192-17 • 08:50 AM - 09:10 AM

#### Pre-launch analysis and test of the Ocean Color Instrument modulation transfer function

Author(s): **Leland H. Chemerys**, Intuitive Machines, LLC (United States); **Hyeungu Choi**, Global Science & Technology, Inc. (United States); **David A. Kubalak**, NASA Goddard Space Flight Ctr. (United States); **Ulrik B. Gliese**, KBR, Inc. (United States); **Gerhard Meister**, **Joseph J. Knuble**, NASA Goddard Space Flight Ctr. (United States)

13192-18 • 09:10 AM - 09:30 AM

#### Spectrally dependent radiometric measurement errors due to CCD serial pixel-to-pixel readout interference in the Ocean Color Instrument of the NASA PACE mission

Author(s): **Ulrik B. Gliese**, KBR, Inc. (United States), NASA Goddard Space Flight Ctr. (United States); **Kim S. Jepsen**, Science Systems and Applications, Inc. (United States), NASA Goddard Space Flight Ctr. (United States); **Kasey L. Boggs**, **Gregory R. Bredthauer**, Semiconductor Technology Associates, Inc. (United States); **Leland H. Chemerys**, **Felix N. Chi**, Science Systems and Applications, Inc. (United States), NASA Goddard Space Flight Ctr. (United States); **David G. Holliday**, KBR, Inc. (United States), NASA Goddard Space Flight Ctr. (United States); **Joseph J. Knuble**, NASA Goddard Space Flight Ctr. (United States); **Shihyan Lee**, SAIC (United States), NASA Goddard Space Flight Ctr. (United States); **Wei Lu**, Telophase Corp. (United States), NASA Goddard Space Flight Ctr. (United States); **Albert J. Mariano**, NASA Goddard Space Flight Ctr. (United States); **Jeffrey W. McIntire**, Science Systems and Applications, Inc. (United States), NASA Goddard Space Flight Ctr. (United States); **Gerhard Meister**, NASA Goddard Space Flight Ctr. (United States); **David M. Morgan**, Science Systems and Applications, Inc. (United States), NASA Goddard Space Flight Ctr. (United States); **David B. Mott**, NASA Goddard Space Flight Ctr. (United States)

13192-13 • 09:30 AM - 09:50 AM

**In-flight characterization of the Hyper-Angular Rainbow Polarimeter (HARP2) on the NASA PACE mission**

Author(s): **Brent A. McBride, Noah Sienkiewicz, Xiaoguang Xu, Anin Puthukkudy, Roberto Fernandez-Borda, Jose Vanderlei Martins**, Univ. of Maryland, Baltimore County (United States)

13192-12 • 09:50 AM - 10:10 AM

**Georegistration and viewport coregistration for SPEXone, the multi-angle spectropolarimeter on-board the NASA PACE satellite**

Author(s): **Laura van der Schaaf**, SRON Netherlands Institute for Space Research (Netherlands); **Marissa Jonker**, Univ. Twente (Netherlands); **Raul Laasner, Jeroen H. H. Rietjens, Otto P. Hasekamp Mario Vretenar, Paul Tol, Martijn Smit**, SRON Netherlands Institute for Space Research (Netherlands)

**Coffee Break 10:10 AM - 10:40 AM**

**SESSION 5: JAPANESE MISSIONS AND TECHNOLOGY**

17 September 2024 • 10:40 AM - 12:10 PM | Sidlaw

Session Chair(s): **Toshiyoshi Kimura**, Japan Aerospace Exploration Agency (Japan)

13192-19 • 10:40 AM - 11:10 AM

**Overview of Japanese Earth Observation programs (Invited Paper)**

Author(s): **Toshiyoshi Kimura**, Japan Aerospace Exploration Agency (Japan)

13192-20 • 11:10 AM - 11:30 AM

**Overview of next generation precipitation radar satellite, PMM**

Author(s): **Hidekazu Masuda, Kinji Furukawa, Kazuyuki Okada, Tomomi Nio**, Japan Aerospace Exploration Agency (Japan)

13192-21 • 11:30 AM - 11:50 AM

**EarthCARE/CPR pre-launch preparations and post-launch status**

Author(s): **Kanae Haze, Eiichi Tomita, Tomomi Nio, Kazuyuki Okada, Kenta Maruyama, Hiroataka Nakatsuka, Nobuhiro Tomiyama, Yoshihisa Aida, Shusuke Ochiai, Kazuya Konoue, Yuki Imura, Takuji Kubota, Masataka Muto, Shunsuke Aoki, Toshiyuki Tanaka**, Japan Aerospace Exploration Agency (Japan); **Hiroaki Horie, Yuichi Ohno, Kenji Sato**, National Institute of Information and Communications Technology (Japan)

13192-22 • 11:50 AM - 12:10 PM

**Optical designing and case study of image restoration for space-based ultra-lightweight electro-optical telescopic systems with an optically-sparse non-uniform-sized segmented primary aperture mirror**

Author(s): **Avyarthana Ghosh**, Tata Consultancy Services, Ltd. (India); **Pavan Kumar Reddy K.**, Tata Consultancy Services (India); **Achanna Anil Achanna, Tapas Chakravarty, Arpan Pal, Balamuralidhar P.**, Tata Consultancy Services, Ltd. (India)

**Lunch/Exhibition Break 12:10 PM - 01:20 PM**

**SESSION 6: EUROPEAN MISSIONS AND TECHNOLOGY I**

17 September 2024 • 01:20 PM - 03:10 PM | Sidlaw

Session Chair(s): **Arnaud Hélière**, European Space Agency (Netherlands)

13192-23 • 01:20 PM - 01:50 PM

**Overview of ESA Earth observation missions (Invited Paper)**

Author(s): **Arnaud Hélière**, European Space Agency (Netherlands)

13192-24 • 01:50 PM - 02:10 PM

**EarthDaily Constellation: daily global scientific quality imagery for environmental monitoring**

Author(s): **Chris Rampersad, Miriam Cabero**, EarthDaily Analytics (Canada)

13192-25 • 02:10 PM - 02:30 PM

**Theoretical performance limitations and filter selection based on Fisher information of a computational photonic crystal spectrometer for trace-gas retrieval**

Author(s): **Marijn Siemons, Ralf Kohlhaas**, SRON Netherlands Institute for Space Research (Netherlands)

13192-11 • 02:30 PM - 02:50 PM

**Calibration campaign of SPEXone Second Generation: early results and instrument performance**

*Author(s):* **Matej Arko, Jochen Campo, Marijn Siemons**, SRON Netherlands Institute for Space Research (Netherlands); **Robbert Winkelman**, Airbus Defence and Space Netherlands (Netherlands); **Alexander Eigenraam, Paul Tol, Mario Vretenar, Jeroen H. H. Rietjens, Martijn Smit**, SRON Netherlands Institute for Space Research (Netherlands); **Jos Dingjan**, Airbus Defence and Space (Netherlands); **Jeroen Peters**, Airbus Defence and Space Netherlands (Netherlands); **Berit Ahlers, Jens Löhring**, European Space Research and Technology Ctr., European Space Agency (Netherlands); **Ralf Kohlhaas, Bastiaan van Diedenhoven, Ruud Hoogeveen, Aaldert van Amerongen**, SRON Netherlands Institute for Space Research (Netherlands)

13192-27 • 02:50 PM - 03:10 PM

**Synthetic aperture radar in a near-zero inclination almost circular geosynchronous orbit: mission analysis and orbit maintenance**

*Author(s):* **Francesca Pelliccia, Maria Daniela Graziano, Antonio Moccia, Alfredo Renga, Matteo Monti**, Univ. degli Studi di Napoli Federico II (Italy); **Andrea Monti Guarnieri**, Politecnico di Milano (Italy); **Giovanni Paolo Blasone, Simona Zoffoli, Deodato Tapete**, Agenzia Spaziale Italiana (Italy)

**Coffee Break 03:10 PM - 03:40 PM**

**SESSION 7: EUROPEAN MISSIONS AND TECHNOLOGY II**

17 September 2024 • 03:40 PM - 05:30 PM | Sidlaw

*Session Chair(s):* **Arnaud Hélière**, European Space Agency (Netherlands)

13192-28 • 03:40 PM - 04:10 PM

**Progress on the development of the Copernicus CO2M mission (Invited Paper)**

*Author(s):* **Gregory Bazalgette Courrèges-Lacoste, Yannig Durand, Charlotte Pachot, Monica Martinez Fernandez, Terry Bastirmaci, Angela Birthwistle, Yasjka Meijer, Mauro Caleno, Valérie Fernandez, Hana Ouslimani, Arnaud Pasquet, Anantha Chanumolu**, European Space Research and Technology Ctr. (Netherlands)

13192-29 • 04:10 PM - 04:30 PM

**MBZSAT-1 mission overview**

*Author(s):* **Saeed H. Al Mansoori**, Mohammed Bin Rashid Space Ctr. (United Arab Emirates); **Nour Aburaed, Mina Al-Saad**, Univ. of Dubai (United Arab Emirates)

13192-30 • 04:30 PM - 04:50 PM

**Voltage domain TDI with diffusion enhanced pixels**

*Author(s):* **Bart Dierickx, Jan Vermeiren, gaozhan Cai, Veerarraghavan Sridharan, Benjamin Van Camp, Bilgesu Sezgin**, Caeleste (Belgium)

13192-31 • 04:50 PM - 05:10 PM

**Room temperature 96x96 InGaAs/InP SPAD array for SWIR imaging**

*Author(s):* **Pascal Rustige, Patrick Runge**, Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut, HHI (Germany); **Martin Schell**, Fraunhofer-Institut für Nachrichtentechnik, Heinrich-Hertz-Institut, HHI (Germany), Technische Univ. Berlin (Germany)

13192-32 • 05:10 PM - 05:30 PM

**High performance detector and FEE combined solutions for visible and infrared imaging to support future space missions**

*Author(s):* **Jérôme Pratlong, Douglas Jordan**, Teledyne e2v UK Ltd. (United Kingdom)

**POSTERS-TUESDAY**

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 16:00 hrs, Lennox Suite

View poster presentation guidelines and set-up instructions at

<https://spie.org/ESI/poster-presentation-guidelines>

13192-7 • 05:30 PM - 07:00 PM

**CLARREO Pathfinder solar diffuser pre-flight calibration**

*Author(s):* **Georgi T. Georgiev, Julia A. Barsi**, NASA Goddard Space Flight Ctr. (United States); **Nathan E. Kelley**, Science Systems and Applications, Inc. (United States); **Elena M. Georgieva**, NASA Goddard Space Flight Ctr. (United States); **Yana Z. Williams**, NASA Langley Research Ctr. (United States); **Paul Smith, Anthony J. Barsic**, Lab. for Atmospheric and Space Physics (United States)

13192-43 • 05:30 PM - 07:00 PM

**A double-dispersive setup for spatio-spectral scanning in hyperspectral Earth observation**

Author(s): **Peter Hinderberger, Martin J. Losekamm**, Technische Univ. München (Germany); **Martin J. Losekamm, Sascha Grusche**, Technische Univ. München (Germany)

13192-44 • 05:30 PM - 07:00 PM

**Imaging quality evaluation and improvement of in-orbit satellites based on lunar observation**

Author(s): **Chunling Lu**, DFH Satellite Co., Ltd. (China)

13192-46 • 05:30 PM - 07:00 PM

**Designing a hyperspectral imaging system for Earth observation: insights into mission analysis**

Author(s): **Imène Taleb**, Agence Spatiale Algérienne (Algeria)

13192-47 • 05:30 PM - 07:00 PM

**The accuracy assessment by UAV vs. field goniometer for BRDF**

Author(s): **SeungChan Lim**, Pukyong National Univ. (Korea, Republic of)

13192-48 • 05:30 PM - 07:00 PM

**Long-term harmonized cross-sensor SIF datasets from 1995 improve vegetation monitoring**

Author(s): **Chu Zou**, Aerospace Information Research Institute (China)

## Wednesday 18 September 2024

### SESSION 9: CALIBRATION AND VALIDATION I

18 September 2024 • 08:30 AM - 10:20 AM | Sidlaw

Session Chair(s): **Xiaoxiong Xiong**, NASA Goddard Space Flight Ctr. (United States)

13192-33 • 08:30 AM - 09:00 AM

**An update of NOAA-21 VIIRS on-orbit calibration and performance** *(Invited Paper)*

Author(s): **Xiaoxiong Xiong**, NASA Goddard Space Flight Ctr. (United States)

13192-34 • 09:00 AM - 09:20 AM

**JPSS-4 VIIRS prelaunch calibration performance and assessment**

Author(s): **Amit Angal**, Science Systems and Applications, Inc. (United States); **David Moyer**, The Aerospace Corp. (United States); **Xiaoxiong Xiong**, NASA Goddard Space Flight Ctr. (United States); **Daniel Link, Thomas Schwarting, Jeffrey W. McIntire, Qiang Ji**, Science Systems and Applications, Inc. (United States); **Chengbo Sun**, Global Science & Technology, Inc. (United States)

13192-35 • 09:20 AM - 09:40 AM

**Continuing impact of satellite orbit drift on MODIS solar diffuser calibrations**

Author(s): **Kevin A. Twedt**, Science Systems and Applications, Inc. (United States); **Xiaoxiong Xiong**, NASA Goddard Space Flight Ctr. (United States); **Gal Sarid, Joseph Kwasizur**, Science Systems and Applications, Inc. (United States)

13192-36 • 09:40 AM - 10:00 AM

**Improved characterization of Dome Concordia for tracking calibration changes in MODIS reflective solar bands**

Author(s): **Brent A. McBride, Kevin A. Twedt, Aisheng Wu, Xu Geng**, Science Systems and Applications, Inc. (United States); **Xiaoxiong Xiong**, NASA Goddard Space Flight Ctr. (United States)

13192-37 • 10:00 AM - 10:20 AM

**OCI geolocation evaluation and refinement using Landsat control points**

Author(s): **Frederick S. Patt, Alexandr V. Semenov, Gwyn F. Fireman, Thomas J. Owens, Corrine Rojas, John G. Wilding**, SAIC (United States)

### Coffee Break 10:20 AM - 10:50 AM

### SESSION 7: CALIBRATION AND VALIDATION II

18 September 2024 • 10:50 AM - 12:30 PM | Sidlaw

Session Chair(s): **Xiaoxiong Xiong**, NASA Goddard Space Flight Ctr. (United States)

13192-38 • 10:50 AM - 11:10 AM

**NASA TROPICS Mission: microwave radiometer calibration using machine learning**

Author(s): **Robert V. Leslie, William J. Blackwell, Michael DiLiberto**, MIT Lincoln Lab. (United States)

13192-39 • 11:10 AM - 11:30 AM

**Radiometric calibration of low earth orbit infrared imagery using a hybrid on-orbit and ground processing approach**

Author(s): **Samuel N. Nissim, Tania Kleynhans, William Thomas**, Hydrosat Inc. (United States)

13192-40 • 11:30 AM - 11:50 AM

**In-orbit monitoring of the EUMETSAT Polar System: second generation (EPS-SG) visible/infrared imager (METImage) polarisation sensitivity using the multiview, multichannel, multipolarisation imager (3MI)**

*Author(s):* **Pepe L. Phillips, Bertrand Fournie**, EUMETSAT (Germany)

13192-41 • 11:50 AM - 12:10 PM

**The use of space-to-space non-Earth imagery (NEI) to underpin and de-risk space operations**

*Author(s):* **Toby Harris, Catie Allen**, HEO Robotics (UK) Ltd. (United Kingdom)

13192-42 • 12:10 PM - 12:30 PM

**Impact of varying SNR in L1C data on Sentinel-2 L2A products**

*Author(s):* **Sébastien Clerc**, ACRI-ST (France); **Bringfried Pflug**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Louis Rivoire**, ACRI-ST (France); **Avi Putri Pertiwi**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Silvia Enache**, CS Group (France); **Rosario Quirino Lannone**, RHEA Group Ltd. (Italy); **Marco Celesti, Roberto Camarero, Francisco Reina, Constantin Mavrocordatos**, European Space Agency (Netherlands)



# CONFERENCE 13193

## Remote Sensing of Clouds and the Atmosphere XXIX

17 September 2024 | Carrick

**Conference Chair(s):** Evgueni I. Kassianov, Pacific Northwest National Lab. (United States); Simone Lolli, CNR-IMAA (Italy)

**Program Committee:** Lucas Alados-Arboledas, Univ. de Granada (Spain); Romain Ceolato, ONERA (France); Adolfo Comerón, Univ. Politècnica de Catalunya (Spain); Erica Dolinar, U.S. Naval Research Lab. (United States); Connor Flynn, The Univ. of Oklahoma (United States); Guido Masiello, Univ. degli Studi della Basilicata (Italy); Klaus Schäfer, Atmospheric Physics Consulting (Germany); Carmine Serio, Univ. degli Studi della Basilicata (Italy); Bastiaan van Diedenhoven, SRON Netherlands Institute for Space Research (Netherlands); Gemine Vivone, CNR-NBFC (Italy); Konradin Weber, Fachhochschule Düsseldorf (Germany)

### Tuesday 17 September 2024

#### SESSION 1: REMOTE SENSING OF CLOUDS, AEROSOLS, TRACE GASES AND METEOROLOGICAL PARAMETERS I

17 September 2024 • 09:00 AM - 10:20 AM | Carrick

*Session Chair(s):* Simone Lolli, Istituto di Metodologie per l'Analisi Ambientale (Italy)

13193-1 • 09:00 AM - 09:20 AM

**The Cloud Identification and Classification (CIC) algorithm for high spectral resolution observations in the far- and mid-infrared part of the spectrum**

*Author(s):* Tiziano Maestri, Michele Martinazzo, Fabrizio Masin, Giorgia Proietti Pelliccia, Univ. degli Studi di Bologna (Italy); Federico Donat, Univ. degli Studi della Basilicata (Italy); Lorenzo Cassini, Univ. degli Studi della Basilicata (Italy), Sapienza Univ. di Roma (Italy); Guido Masiello, Giuliano Liuzzi, Carmine Serio, Univ. degli Studi della Basilicata (Italy)

13193-2 • 09:20 AM - 09:40 AM

**Developments of the  $\sigma$ -IASI/F2N radiative transfer model: a new linear-in-T approach for accurate treatment of clouds**

*Author(s):* Guido Masiello, Carmine Serio, Giuliano Liuzzi, Pamela Pasquariello, Rocco Giosa, Univ. degli Studi della Basilicata (Italy); Tiziano Maestri, Michele Martinazzo, Fabrizio Masin, Univ. degli Studi di Bologna (Italy); Lorenzo Cassini, Sapienza Univ. di Roma (Italy), Univ. degli Studi della Basilicata (Italy); Federico Donat, Univ. degli Studi della Basilicata (Italy), Univ. degli Studi di Bologna (Italy); Giorgia Proietti Pelliccia, Univ. degli Studi di Bologna (Italy); Sara Venafra, Agenzia Spaziale Italiana (Italy); Luca Sgheri, Francesco De Cosmo, Istituto per le Applicazioni del Calcolo "Mauro Picone", CNR (Italy)

13193-4 • 09:40 AM - 10:00 AM

**Comparative Analysis of Precipitation Scavenging Effects on Aerosol Loading in Beijing and Shanghai: Seasonal Variability and Implications for Air Quality Management**

*Author(s):* Andreu Salcedo-Bosch, Simone Lolli, Istituto di Metodologie per l'Analisi Ambientale (Italy); Zong Lian, Shiyu Chen, Yuanjing Yang, Nanjing Univ. of Information Science & Technology (China)

13193-5 • 10:00 AM - 10:20 AM

**Recent Progress on Forward and Inverse Model Development for Satellite Hyperspectral Remote Sensing**

*Author(s):* Xu Liu, NASA Langley Research Ctr. (United States)

**Coffee Break 10:20 AM - 10:50 AM**

#### SESSION 2: REMOTE SENSING OF CLOUDS, AEROSOLS, TRACE GASES AND METEOROLOGICAL PARAMETERS II

17 September 2024 • 10:50 AM - 12:10 PM | Carrick

*Session Chair(s):* Simone Lolli, Istituto di Metodologie per l'Analisi Ambientale (Italy)

13193-6 • 10:50 AM - 11:10 AM

**Estimating surface water loss using WDI and ECI: a climatological study on different land covers**

*Author(s):* Pamela Pasquariello, Guido Masiello, Carmine Serio, Vito Telesca, Giuliano Liuzzi, Marco D'Emilio, Rocco Giosa, Univ. degli Studi della Basilicata (Italy); Sara Venafra, Agenzia Spaziale Italiana (Italy); Italia De Feis, Istituto per le Applicazioni del Calcolo "Mauro Picone" (Italy); Fabio Della Rocca, Univ. degli Studi di Napoli Federico II (Italy)

13193-7 • 11:10 AM - 11:30 AM

**Machine learning techniques for spatial interpolation of the IASI water deficit index**

*Author(s):* Fabio Della Rocca, Univ. degli Studi di Napoli Federico II (Italy); Italia De Feis, Istituto per le Applicazioni del Calcolo "Mauro Picone" (Italy); Guido Masiello, Carmine Serio, Pamela Pasquariello, Univ. degli Studi della Basilicata (Italy)

13193-8 • 11:30 AM - 11:50 AM

**Nitric acid retrieval in the Antarctic atmosphere with all-sky IASI spectra and comparison with AURA-MLS observations**

*Author(s):* Carmine Serio, Guido Masiello, Giuliano Liuzzi, Pamela Pasquariello, Univ. degli Studi della Basilicata (Italy); Federico Donat, Univ. degli Studi della Basilicata (Italy), Univ. degli Studi di Bologna (Italy); Tiziano Maestri, Michele Martinazzo, Univ. degli Studi di Bologna (Italy); Rocco Giosa, Univ. degli Studi della Basilicata (Italy); Lorenzo Cassini, Sapienza, Univ. di Roma (Italy), Univ. degli Studi della Basilicata (Italy)

13193-9 • 11:50 AM - 12:10 PM

**GHG measurements using an imaging FTS on a stratospheric balloon - A Tech Demo for the Arctic Observing Mission**

*Author(s):* Shen-En Qian, Stephane Routhier, Tongxi Wu, Denis Dufour, Canadian Space Agency (Canada); Stephane Lantagne, ABB Canada, Measurement & Analytics Division (Canada); Frederic Grandmont, ABB Canada (Canada); Doug Degenstein, Alexis Bourassa, Adam Bourassa, Daniel Zawada, Nicolas Lloyd, Paul Loewen, Jeff Langille, University of Saskatchewan (Canada); Ray Nassar, Chris Sioris, Joseph Mendonca, Environment and Climate Change Canada (Canada)

**Lunch/Exhibition Break 12:10 PM - 01:40 PM**

**SESSION 3: TECHNOLOGIES, TECHNIQUES AND ALGORITHMS FOR ACTIVE AND PASSIVE REMOTE SENSING I**

17 September 2024 • 01:40 PM - 03:00 PM | Carrick

*Session Chair(s):* Evgueni I. Kassianov, Pacific Northwest National Lab. (United States)

13193-10 • 01:40 PM - 02:00 PM

**Estimation of BBA plume altitude from cross reference between satellite observations and model simulations**

*Author(s):* Sonoyo Mukai, The Kyoto College of Graduate Studies for Informatics (Japan); Makiko Nakata, Kindai Univ. (Japan); Souichiro Hioki, Univ. de Lille (France), CNRS (France); Takuya Funatomi, Nara Institute of Science and Technology (Japan); Masatugu Kidode, Advanced Telecommunications Research Institute International (Japan)

13193-11 • 02:00 PM - 02:20 PM

**Stereoscopic height estimation of biomass burning aerosol and volcanic ash plumes by the second-generation global imager (SGLI)**

*Author(s):* Souichiro Hioki, Univ. de Lille (France); Takuya Funatomi, Nara Institute of Science and Technology (Japan); Makiko Nakata, Kindai Univ. (Japan); Sonoyo Mukai, The Kyoto College of Graduate Studies for Informatics (Japan); Masatugu Kidode, Nara Institute of Science and Technology (Japan)

13193-12 • 02:20 PM - 02:40 PM

**Short-range high spectral resolution lidar: a proof-of-concept for aerosol characterization near the source**

*Author(s):* Manuela Hoyos Restrepo, Romain Ceolato, ONERA (France); Yoshitaka Jin, National Institute for Environmental Studies (Japan)

13193-13 • 02:40 PM - 03:00 PM

**Surface atmosphere observation with 265nm LED mini-lidar**

*Author(s):* Tatsuo Shiina, Chiba Univ. (Japan); Yasuyuki Kawakami, Takumi Ikeda, Kunihiro Katano, Yuta Yamaguchi, Stanley Electric Co., Ltd. (Japan)

**Coffee Break 03:00 PM - 03:30 PM**

**SESSION 4: TECHNOLOGIES, TECHNIQUES AND ALGORITHMS FOR ACTIVE AND PASSIVE REMOTE SENSING II**

17 September 2024 • 03:30 PM - 05:30 PM | Carrick

*Session Chair(s):* Evgueni I. Kassianov, Pacific Northwest National Lab. (United States)

13193-15 • 03:30 PM - 03:50 PM

**Utilizing CLAVR-x to model sensitivity of cloud products to satellite sensor performance**

*Author(s):* Cameron Martus, Brian Johnson, Patrick D. Johnson, David I. Moyer, Joel Thomas, The Aerospace Corp. (United States)

13193-16 • 03:50 PM - 04:10 PM

**Deep learning-based cloud segmentation and classification for weather monitoring**

*Author(s):* **Cameron Martus, Brian Johnson**, The Aerospace Corp. (United States)

13193-17 • 04:10 PM - 04:30 PM

**Ground-based radiometers with extended spectral coverage: evaluation and expected applications**

*Author(s):* **Evgueni I. Kassianov**, Pacific Northwest National Lab. (United States); **Connor Flynn**, The Univ. of Oklahoma (United States); **James Barnard, Brian Ermold, Erol Cromwell, John E. Shilling, Jennifer M. Comstock**, Pacific Northwest National Lab. (United States)

13193-18 • 04:30 PM - 04:50 PM

**Precipitation water at the peak cloud liquid water and surface rainfall**

*Author(s):* **Rajasri Sen Jaiswal**, Gopalan College of Engineering and Management (India)

13193-19 • 04:50 PM - 05:10 PM

**Cloud detection for multispectral images of space-based Earth observational sensors using imagery simulation model**

*Author(s):* **Xiaoyu He**, Beihang Univ. (China); **Ouning Zhu**, The System Design Institute of Mechanical (China); **Mengfan Zou, Shaoping Shuai, Xiaojian Xu**, Beihang Univ. (China)

13193-20 • 05:10 PM - 05:30 PM

**Modeling of atmospheric radiative transfer with polarization effects using scattering phase matrix**

*Author(s):* **Mengfan Zou**, Beihang Univ. (China); **Jianhua Li**, National Key Lab. of Science and Technology on Space Microwave Technology (China); **Xiaojian Xu, Xiaoyu He**, Beihang Univ. (China)

## POSTERS-TUESDAY

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

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View poster presentation guidelines and set-up instructions at

<https://spie.org/ESI/poster-presentation-guidelines>

13193-21 • 05:30 PM - 07:00 PM

**Assessment of dust and biomass burning episodes using Sentinel-2 satellite data**

*Author(s):* **Luciano Alparone**, Univ. degli Studi di Firenze (Italy); **Alberto Arienzo**, Univ. degli studi di Firenze (Italy); **Andrea Garzelli**, Univ. degli Studi di Siena (Italy); **Simone Lolli**, Istituto di Metodologie per l'Analisi Ambientale (Italy)

13193-23 • 05:30 PM - 07:00 PM

**Consideration of aerosol injection processes originating from wildfires in a chemical transport model**

*Author(s):* **Makiko Nakata**, Kindai Univ. (Japan); **Sonoyo Mukai**, The Kyoto College of Graduate Studies for Informatics (Japan)

13193-24 • 05:30 PM - 07:00 PM

**Towards an optimal estimation retrieval of cirrus cloud optical and microphysical properties using hyperspectral shortwave instruments and a fast radiative transfer algorithm**

*Author(s):* **Jeffrey Mast**, NASA Postdoctoral Program (United States); **Yolanda Shea, Xu Liu**, NASA Langley Research Ctr. (United States)

13193-25 • 05:30 PM - 07:00 PM

**Optimal cloud-clearing radiances for GIIRS onboard FengYun-4A satellite**

*Author(s):* **Xinya Gong, Jun Li**, National Satellite Meteorological Ctr. (China); **Zhenglong Li**, Univ. of Wisconsin-Madison (United States); **Ruoying Yin, Wei Han**, China Meteorological Administration (China)

13193-26 • 05:30 PM - 07:00 PM

**A novel satellite optical sensing system for atmospheric NO<sub>2</sub>– motivation, concept design, and instrument modelling**

*Author(s):* **Andrew Matheson**, The Univ. of Edinburgh (United Kingdom); **William Brzozowski**, Astronomy Technology Centre, Royal Observatory Edinburgh (United Kingdom); **Ranvir Dhillon**, University of Leicester (United Kingdom); **Frances McGinley, Anna Michalska**, The Univ. of Edinburgh (United Kingdom); **Joshua Vande Hey**, University of Leicester (United Kingdom); **Jerome Woodward, Paul Palmer**, The Univ. of Edinburgh (United Kingdom)

13193-27 • 05:30 PM - 07:00 PM

**NIMCAM: a high spatial resolution methane monitoring instrument**

*Author(s):* **Anna Michalska, Frances McGinley, A. Jerome P. Woodward, Andrew B. Matheson, Paul I. Palmer**, The Univ. of Edinburgh (United Kingdom)

# CONFERENCE 13194

## Environmental Effects on Light Propagation and Adaptive Systems VII

18 - 19 September 2024 | Carrick

**Conference Chair(s):** Karin Stein, Szymon Gladysz, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

**Program Committee:** Eyal Agassi, Israel Institute for Biological Research (Israel); Kasia Balakier, European Space Agency (United Kingdom); Mara Baraban, Rafael Advanced Defense Systems Ltd. (Israel); Ivo Buske, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Christian Eisele, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); Ariadna I. Huerta Viso, TNO (Netherlands); Gaël Kermarrec, Leibniz Univ. Hannover (Germany); Andrew J. Lambert, UNSW Canberra (Australia); Vladimir P. Lukin, V.E. Zuev Institute of Atmospheric Optics (Russian Federation); Florian Moll, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Andreas Muschinski, NorthWest Research Associates (United States); Pietro Paglierani, NATO STO-CMRE (Italy); Darío G. Pérez, Pontificia Univ. Católica de Valparaíso (Chile); Andrew P. Reeves, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); Italo Toselli, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); Alexander M. J. van Eijk, TNO Defence, Security and Safety (Netherlands); Vladimir Yurievich Venediktov, Saint Petersburg Electrotechnical Univ. "LETI" (Russian Federation); Oskar F. von der Lühe, Leibniz-Institut für Sonnenphysik (KIS) (Germany); Henry White, BAE Systems (United Kingdom)

### Wednesday 18 September 2024

#### OPENING REMARKS

18 September 2024 • 09:35 AM - 09:40 AM | Carrick

**Szymon Gladysz**, Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB (Germany)

#### SESSION 1: CHARACTERIZATION AND MODELLING OF THE PROPAGATION ENVIRONMENT I

18 September 2024 • 09:40 AM - 11:30 AM | Carrick

**Session Chair(s):** Roderik A. Overzier, TNO (Netherlands)

13194-1 • 09:40 AM - 10:00 AM

**Real-time atmospheric characterization using drone swarms as sensor platforms**

**Author(s):** Karel Desnijder, Abdoulrahmane Sani Ali, Marijke Vandewal, Royal Military Academy (Belgium)

13194-3 • 10:00 AM - 10:20 AM

**Introducing TURBO: a 24-hour continuous turbulence monitor in Barcelona**

**Author(s):** Lily F. Beesley, James Osborn, Ryan Griffiths, Kathryn Hartley, Ollie J. Farley, Durham Univ. (United Kingdom); Matthew J. Townson, Northumbria Univ. (United Kingdom); Adolfo Comerón, Alejandro Rodríguez-Gomez, Univ. Politècnica de Catalunya (Spain); David Alaluf, European Space Research and Technology Ctr., European Space Agency (Netherlands); Florian Quatresooz, Univ. Catholique de Louvain (Belgium)

Coffee Break • 10:20 AM - 10:50 AM

13194-5 • 10:50 AM - 11:10 AM

**Laser propagation influence research considering the atmospheric characteristics of South Korea**

**Author(s):** Ji Yong Joo, Kongju National Univ. (Korea, Republic of); Ji Hyun Pak, Kongju National Univ. (Kiribati, Republic of); Seok Gi Han, Jun ho Lee, Kongju National Univ. (Korea, Republic of)

13194-7 • 11:10 AM - 11:30 AM

**Pixel Reconstruction Based Optical Transmission Simulation Method in Hypersonic Environment**

**Author(s):** Zeqi Wang, Yutang Wang, Jian Chen, Dapeng Tian, Changchun Institute of Optics, Fine Mechanics and Physics (China)

**Lunch/Exhibition Break 11:30 AM - 01:10 PM**

**SESSION 2: CHARACTERIZATION AND MODELLING OF THE PROPAGATION ENVIRONMENT II**

18 September 2024 • 01:10 PM - 03:20 PM | Carrick

*Session Chair(s):* **Szymon Gladysz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13194-8 • 01:10 PM - 01:40 PM

**Improvements in accuracy and resolution of 24-hour Shack-Hartmann optical turbulence profiling and implementation on the 24hSHIMM.** (*Invited Paper*)*Author(s):* **Ryan Griffiths**, Ctr. for Advanced Instrumentation (United Kingdom); **Florian Quatresooz**, Univ. Catholique de Louvain (Belgium); **James Osborn, Richard Wilson**, Ctr. for Advanced Instrumentation (United Kingdom)

13194-9 • 01:40 PM - 02:00 PM

**Exploring of length scales of the Kolmogorov turbulence spectrum in the atmospheric surface layer***Author(s):* **Detlev Sprung, Erik Sucher, Carmen Ullwer**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Alexander M. J. van Eijk**, TNO (Netherlands), Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13194-10 • 02:00 PM - 02:20 PM

**Comparison of mixing length scale parametrization for the investigation of turbulence relevant for ground to satellite communication***Author(s):* **Detlev Sprung, Carmen Ullwer**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Alexander M. J. van Eijk**, TNO (Netherlands), Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13194-11 • 02:20 PM - 02:40 PM

**Wavelength-dependent extinction statistics based on long-term aerosol size distribution measurements***Author(s):* **Daniel Brattgård, Mattias Rahm, Markus Henriksson**, FOI-Swedish Defence Research Agency (Sweden)

13194-12 • 02:40 PM - 03:00 PM

**Design and solution-based testing of a synthetic aerosol particle with asymmetric scattering behavior***Author(s):* **Adriana Stohn, Shichen Guo, Gregory M. Hernandez, Benjamin J. Wiley, Steven A. Cummer, Michael E. Gehm**, Duke Univ. (United States)

13194-13 • 03:00 PM - 03:20 PM

**Comparative analysis of atmospheric aerosol models for quantifying aerosol loading and characterizing visibility in West Africa***Author(s):* **Thomas Kociok, Carmen Ullwer**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Alexander M. J. van Eijk**, TNO Defence, Security and Safety (Netherlands); **Karin Stein**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)**Coffee Break 03:20 PM - 03:50 PM****SESSION 3: ADAPTIVE OPTICS AND ALTERNATIVES FOR MITIGATION OF ATMOSPHERIC EFFECTS**

18 September 2024 • 03:50 PM - 05:10 PM | Carrick

*Session Chair(s):* **Szymon Gladysz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13194-14 • 03:50 PM - 04:10 PM

**Demonstrating a line-of-sight optical dome turbulence monitor***Author(s):* **Kathryn Barrett, James Osborn**, Durham Univ. (United Kingdom); **David Alaluf**, European Space Research and Technology Ctr., European Space Agency (Netherlands); **Ollie J. Farley**, Durham Univ. (United Kingdom)

13194-16 • 04:10 PM - 04:30 PM

**Simulated evaluation of laser tomography adaptive optics system performance using MATLAB***Author(s):* **Seok Gi Han, Ji Yong Joo, Jun Ho Lee**, Kongju National Univ. (Korea, Republic of)

13194-17 • 04:30 PM - 04:50 PM

**Estimation and application of the transmission matrix of a turbulent atmospheric channel***Author(s):* **Raphael Bellossi, Giacomo Sorelli**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Cade Peters, Andrew Forbes**, Univ. of the Witwatersrand, Johannesburg (South Africa); **Szymon Gladysz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13194-18 • 04:50 PM - 05:10 PM

**Improving the performance of the modal holographic wavefront sensor by adapting to prevailing turbulence conditions: experimental verification***Author(s):* **Andreas Zepp**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Emma Branigan, Kevin Murphy**, Technological Univ. Dublin (Ireland); **Szymon Gladysz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)



## Thursday 19 September 2024

## SESSION 4: LASER BEAM PROPAGATION

19 September 2024 • 08:30 AM - 09:30 AM | Carrick

Session Chair(s): **Christian Eisele**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13194-19 • 08:30 AM - 08:50 AM

**High-speed complex phase retrieval of light propagating through optical turbulence: spatiotemporal characteristics**Author(s): **Darío G. Pérez, Aarón Cofré, Pablo Scherz, Bastian Romero**, Pontificia Univ. Católica de Valparaíso (Chile); **Eduardo Peters**, Univ. de los Andes (Chile)

13194-20 • 08:50 AM - 09:10 AM

**Evaluating the effects of buoyancy range models on beam wander via wave optics simulations**Author(s): **Jeremy P. Bos**, Michigan Technological Univ. (United States)

13194-21 • 09:10 AM - 09:30 AM

**Symbol error probability for coherent laser communications systems in atmospheric turbulence: Gaussian beam analysis**Author(s): **Italo Toselli, Szymon Gladysz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

## SESSION 5: CHANNEL PROPAGATION CHALLENGES IN LASER SATELLITE COMMUNICATIONS

19 September 2024 • 09:30 AM - 11:50 AM | Carrick

Session Chair(s): **Florian Moll**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13194-22 • 09:30 AM - 10:00 AM

**Field and in-orbit trials with free-space optical communication: the impact of time-variant links** (*Invited Paper*)Author(s): **Niek J. Doelman, Gert Witvoet, Erik Veldhuis, Stijn Langedijk, Kristiaan Broekens**, TNO (Netherlands)

13194-23 • 10:00 AM - 10:30 AM

**Review of spatial mode multiplexed FSO transmission in the presence of atmospheric turbulence** (*Invited Paper*)Author(s): **Majid Safari, Shenjie Huang**, The Univ. of Edinburgh (United Kingdom)

Coffee Break • 10:30 AM - 10:50 AM

13194-24 • 10:50 AM - 11:10 AM

**Image sensor-based pointing, acquisition and tracking for optical satellite links**Author(s): **Jan Paul Jakobs, Christopher Schmidt**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13194-26 • 11:10 AM - 11:30 AM

**Design and deployment of a physical channel simulator for performance analysis of free-space optical links**Author(s): **Davide Orsucci, Johannes Prell, Florian Moll, Lützen Pia, Janis Surof, Christian Fuchs**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13194-27 • 11:30 AM - 11:50 AM

**A spectral shaping approach to generate power vectors for optical ground-to-space links**Author(s): **Gianluca La Torre, Samuele Raffa, Juraj Poliak, Andrew P. Reeves, Ilija Hristovski**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

## Lunch Break 11:50 AM - 01:00 PM

## SESSION 6: CHANNEL PROPAGATION CHALLENGES IN FREE-SPACE QUANTUM KEY DISTRIBUTION

19 September 2024 • 01:00 PM - 04:30 PM | Carrick

Session Chair(s): **Pietro Paglierani**, STO-CMRE (Italy)

13194-28 • 01:00 PM - 01:30 PM

**Site characterization for QKD ground stations: a requirements perspective and data of the Optical Ground Station Oberpfaffenhofen** (*Invited Paper*)Author(s): **Florian Moll**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Alessia Scriminich, Christoph Gohle**, OHB System AG (Germany); **Stefanie Häusler**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Bettina Heim**, OHB System AG (Germany); **Davide Orsucci, Johannes Prell**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13194-29 • 01:30 PM - 02:00 PM

**Daylight free space quantum key distribution** (*Invited Paper*)Author(s): **Alberto Comin**, Airbus Defence and Space (Germany)

13194-30 • 02:00 PM - 02:30 PM

**A retracing free space optical connection for reliable underwater optical communications** *(Invited Paper)*

*Author(s):* **Pietro Paglierani**, STO-CMRE (Italy); **Mario Martinelli**, Politecnico di Milano (Italy); **Marin Stipanov**, **Giovanni Zappa**, **Joao Alves**, STO-CMRE (Italy); **Matthew Panipinto**, Clemson Univ. (United States)

13194-31 • 02:30 PM - 02:50 PM

**Measurements of atmospheric background light in the urban area Waterloo and its impact on satellite QKD system performance**

*Author(s):* **Stefanie Häusler**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Florian Schümann**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Leonard Vollmann**, **Davide Orsucci**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Paul Godin**, **Katanya Kuntz**, **Nouralhoda Bayat**, **Thomas Jennewein**, University of Waterloo (Canada); **Florian Moll**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

Coffee Break • 02:50 PM - 03:20 PM

13194-32 • 03:20 PM - 03:40 PM

**Impact of wind conditions on free space satellite to ground quantum communications link**

*Author(s):* **Elizabeth Eso**, **Cameron Simmons**, **Ross J. Donaldson**, Heriot-Watt Univ. (United Kingdom)

13194-33 • 03:40 PM - 04:00 PM

**Free-space quantum communication for security and defence applications**

*Author(s):* **Carlo Liorni**, **Giuseppe De Falco**, **Massimiliano Dispenza**, Leonardo S.p.A. (Italy)

13194-34 • 04:00 PM - 04:30 PM

**Adaptive Optics & Optical communications at ESA: past – present – future** *(Invited Paper)*

*Author(s):* **David Alaluf**, European Space Research and Technology Ctr., European Space Agency (Netherlands)

# CONFERENCE 13195

## Microwave Remote Sensing: Data Processing and Applications III

18 - 19 September 2024 | Tinto

**Conference Chair(s):** **Fabio Bovenga**, Istituto per il Rilevamento Elettromagnetico dell'Ambiente (Italy); **Claudia Notarnicola**, EURAC (Italy); **Nazzareno Pierdicca**, Sapienza Univ. di Roma (Italy); **Emanuele Santi**, Istituto di Fisica Applicata "Nello Carrara" (Italy)

**Program Committee:** **Rajat Bindlish**, NASA Goddard Space Flight Ctr. (United States); **Maria-Paola Clarizia**, ESA-ESTEC (Netherlands); **Katarzyna Dabrowska-Zielinska**, Institute of Geodesy and Cartography (Poland); **Fabio Del Frate**, Univ. degli Studi di Roma "Tor Vergata" (Italy); **Christine Gommenginger**, National Oceanography Ctr. (United Kingdom); **Carlos Lopez-Martinez**, Univ. Politècnica de Catalunya (Spain); **Simonetta Paloscia**, **Simone Pettinato**, Istituto di Fisica Applicata "Nello Carrara" (Italy); **Luca Pulvirenti**, CIMA Research Foundation (Italy); **Ronny Schomacker**, Technische Univ. Berlin (Germany); **Susan Steele-Dunne**, Technische Univ. Delft (Netherlands); **Hong Zhao**, Univ. Twente (Netherlands)

### Tuesday 17 September 2024

#### POSTERS-TUESDAY

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 16:00 hrs, Lennox Suite  
View poster presentation guidelines and set-up instructions at  
<https://spie.org/ESI/poster-presentation-guidelines>

13195-19 • 05:30 PM - 07:00 PM

**Hybrid Pol-InSAR decomposition: a novel approach for enhanced accuracy**

*Author(s):* **Sofiane Tahraoui**, Univ. Saad Dahlab Bliida 1 (Algeria); **Carmine Clemente**, Univ. of Strathclyde (United Kingdom); **Mounira Ouazzeddine**, Univ. des Sciences et de la Technologie Houari Boumediene (Algeria)

13195-20 • 05:30 PM - 07:00 PM

**An effective method for precisely observing large-scale land surface displacements with KOMPSAT-5 SAR satellite imagery: coarse-to-fine SAR offset tracking methods**

*Author(s):* **Sung-Ho Chae**, **Seung-Jae Lee**, **Kwang-Jae Lee**, Korea Aerospace Research Institute (Korea, Republic of)

13195-22 • 05:30 PM - 07:00 PM

**Comprehensive study of the damage assessment using coherence and land cover map by satellite SAR data**

*Author(s):* **Takashi Nonaka**, **Tomohito Asaka**, Nihon Univ. (Japan)

13195-23 • 05:30 PM - 07:00 PM

**Complex analysis of co-seismic deformations using SAR satellite data: application for the Balkan Peninsula**

*Author(s):* **Mila S. Atanasova-Zlatareva**, National Institute in Geophysics, Geodesy, and Geography (Bulgaria); **Hristo Nikolov**, Space Research and Technology Institute (Bulgaria)

### Wednesday 18 September 2024

#### SESSION 1: SAR-BASED FLOOD AND VEGETATION MAPPING: JOINT SESSION

18 September 2024 • 10:50 AM - 12:10 PM | Menteith

*Session Chair(s):* **Claudia Notarnicola**, Eurac Research (Italy)

Joint Session between Conference 13191, RS for Agriculture, Ecosystems, and Hydrology, and Conference 13195 Microwave Remote Sensing. Session will be held in room Menteith.

13195-1 • 10:50 AM - 11:10 AM

**Linking the structural parameters of a priority Natura 2000 grassland to SAR and optical data**

*Author(s):* **Alessandro Sebastiani, Teodoro Semeraro, Flavio Monti, Jessica Titocci, Lorenzo Liberatore**, Consiglio Nazionale delle Ricerche (Italy); **Alberto Basset**, Univ. del Salento (Italy); **Carlo Calfapietra, Dario Papale, Gaia Vaglio Laurin**, Consiglio Nazionale delle Ricerche (Italy)

13191-33 • 11:10 AM - 11:30 AM

**Monitoring of climate-change induced floods and impact analysis on agricultural systems in the Mojana region of Colombia through automatic change detection and machine learning**

*Author(s):* **Wilson Andres Velasquez Hurtado**, Sapienza Univ. di Roma (Italy); **Armando Marino**, Univ. of Stirling (United Kingdom); **Deodato Tapete**, Agenzia Spaziale Italiana (Italy)

13195-2 • 11:30 AM - 11:50 AM

**Urban flood extent mapping using Sentinel-1 intensity and coherence data: 2023 Greek floods**

*Author(s):* **Rasheeda Soudagar, Alok Bhardwaj**, Indian Institute of Technology Roorkee (India)

13191-34 • 11:50 AM - 12:10 PM

**SAR-FM: SAR based Flood Rapid Mapping using Multi-Modal Data Fusion**

*Author(s):* **Krishna Kanth Rokkam, Smriti Rani, Kriti Kumar, Anil Kumar Achanna, Balamuralidhar Purushothaman, Arpan Pal**, Tata Consultancy Services, Ltd. (India)

**Lunch/Exhibition Break 12:10 PM - 01:50 PM**

**SESSION 2: SAR DATA PROCESSING: JOINT SESSION**

18 September 2024 • 01:50 PM - 02:50 PM | Tinto

*Session Chair(s):* **Claudia Notarnicola**, Eurac Research (Italy)

Joint Session between Conference 13196 AI & Image and Signal Processing, and Conference 13195, Microwave Remote Sensing

13196-36 • 01:50 PM - 02:10 PM

**Monitoring of ground deformation before and after an earthquake using interferometric SAR**

*Author(s):* **Kengo Oiwane, Hiroshi Okumura, Osamu Fukuda, Nobuhiko Yamaguchi, Wen Liang Yeoh**, Saga Univ. (Japan)

13195-3 • 02:10 PM - 02:30 PM

**Deceptive jamming technique against bistatic synthetic aperture radar**

*Author(s):* **Greta Zefi, Christos V. Ilioudis, Malcolm Macdonald, Carmine Clemente**, Univ. of Strathclyde (United Kingdom)

13195-4 • 02:30 PM - 02:50 PM

**SAR speckle filtering with CNN using simulated training data**

*Author(s):* **Horst Hammer, Silvia Kuny, Antje Thiele**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

**Thursday 19 September 2024**

**SESSION 3: HYDROLOGICAL CYCLE**

19 September 2024 • 08:40 AM - 10:30 AM | Tinto

*Session Chair(s):* **Emanuele Santi**, Istituto di Fisica Applicata "Nello Carrara" (Italy)

13195-5 • 08:40 AM - 09:10 AM

**Earth observation retrieval of high-resolution soil moisture: challenges and opportunities** (*Invited Paper*)

*Author(s):* **Francesco Mattia, Anna Balenzano, Davide Palmisano, Francesco Lovergine, Antonella Belmonte, Cinzia Albertini, Giuseppe Satalino**, Istituto per il Rilevamento Elettromagnetico dell'Ambiente (Italy)

13195-6 • 09:10 AM - 09:30 AM

**ESA Scout HydroGNSS monitoring soil moisture and forest biomass**

*Author(s):* **Nazzareno Pierdicca**, Sapienza Univ. di Roma (Italy); **Emanuele Santi**, Istituto di Fisica Applicata "Nello Carrara" (Italy); **Leila Guerriero**, Univ. degli Studi di Roma "Tor Vergata" (Italy); **Hamed Izadgoshasb, Flavio Cordari**, Sapienza Univ. di Roma (Italy); **Estel Cardellach**, Institut d'Estudis Espacials de Catalunya (Spain); **Martin Unwin**, Surrey Satellite Technology Ltd. (United Kingdom)

13195-7 • 09:30 AM - 09:50 AM

**Polarimetric SAR decompositions for soil moisture retrieval over corn fields in Argentina**

*Author(s):* **Giovanni Anconitano**, Sapienza Univ. di Roma (Italy); **Lorenzo Giuliano Papale**, Univ. degli Studi di Roma "Tor Vergata" (Italy); **Nazzareno Pierdicca**, Sapienza Univ. di Roma (Italy); **Leila Guerriero**, Univ. degli Studi di Roma "Tor Vergata" (Italy); **Mario Alberto Acuña**, Comisión Nacional de Actividades Espaciales (Argentina)

13195-8 • 09:50 AM - 10:10 AM

**Soil moisture retrieval in Texas Grasslands: Integrating In-Situ and Satellite Observations**

Author(s): **Catherin Sebastian, Raffaella Guida**, Univ. of Surrey (United Kingdom); **Hassan Dashtian**, The Univ. of Texas at Austin (United States)

13195-9 • 10:10 AM - 10:30 AM

**High resolution snow depth mapping in Alpine environments based on active and passive microwave data integration: a machine learning approach.**

Author(s): **Emanuele Santi, Simone Pettinato, Simonetta Paloscia, Fabrizio Baroni, Simone Pilia, Giuliano Ramat**, Istituto di Fisica Applicata "Nello Carrara" (Italy)

**Coffee Break 10:30 AM - 11:00 AM**

**SESSION 4: NATURAL HAZARDS**

19 September 2024 • 11:00 AM - 12:20 PM | Tinto

Session Chair(s): **Nazzareno Pierdicca**, Sapienza Univ. di Roma (Italy)

13195-10 • 11:00 AM - 11:20 AM

**Precipitation retrieval in tropical cyclones by means of TROPICS constellation and neural networks**

Author(s): **Iliaria Petracca, Fabio Del Frate**, Univ. degli Studi di Roma "Tor Vergata" (Italy); **William J. Blackwell, Vincent V. Leslie**, MIT Lincoln Lab. (United States); **Kerri L. Cahoy**, Massachusetts Institute of Technology (United States)

13195-11 • 11:20 AM - 11:40 AM

**Multi-temporal InSAR coherence analysis of 2023 Nyamulagira volcano activity**

Author(s): **Marco Polcari**, Istituto Nazionale di Geofisica e Vulcanologia (Italy); **Charles Belagizi**, Goma Volcano Observatory (Congo, Democratic Republic of the); **Emanuele Ferrentino**, Istituto Nazionale di Geofisica e Vulcanologia (Italy); **Sebastien Valade**, Univ. Nacional Autónoma de México (Mexico); **Diego Coppola**, Univ. degli Studi di Torino (Italy); **Stefano Salvi**, Istituto Nazionale di Geofisica e Vulcanologia (Italy)

13195-12 • 11:40 AM - 12:00 PM

**Micro-motion extraction from spotlight SAR using a backprojection approach**

Author(s): **Finlay Rollo, Christos V. Ilioudis, Greta Zefi**, Univ. of Strathclyde (United Kingdom); **Alessandro Lotti, Daniel Tonelli**, University of Trento (Italy); **Massimo Zavagli, Mario Constantini**, B-Open Solutions (Italy); **Daniele Zonta**, University of Trento (Italy); **Enrico Tubaldi**, Univ. of Strathclyde (United Kingdom); **Pietro Milillo**, University of Houston (United States); **Malcolm Macdonald, Carmine Clemente**, Univ. of Strathclyde (United Kingdom)

13195-13 • 12:00 PM - 12:20 PM

**Integrating Sentinel-1 radar and Sentinel-2 data for detecting freshly exposed supraglacial deposits**

Author(s): **Chiara Crippa, Giovanni Cuzzo, Mattia Callegari, Claudia Notarnicola**, Eurac Research (Italy)

**Lunch Break 12:20 PM - 01:30 PM**

**SESSION 5: DATA PROCESSING AND TECHNIQUES**

19 September 2024 • 01:30 PM - 03:10 PM | Tinto

Session Chair(s): **Claudia Notarnicola**, Eurac Research (Italy)

13195-14 • 01:30 PM - 01:50 PM

**GNSS reflectometry measurement campaign: processing and analysis of reflected signals**

Author(s): **Adonees Semaan**, Univ. der Bundeswehr München (Germany)

13195-15 • 01:50 PM - 02:10 PM

**Simple and robust quad corner reflectors for persistent scatterer measurements**

Author(s): **Karsten Schulz, Erich Cadario, Sylvia Hochstuhl, Antje Thiele**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13195-16 • 02:10 PM - 02:30 PM

**Improving the quality of information received from synthetic aperture radars implementing innovative passive reflectors**

Author(s): **Hristo S. Nikolov**, Space Research and Technology Institute (Bulgaria); **Mila S. Atanasova-Zlatareva**, National Institute in Geophysics, Geodesy, and Geography (Bulgaria); **Konstantin Metodiev**, Space Research and Technology Institute - Bulgarian Academy of Sciences (Bulgaria)



13195-17 • 02:30 PM - 02:50 PM

**Monitoring of small islands by satellite InSAR data: the Aeolian archipelago**

*Author(s):* **Silvia Puliero, Marco Polcari, Mimmo Palano, Francesca Silverii, Claudia Spinetti, Cristiano Tolomei**, Istituto Nazionale di Geofisica e Vulcanologia (Italy)

13195-18 • 02:50 PM - 03:10 PM

**A recursive algorithm for long-term space-time correlated sea clutter simulation**

*Author(s):* **Mengjia Duan, Jianda Xie, Xiaojian Xu**, Beihang Univ. (China)

# CONFERENCE 13196

## Artificial Intelligence and Image and Signal Processing for Remote Sensing XXX

16 - 18 September 2024 | Tinto

**Conference Chair(s):** **Lorenzo Bruzzone**, Univ. degli Studi di Trento (Italy); **Francesca Bovolo**, Fondazione Bruno Kessler (Italy)

**Program Committee:** **Abdourrahmane M. Atto**, Univ. Savoie Mont Blanc (France); **Jocelyn Chanussot**, Lab. des Images et des Signaux (France); **B. S. Daya Sagar**, Indian Statistical Institute, Bangalore (India); **Begüm Demir**, Technische Univ. Berlin (Germany); **Mathieu Fauvel**, Univ. of Iceland (Iceland); **Andrea Garzelli**, Univ. degli Studi di Siena (Italy); **Manolis Koubarakis**, National and Kapodistrian Univ. of Athens (Greece); **Sicong Liu**, Tongji Univ. (China); **José M. P. Nascimento**, Instituto de Telecomunicações (Portugal); **Claudia Paris**, Univ. Twente (Netherlands); **Charlotte Pelletier**, Univ. de Bretagne Sud (France); **Benoit Vozel**, Univ. de Rennes 1 (France); **Josiane B. Zerubia**, INRIA, Univ. Côte-d'Azur (France)

### Monday 16 September 2024

#### WELCOME AND INTRODUCTION

16 September 2024 • 01:30 PM - 01:40 PM | Tinto

**Lorenzo Bruzzone**, Univ. degli Studi di Trento (Italy)

**Francesca Bovolo**, Fondazione Bruno Kessler (Italy)

#### SESSION 1: PANSHARPENING, SUPERRESOLUTION, AND IMAGE PRE-PROCESSING

16 September 2024 • 01:40 PM - 03:00 PM | Tinto

*Session Chair(s):* **Andrea Garzelli**, Univ. degli Studi di Siena (Italy)

13196-1 • 01:40 PM - 02:00 PM

**Super-resolution of Sentinel-2 and PlanetScope EO images in precision agriculture: a comparative study**

*Author(s):* **Roberto Cilli**, Univ. degli Studi di Bari Aldo Moro (Italy)

13196-2 • 02:00 PM - 02:20 PM

**Enhancing spatial resolution of OLI 100m thermal bands through hypersharpening of 30m spectral bands**

*Author(s):* **Andrea Garzelli**, Univ. degli Studi di Siena (Italy); **Alberto Arienzo**, **Luciano Alparone**, Univ. degli Studi di Firenze (Italy); **Simone Loli**, Istituto di Metodologie per l'Analisi Ambientale (Italy)

13196-3 • 02:20 PM - 02:40 PM

**Optimizing cloud detection: small-sized deep learning model for on-board implementation using visible images**

*Author(s):* **Sanjay Shantayya Swami**, **Michael Schmitt**, Univ. der Bundeswehr München (Germany)

13196-4 • 02:40 PM - 03:00 PM

**A benchmark semantic segmentation dataset for data-driven cloud masking**

*Author(s):* **Xiong Zhou**, **Boran Han**, **Anirudh Viswanathan**, **Xiaoyong Jin**, Amazon Web Services, Inc. (United States); **Janosch Woschitz**, **Karsten Schroer**, Amazon Web Services, Inc. (Germany); **Amit Modi**, Amazon Web Services, Inc. (United States)

**Coffee Break 03:00 PM - 03:30 PM**

#### SESSION PL: SENSORS + IMAGING PLENARY SESSION

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium

15:30 to 15:40 hrs

**Welcome and Introduction**

**Ric Schleijpen**

TNO Defence, Security and Safety (Netherlands)

**Lorenzo Bruzzone**

Univ. degli Studi di Trento (Italy)

*2024 Symposium Chairs*

13191-500 • 03:40 PM - 04:25 PM

**Tracking Earth's ice from space** (Plenary Presentation)

Author(s): **Andrew Shepherd**, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

**Sensing in the second quantum revolution** (Plenary Presentation)

Author(s): **Francesco Saverio Cataliotti**, LENS - Lab. Europeo di Spettroscopia Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

**Imaging and sensing that delivers operational advantage** (Plenary Presentation)

Author(s): **Jason Field**, Ministry of Defence (United Kingdom)

## Tuesday 17 September 2024

### SESSION 2: IMAGE ANALYSIS AND ONBOARD DATA PROCESSING

17 September 2024 • 08:50 AM - 10:10 AM | Tinto

Session Chair(s): **Michael Schmitt**, Univ. der Bundeswehr München (Germany)

13196-6 • 08:50 AM - 09:10 AM

**Multi-mode infrared image colorization**

Author(s): **Suleyman E. Akin, Toygar Akgun**, TOBB ETÜ (Turkey)

13196-7 • 09:10 AM - 09:30 AM

**On-board detection of fast-moving targets using an MWIR sensor on a small satellite**

Author(s): **Sanjay Shantayya Swami, Bilal Mohd, Michael Schmitt, Christian Mundt**, Univ. der Bundeswehr München (Germany)

13196-8 • 09:30 AM - 09:50 AM

**Compressed learning based onboard semantic compression for remote sensing platforms**

Author(s): **Protim Bhattacharjee, Peter Jung**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13196-5 • 09:50 AM - 10:10 AM

**Restoration of heat haze in image and video based on DT-CWT image fusion**

Author(s): **Özlem Alpergün Tanas**, ASELSAN A.S. (Turkey); **Ender Mete EKŞİOĞLU**, ISTANBUL TECHNICAL UNIVERSITY (Turkey)

### Coffee Break 10:10 AM - 10:40 AM

### SESSION 3: DEEP LEARNING FOR IMAGE CLASSIFICATION AND ANALYSIS I

17 September 2024 • 10:40 AM - 12:00 PM | Tinto

Session Chair(s): **José M. P. Nascimento**, Instituto de Telecomunicações (Portugal)

13196-10 • 10:40 AM - 11:00 AM

**High-performance embedded system for onboard object detection in hyperspectral images**

Author(s): **José M. P. Nascimento**, Instituto de Telecomunicações (Portugal); **Mário Véstias**, Instituto Superior de Engenharia de Lisboa (Portugal)

13196-11 • 11:00 AM - 11:20 AM

**Advanced building detection in VHR satellite imagery: a comprehensive study using different mask R-CNN approaches**

Author(s): **Luca Galli, Martina Infante, Edoardo Unali, Alberto Gallottini**, Exprivia S.p.A. (Italy)

13196-12 • 11:20 AM - 11:40 AM

**A machine learning approach for the fusion of Sentinel-1 and Sentinel-2 and VIIRS snow products**

Author(s): **Thu Trang Le, Abdourrahmane ATTO, Emmanuel Trouve**, Lab. d'Informatique, Systèmes, Traitement de l'Information et de la Connaissance (France); **Fatima Karbou**, Ctr. National de Recherches Météorologiques (France)

13196-14 • 11:40 AM - 12:00 PM

**TempoNet: advancing oceanographic predictions through ensemble modelling**

*Author(s): Lalita Chaudhary, Shakti Sharma, Tapas Badal, Bennett Univ. (India)*

**Lunch/Exhibition Break 12:00 PM - 02:00 PM**

#### SESSION 4: DEEP LEARNING FOR IMAGE CLASSIFICATION AND ANALYSIS II

17 September 2024 • 02:00 PM - 03:20 PM | Tinto

*Session Chair(s): Abdourrahmane Atto, Univ. Savoie Mont Blanc (France)*

13196-16 • 02:00 PM - 02:20 PM

**Attention-based 3D convolutional neural network for crop boundary detection in high-resolution satellite image time series**

*Author(s): Khatereh Meshkini, Francesca Bovolo, Fondazione Bruno Kessler (Italy); Daniel Doktor, Helmholtz-Zentrum für Umweltforschung GmbH (Germany)*

13196-17 • 02:20 PM - 02:40 PM

**One-shot gas detection with transformer paired neural networks in Mako collected longwave infrared hyperspectral imagery**

*Author(s): Kevin Benham, Elihu Deneke, Sandia National Labs. (United States)*

13196-18 • 02:40 PM - 03:00 PM

**Efficient u2net for semantic segmentation of radar sounder data**

*Author(s): Lorenzo Bruzzone, Milkisa Tesfaye Yebasse, Univ. degli Studi di Trento (Italy)*

13196-19 • 03:00 PM - 03:20 PM

**Disaster area detection based on YOLOv8 using SAR data**

*Author(s): Yushin Nakaoka, Kohei Arai, Hiroshi Okumura, Osamu Fukuda, Nobuhiko Yamaguchi, Wen Liang Yeoh, Saga Univ. (Japan)*

**Coffee Break 03:20 PM - 03:50 PM**

#### SESSION 5: DEEP LEARNING FOR IMAGE CLASSIFICATION AND ANALYSIS III

17 September 2024 • 03:50 PM - 05:30 PM | Tinto

*Session Chair(s): Lorenzo Bruzzone, Univ. degli Studi di Trento (Italy)*

13196-20 • 03:50 PM - 04:10 PM

**Hyperspectral data augmentation with transformer-based diffusion models**

*Author(s): Mattia Ferrari, Lorenzo Bruzzone, Univ. degli Studi di Trento (Italy)*

13196-21 • 04:10 PM - 04:30 PM

**Class-specific spatial-aware collaborative representation for hyperspectral image classification**

*Author(s): Qian Du, Chiranjibi Shah, Mississippi State Univ. (United States)*

13196-22 • 04:30 PM - 04:50 PM

**Unsupervised multi-class change detection in hyperspectral images via sparse convolutional autoencoder**

*Author(s): Luca Bergamasco, Francesca Bovolo, Fondazione Bruno Kessler (Italy)*

13196-23 • 04:50 PM - 05:10 PM

**SAR-optical deep uNet matching with Gabor jet model**

*Author(s): Syed Mujibul Islam, Shubhrangshu Ghosh, Abhishek Roy Choudhury, Arpan Pal, Tata Consultancy Services, Ltd. (India)*

13196-24 • 05:10 PM - 05:30 PM

**Improvement of ALB data analysis method using machine learning for rescuer search in water rescue**

*Author(s): Taishi Kawamoto, Hiroshi Okumura, Osamu Fukuda, Nobuhiko Yamaguchi, Wen Liang Yeoh, Saga Univ. (Japan)*

#### POSTERS-TUESDAY

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 16:00 hrs, Lennox Suite

View poster presentation guidelines and set-up instructions at

<https://spie.org/ESI/poster-presentation-guidelines>

13196-37 • 05:30 PM - 07:00 PM

**Deep learning-enhanced fusion of low coherence optical interferometry and ghost imaging**

*Author(s):* **Alifu Xiafukaiti**, Mitsubishi Electric Corp. (Japan); **Huyan Decai**, Chiba Univ. (Japan); **Masato Gocho**, Ryuhei Takahashi, Mitsubishi Electric Corp. (Japan); **Shiina Tatsuo**, Chiba Univ. (Japan)

13196-38 • 05:30 PM - 07:00 PM

**Instantaneous Infrastructure Monitoring by Earth Observation: SAR-based railway obstacle detection**

*Author(s):* **Massimo Zanetti**, **Francesca Bovolo**, Fondazione Bruno Kessler (Italy)

13196-39 • 05:30 PM - 07:00 PM

**Mapping recent wildfires in Greece and the associated built-up losses**

*Author(s):* **Christoforos Pappas**, **Styliani Gkanis**, **Alexandros Paganias**, Univ. of Patras (Greece)

13196-40 • 05:30 PM - 07:00 PM

**Comparison of algorithms for monitoring the behavior of microorganisms based on remote laser speckle method**

*Author(s):* **Ilya Balmages**, Riga Technical Univ. (Latvia); **Aigars Reinis**, **Svjatoslavs Kistkins**, Pauls Stradiņš Clinical Univ. Hospital (Latvia); **Dmitrijs Bliznuks**, Riga Technical Univ. (Latvia); **Alexey Lihachev**, **Ilze Lihacova**, Univ. of Latvia (Latvia)

13196-41 • 05:30 PM - 07:00 PM

**High resolution satellite image and surface normal fusion using stereo matching and iterative edge aware filter**

*Author(s):* **Ishan Narayan**, CSIR - Central Scientific Instruments Organisation (India)

13196-42 • 05:30 PM - 07:00 PM

**Explainability of a CNN model for identification of mistletoe species in urban parks**

*Author(s):* **Mauricio G. Orozco-del-Castillo**, Instituto Tecnológico de Mérida (Mexico); **Juan Carlos Valdiviezo Navarro**, **Diego Novelo-Pech**, Ctr. de Investigación en Ciencias de Información Geoespacial (Mexico)

13196-44 • 05:30 PM - 07:00 PM

**Real-time 3D terrain reconstruction and rendering using denoising diffusion probabilistic model and gaussian splatting**

*Author(s):* **Ayushi Verma**, **Tapas Badal**, **Abhay Bansal**, Bennett Univ. (India)

13196-45 • 05:30 PM - 07:00 PM

**Decoding complexity: unveiling interpretability in GNN-enabled hyperspectral image classification through XAI approaches**

*Author(s):* **Haseena Rahmath**, **Kuldeep Chaurasia**, **Anika Gupta**, Bennett Univ. (India)

## Wednesday 18 September 2024

### SESSION 6: DATA ANALYSIS AND APPLICATIONS

18 September 2024 • 08:30 AM - 10:10 AM | Tinto

*Session Chair(s):* **Francesca Bovolo**, Fondazione Bruno Kessler (Italy)

13196-25 • 08:30 AM - 08:50 AM

**Hyperspectral anomaly detection method based on tensor decomposition and information entropy**

*Author(s):* **Lei Yang**, **Jinsong Zhou**, **Juanjuan Jing**, **Boyang Nie**, **Yacan Li**, **Xiaoying He**, **Lei Feng**, Aerospace Information Research Institute (China)

13196-26 • 08:50 AM - 09:10 AM

**Remote sensing classification using quantum image processing**

*Author(s):* **Hrithik Kumar**, **Teymoor Ali**, **Chris J. Holder**, **Stephen MCGough**, **Deepayan Bhowmik**, Newcastle Univ. (United Kingdom)

13196-27 • 09:10 AM - 09:30 AM

**A novel semantic geolocalization approach with satellite images for GPS-free navigation of UAV**

*Author(s):* **Yu-Cheng Cheng**, **Yung-Jhe Yan**, **Peng-Jie Chen**, **Cheng-Chuan Hsu**, **Chun-Yan Lo**, **Cong-Yuan Chou**, **Chi-Han Lin**, **Ou-Yang Mang**, National Yang Ming Chiao Tung Univ. (Taiwan)

13196-28 • 09:30 AM - 09:50 AM

**The role of image-based phenotyping tools in terms of disease treatment management**

*Author(s):* **Ilva Licaj**, Univ. degli Studi del Sannio (Italy); **Jara Jauregui Besó**, **Joel Segarra**, Univ. de Barcelona (Spain); **Nieves Aparicio Gutiérrez**, Instituto Tecnológico Agrario de Castilla y León (Spain); **Mario Puppio**, Univ. degli Studi della Basilicata (Italy); **José Luis Araus**, **Shawn Carlisle Kefauver**, Univ. de Barcelona (Spain)

13196-29 • 09:50 AM - 10:10 AM

**Automatic occlusion removal from 3D maps for maritime situational awareness**

*Author(s):* **Felix Sattler**, **Borja Carrillo Perez**, **Maurice Stephan**, **Sarah Barnes**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)



**Coffee Break 10:10 AM - 10:40 AM**

**SESSION 7: RADAR AND SAR DATA ANALYSIS**

18 September 2024 • 10:40 AM - 12:20 PM | Tinto

Session Chair(s): **Lorenzo Bruzzone**, Univ. degli Studi di Trento (Italy)

13196-30 • 10:40 AM - 11:00 AM

**UEIKAP: space-based ship wake detection integrating contextual meteo-marine knowledge of local sea state**

Author(s): **Andrea Mazzeo, Maria D. Graziano**, Univ. degli Studi di Napoli Federico II (Italy); **Giuliano Vernengo**, Università di Genova (Italy);

**Davide Bonaldo**, CNR-ISMAR (Italy); **Diego Villa, Federico Franciosa**, Università di Genova (Italy); **Gian M Scarpa, Federica Braga, Paolo**

**Vavasori**, CNR-ISMAR (Italy); **Roberto Del Prete, Angela C. Cristofano, Margareth Di Vaia, Marisa Sperandeo, Sergio Iervolino**, Univ. degli Studi di Napoli Federico II (Italy)

13196-31 • 11:00 AM - 11:20 AM

**A preliminary study on the multitemporal analysis of cryosphere radar sounder data**

Author(s): **Elena Donini, Miguel Hoyo García, Francesca Bovolo**, Fondazione Bruno Kessler (Italy)

13196-32 • 11:20 AM - 11:40 AM

**A fast 2D-AR(1) filtering for bitemporal change detection on UWB SAR images**

Author(s): **Marcello G. Costa, Christer Fuglesang, Ingo Sander**, KTH Royal Institute of Technology (Sweden); **Patrik Dammert, Anders**

**Åhlander, Ingemar Söderquist**, Saab AB (Sweden)

13196-33 • 11:40 AM - 12:00 PM

**Comparative analysis of SAR polarizations for VHR SAR to optical image translation using conditional BBDM**

Author(s): **Seonhoon Kim**, Univ. of Science and Technology (Korea, Republic of), Korea Aerospace Research Institute (Korea, Republic of);

**Dae-won Chung**, Korea Aerospace Research Institute (Korea, Republic of)

13196-34 • 12:00 PM - 12:20 PM

**Deblurring of radar images aided by PSF estimator and convolutional regulariser**

Author(s): **Rahul Sharma, María García-Fernández, Guillermo Álvarez-Narciandi, Okan Yurduseven**, Queen's Univ. Belfast (United Kingdom)

**Lunch/Exhibition Break 12:20 PM - 01:50 PM**

**SESSION 8: SAR DATA PROCESSING: JOINT SESSION**

18 September 2024 • 01:50 PM - 02:50 PM | Tinto

Session Chair(s): **Claudia Notarnicola**, Eurac Research (Italy)

Joint Session between Conference 13196 AI & Image and Signal Processing, and Conference 13195, Microwave Remote Sensing

13196-36 • 01:50 PM - 02:10 PM

**Monitoring of ground deformation before and after an earthquake using interferometric SAR**

Author(s): **Kengo Oiwane, Hiroshi Okumura, Osamu Fukuda, Nobuhiko Yamaguchi, Wen Liang Yeoh**, Saga Univ. (Japan)

13195-3 • 02:10 PM - 02:30 PM

**Deceptive jamming technique against bistatic synthetic aperture radar**

Author(s): **Greta Zefi, Christos V. Ilioudis, Malcolm Macdonald, Carmine Clemente**, Univ. of Strathclyde (United Kingdom)

13195-4 • 02:30 PM - 02:50 PM

**SAR speckle filtering with CNN using simulated training data**

Author(s): **Horst Hammer, Silvia Kuny, Antje Thiele**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

# CONFERENCE 13197

## Earth Resources and Environmental Remote Sensing/GIS Applications XV

16 - 19 September 2024 | Moorfoot

**Conference Chair(s):** **Karsten Schulz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Ulrich Michel**, ROSENXT Creation Ctr. GmbH (Germany); **Konstantinos G. Nikolakopoulos**, Univ. of Patras (Greece)

**Program Committee:** **Maria Libera Battagliere**, Agenzia Spaziale Italiana (Italy); **Markus Boldt**, **Dimitri Bulatov**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Joana Maria Cardoso-Fernandes**, Univ. do Porto (Portugal); **Valerio Gagliardi**, Univ. degli Studi di Roma Tre (Italy); **Pierre Karrasch**, TU Dresden (Germany); **Aggeliki Kyriou**, Univ. of Patras (Greece); **Maria Niebla**, Hydrock Consultants (United Kingdom); **Pablo H. Rosso**, Leibniz-Zentrum für Agrarlandschaftsforschung (ZALF) e.V. (Germany); **Ana Claudia Moreira Teodoro**, Univ. do Porto (Portugal); **Kyriacos Themistocleous**, Cyprus Univ. of Technology (Cyprus); **Christine Wessollek**, TU Dresden (Germany)

### Monday 16 September 2024

#### WELCOME AND OPENING REMARKS

16 September 2024 • 10:45 AM - 11:00 AM | Moorfoot

**Karsten Schulz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)  
**Ulrich Michel**, ROSENXT Creation Ctr. GmbH (Germany);  
**Konstantinos G. Nikolakopoulos**, Univ. of Patras (Greece)

#### SESSION 1: ENVIRONMENTAL MONITORING CONCEPTS I

16 September 2024 • 11:00 AM - 12:00 PM | Moorfoot

*Session Chair(s):* **Ulrich Michel**, ROSEN Technology and Research Ctr. GmbH (Germany); **Karsten Schulz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13197-1 • 11:00 AM - 11:20 AM

##### Exploring Sentinel-2 imagery for operational forest loss detection in Portugal

*Author(s):* **Hugo Costa**, Direção-Geral do Território (Portugal), NOVA Information Management School (Portugal); **António Sequeira**, **Francisco D. Moreira**, **Pedro Benevides**, Direção-Geral do Território (Portugal); **Mário Caetano**, Direção-Geral do Território (Portugal), NOVA Information Management School (Portugal)

13197-3 • 11:20 AM - 11:40 AM

##### From complexity to clarity: visualizing PolInSAR data for environmental monitoring

*Author(s):* **Sylvia Hochstuhl**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Antje Thiele**, Fraunhofer IOSB (Germany)

13197-4 • 11:40 AM - 12:00 PM

##### Multi-satellite monitoring of wetland dynamics and nighttime lights

*Author(s):* **Shi Qiu**, **Zhaoyan Liu**, **Weiyuan Yao**, Aerospace Information Research Institute (China)

#### Lunch Break 12:00 PM - 01:50 PM

#### SESSION 2: ENVIRONMENTAL MONITORING CONCEPTS II: NET ZERO TRANSITION

16 September 2024 • 01:50 PM - 03:00 PM | Moorfoot

*Session Chair(s):* **Maria Niebla**, Hydrock Consultants (United Kingdom); **Karsten Schulz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13197-5 • 01:50 PM - 02:20 PM

##### Supporting Net Zero transition (Invited Paper)

*Author(s):* **Maria Niebla**, Hydrock Consultants (United Kingdom)

13197-6 • 02:20 PM - 02:40 PM

**Applying deep learning methods for the bridge-based monitoring of floating macroplastics on rivers**

Author(s): **Marcel Reinhardt, Björn Baschek, Tobias Brehm, Thomas Ternes**, Bundesanstalt für Gewässerkunde (Germany)

13197-7 • 02:40 PM - 03:00 PM

**Application of tasseled cap-derived indices for monitoring of permafrost ground changes on Livingston Island, Antarctica**

Author(s): **Nadya Yanakieva**, Space Research and Technology Institute (Bulgaria)

**Coffee Break 03:00 PM - 03:30 PM**

**SESSION PL: SENSORS + IMAGING PLENARY SESSION**

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium

15:30 to 15:40 hrs

**Welcome and Introduction**

**Ric Schleijpen**

TNO Defence, Security and Safety (Netherlands)

**Lorenzo Bruzzone**

Univ. degli Studi di Trento (Italy)

2024 Symposium Chairs

13191-500 • 03:40 PM - 04:25 PM

**Tracking Earth's ice from space** (Plenary Presentation)

Author(s): **Andrew Shepherd**, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

**Sensing in the second quantum revolution** (Plenary Presentation)

Author(s): **Francesco Saverio Cataliotti**, LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

**Imaging and sensing that delivers operational advantage** (Plenary Presentation)

Author(s): **Jason Field**, Ministry of Defence (United Kingdom)

**Tuesday 17 September 2024**

**SESSION 3: INFRASTRUCTURES AND URBAN AREAS**

17 September 2024 • 09:10 AM - 10:10 AM | Moorfoot

Session Chair(s): **Markus Boldt**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Karsten Schulz**,

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

13197-9 • 09:10 AM - 09:30 AM

**Change detection using NewSpace SAR data**

Author(s): **Markus Boldt, Erich Cadario, Antje Thiele**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13197-10 • 09:30 AM - 09:50 AM

**Physics-informed decomposition of LOS displacement for infrastructure monitoring**

Author(s): **Yukihiro Yanq, Kosuke Kinoshita, Takahiro Kumura**, NEC Corp. (Japan)

13197-11 • 09:50 AM - 10:10 AM

**Remote sensing monitoring of infrastructure in complex and coastal areas**

Author(s): **Valerio Gagliardi**, Univ. degli Studi di Roma Tre (Italy); **Tesfaye T. Tessema**, Univ. of West London (United Kingdom), The Faringdon Research Ctr. for Non-Destructive Testing and Remote Sensing (United Kingdom); **Andrea Benedetto**, Univ. degli Studi di Roma Tre (Italy);

**Fabio Tosti**, Univ. of West London (United Kingdom), The Faringdon Research Ctr. for Non-Destructive Testing and Remote Sensing (United Kingdom)

**Coffee Break 10:10 AM - 10:40 AM**

**SESSION 4: EO USING GEE**

17 September 2024 • 10:40 AM - 12:00 PM | Moorfoot

Session Chair(s): **Joana Maria Cardoso-Fernandes**, Univ. do Porto (Portugal); **Aggeliki Kyriou**, Univ. of Patras (Greece)

13197-12 • 10:40 AM - 11:00 AM

**Use of data from the advanced spaceborne thermal emission and reflection radiometer (ASTER) for the study of the urban heat island (UHI) in Bragança (Portugal) (2000-2023)**

*Author(s):* **Cátia Rodrigues de Almeida**, Univ. do Porto (Portugal), Instituto Politécnico de Bragança (Portugal); **João Alírio**, Univ. do Porto (Portugal); **Artur Gonçalves**, Instituto Politécnico de Bragança (Portugal); **Ana Cláudia M. Teodoro**, Univ. do Porto (Portugal)

13197-14 • 11:00 AM - 11:20 AM

**Automatic lineament extraction, using Sentinel-1 data, in the Ria de Vigo, Spain**

*Author(s):* **Beatriz L. Araújo**, Univ. do Porto (Portugal); **Joana M. Cardoso-Fernandes**, Univ. do Porto (Portugal), ICT (Institute of Earth Sciences) (Portugal); **Antonio Azzalini**, Univ. do Porto (Portugal); **Morgana Carvalho**, **Alexandre M. Campos de Lima**, Univ. do Porto (Portugal), ICT (Institute of Earth Sciences) (Portugal); **Francisco J. González**, **Ana Lobato**, **Wai L. Ng-Cutipa**, Instituto Geologico y Minero de Espana (Spain); **Ana Cláudia M. Teodoro**, Univ. do Porto (Portugal), ICT (Institute of Earth Sciences) (Portugal)

13197-15 • 11:20 AM - 11:40 AM

**Multitemporal remote sensing for ecology and conservation: a fusion of Sentinel-1&2 time series applied to small seasonal ponds in semiarid environments**

*Author(s):* **Francesco Valerio**, Centro de Investigação em Biodiversidade e Recursos Genéticos (Portugal); **Sérgio Godinho**, Univ. de Évora (Portugal); **Gonçalo Ferraz**, Centro de Investigação em Biodiversidade e Recursos Genéticos (Portugal); **Ricardo Pita**, **Bruno Silva**, Univ. de Évora (Portugal); **Ana Teresa Marques**, **João Paulo Silva**, Centro de Investigação em Biodiversidade e Recursos Genéticos (Portugal)

13197-16 • 11:40 AM - 12:00 PM

**Gas flaring onshore detecting based on multisource remote sensing data using GEE platform**

*Author(s):* **Shuhe Zhao**, **Yue Li**, Nanjing Univ. (China)

**Lunch/Exhibition Break 12:00 PM - 01:40 PM**

## SESSION 5: HAZARD MITIGATION GEOLOGIC APPLICATIONS I

17 September 2024 • 01:40 PM - 03:20 PM | Moorfoot

*Session Chair(s):* **Aggeliki Kyriou**, Univ. of Patras (Greece); **Konstantinos G. Nikolakopoulos**, Univ. of Patras (Greece)

13197-17 • 01:40 PM - 02:00 PM

**Mapping of large-scale flooding in Thessaly region using Sentinel data**

*Author(s):* **Aggelos Kalafatis**, **Aggeliki Kyriou**, **Konstantinos G. Nikolakopoulos**, Univ. of Patras (Greece)

13197-18 • 02:00 PM - 02:20 PM

**Using road detection and OSM reference data to refine airborne camera extrinsics in the Ahr Valley flooding use case**

*Author(s):* **Kevin Yuelin Qiu**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Ewan Demeur**, TNO (Netherlands); **Björn Piltz**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Frido Kuijper**, TNO (Netherlands); **Dimitri Bulatov**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Mark van Persie**, NLR - Royal Netherlands Aerospace Ctr. (Netherlands)

13197-19 • 02:20 PM - 02:40 PM

**Landslide monitoring: recent technologies and new perspectives**

*Author(s):* **Ioannis K. Koukouvelas**, **Konstantinos G. Nikolakopoulos**, **Aggeliki Kyriou**, Univ. of Patras (Greece)

13197-20 • 02:40 PM - 03:00 PM

**An overview of the spatiotemporal patterns of land displacements in Western Greece**

*Author(s):* **Konstantinos Fasoulis**, **Michalis Orfanoudakis**, **Panagiotis Hadjidoukas**, **Christoforos Pappas**, Univ. of Patras (Greece)

13197-21 • 03:00 PM - 03:20 PM

**Multitemporal characterization of landslide displacement patterns in the Andean region using InSAR**

*Author(s):* **Sandra Cobos**, Univ. Católica de Cuenca (Ecuador), Univ. de Sevilla (Spain); **Hakan Tanyas**, Univ. Twente (Netherlands); **Victor Rodriguez-Galiano**, Univ. de Sevilla (Spain)

**Coffee Break 03:20 PM - 03:50 PM**

## SESSION 6: HAZARD MITIGATION GEOLOGIC APPLICATIONS II

17 September 2024 • 03:50 PM - 05:30 PM | Moorfoot

*Session Chair(s):* **Konstantinos G. Nikolakopoulos**, Univ. of Patras (Greece); **Ana Cláudia Moreira Teodoro**, Univ. do Porto (Portugal)

13197-22 • 03:50 PM - 04:10 PM

**Decision tree algorithms applied to detect mineral alteration related to cobalt-nickel mineralisation in Asturias: insights of S34I project**

*Author(s):* **Morgana Carvalho, Joana M. Cardoso-Fernandes**, Univ. do Porto (Portugal), ICT (Institute of Earth Sciences) (Portugal); **Antonio Azzalini**, Univ. do Porto (Portugal); **Vaughan Williams**, Aurum Exploration Ltd. (Ireland); **Alexandre M. Campos de Lima, Ana Cláudia M. Teodoro**, Univ. do Porto (Portugal), ICT (Institute of Earth Sciences) (Portugal)

13197-23 • 04:10 PM - 04:30 PM

**Airborne images integration for a first cartographic approximation of critical raw-materials-rich placers on Santa Marta Beach (Ría de Vigo, NW Spain)**

*Author(s):* **Wai L. Ng-Cutipa, Ana Lobato, Francisco J. González**, Instituto Geologico y Minero de Espana (Spain); **Georgios Georgalas, Irene Zananiri**, Hellenic Survey of Geology & Mineral Exploration (Greece); **Joana Cardoso-Fernandes, Morgana Carvalho**, Geosciences, Environment and Spatial Planning, Faculty of Sciences of the University of Porto (Portugal), ICT (Institute of Earth Sciences) (Portugal); **António Azzalini, Beatriz Araújo**, Geosciences, Environment and Spatial Planning, Faculty of Sciences of the University of Porto (Portugal); **Ana Cláudia Teodoro**, Geosciences, Environment and Spatial Planning, Faculty of Sciences of the University of Porto (Portugal), ICT (Institute of Earth Sciences) (Portugal)

13197-24 • 04:30 PM - 04:50 PM

**Application of band ratios to map hydrothermal alteration zones related to Au-Sb mineralization in Freixeda, Northern Portugal**

*Author(s):* **Douglas Barbosa dos Santos, Joana M. Cardoso-Fernandes, Alexandre M. Campos de Lima, Ana Cláudia M. Teodoro**, Univ. do Porto (Portugal)

13197-25 • 04:50 PM - 05:10 PM

**3D representation of a bauxite mine in the frame of m4mining project**

*Author(s):* **Konstantinos G. Nikolakopoulos, Aggeliki Kyriou, Evlampia Kouzeli**, Univ. of Patras (Greece); **Saeid Asadzadeh, Nicole Köllner**, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ (Germany); **Friederike Körting, Justus Constantin Hildebrand**, Norsk Elektro Optikk AS (Norway); **Steven Micklethwaite, Ekaterina Savinova**, The Univ. of Queensland (Australia)

13197-26 • 05:10 PM - 05:30 PM

**HLS for copper exploration: band ratio approach**

*Author(s):* **Xuesong Li, Shi Qiu, Weiyuan Yao**, Aerospace Information Research Institute (China); **Shunjing Yu**, Aerospace DFH Satellite Co., Ltd. (China)

## POSTERS-TUESDAY

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 16:00 hrs, Lennox Suite

View poster presentation guidelines and set-up instructions at

<https://spie.org/ESI/poster-presentation-guidelines>

13197-50 • 05:30 PM - 07:00 PM

**Non-negative matrix factorization (NMF) in fire susceptibility**

*Author(s):* **Iraj Rahimi**, Univ. do Porto (Portugal), Sulaimani Polytechnic Univ. (Iraq); **Lia Duarte, Ana Cláudia M. Teodoro**, Univ. do Porto (Portugal)

13197-51 • 05:30 PM - 07:00 PM

**Montrends: a Google Earth Engine application for analysing species habitat suitability over time**

*Author(s):* **João Alírio**, Univ. do Porto (Portugal); **Neftalí P. Sillero, Nuno Garcia, João J. Campos**, Ctr. de Investigação em Ciências Geo-Espaciais (Portugal); **Salvador Arenas-Castro**, Univ. de Córdoba (Spain); **Isabel Pôças**, ForestWISE (Portugal); **Lia Duarte, Ana Cláudia M. Teodoro**, Univ. do Porto (Portugal)

13197-52 • 05:30 PM - 07:00 PM

**Snow cover monitoring by SAR, optical and thermal data in Rila, Pirin and Vitosha mountains**

*Author(s):* **Temenuzhka Spasova, Andrey Stoyanov, Daniela Avetisyan**, Space Research and Technology Institute (Bulgaria)

13197-55 • 05:30 PM - 07:00 PM

**Multitemporal LiDAR-based terrain anomaly detection of Karstic environments in the Asturian Central Massif (Cantabrian Mountains, Northwest Spain)**

*Author(s):* **Antonio Azzalini**, Univ. do Porto (Portugal); **Joana M. Cardoso-Fernandes, Morgana Carvalho**, Univ. do Porto (Portugal), ICT (Institute of Earth Sciences) (Portugal); **Vaughan Williams**, Aurum Exploration Ltd. (Ireland); **Alexandre M. Campos de Lima, Ana Cláudia M. Teodoro**, Univ. do Porto (Portugal), ICT (Institute of Earth Sciences) (Portugal)



13197-56 • 05:30 PM - 07:00 PM

**Utilizing UAVs and TLS for remote sensing in kshetrapal landslide investigations: current advancements and future prospects**

*Author(s):* **Ashok Anand**, Indian Institute of Technology Roorkee (India)

13197-57 • 05:30 PM - 07:00 PM

**WACAPOU (water awareness and compensation assessment program of optimum use) and green water**

*Author(s):* **Veronique Miegbielle**, TotalEnergies (France); **Allan ROSS, Odile Rambeau**, Totalenergies (France); **Odile Rambeau**, Totalenergies (France); **Nicolas Delaunay**, TotalEnergies (France)

13197-58 • 05:30 PM - 07:00 PM

**Land suitability analysis for relocation of settlements based on natural hazard issues: a case study of the Budhigandaki Hydropower Project in Nepal**

*Author(s):* **Prakash Paudel**, MSc in Geospatial Engineering, IOE, Pashchimanchal Campus, Tribhuvan University, Nepal (Nepal); **Bikash Sherchan**, Department of Geomatics Engineering, IOE, Pashchimanchal Campus, Tribhuvan University, Nepal (Nepal)

## Wednesday 18 September 2024

### SESSION 7: PROCESSING METHODOLOGIES I

18 September 2024 • 09:20 AM - 10:20 AM | Moorfoot

*Session Chair(s):* **Ulrich Michel**, ROSEN Technology and Research Ctr. GmbH (Germany); **Karsten Schulz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13197-27 • 09:20 AM - 09:40 AM

**On-orbit calibration and performance of the NOAA-21 VIIRS day-night band**

*Author(s):* **Hongda Chen**, NASA (United States), Science Systems and Applications, Inc. (United States); **Daniel O. Link, Gal Sarid, Kwofu V. Chiang**, Science Systems and Applications, Inc. (United States); **Xiaoxiong Xiong**, NASA Goddard Space Flight Ctr. (United States)

13197-29 • 09:40 AM - 10:00 AM

**XR-EVPDM : a system for evacuation planning within disaster management**

*Author(s):* **Shakti Sharma**, Bennett University (India); **Jaya Sharma**, Tata Consultancy Services (India), Birla Institute of Technology and Science (India)

13197-30 • 10:00 AM - 10:20 AM

**An efficient technique for hazard susceptibility mapping using AHP and ML based models**

*Author(s):* **Shreyansh Aswal**, Tata Research Development and Design Ctr. (India); **Chaman Banolia**, TCS Research (India); **Shailesh Deshpande**, Tata Research Development and Design Ctr. (India)

**Coffee Break 10:20 AM - 10:50 AM**

### SESSION 8: PROCESSING METHODOLOGIES II

18 September 2024 • 10:50 AM - 11:50 AM | Moorfoot

*Session Chair(s):* **Karsten Schulz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Ulrich Michel**, ROSEN Technology and Research Ctr. GmbH (Germany)

13197-32 • 10:50 AM - 11:10 AM

**Shadow detection and shadow removal: a benefit for land cover classification**

*Author(s):* **Gisela Häufel, Melanie Böge**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Kevin Qiu**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB, Germany (Germany); **Dimitri Bulatov**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13197-33 • 11:10 AM - 11:30 AM

**A comparative analysis of machine learning algorithms for maize crop mapping**

*Author(s):* **Simbarashe Jombo, Mohamed A. M. Abd ElBasit**, Sol Plaatje Univ. (South Africa)

13197-34 • 11:30 AM - 11:50 AM

**Application of hyperspectral remote sensing for supplementary investigation of medicinal plants in Uttarakhand on northern region of Pithoragarh District**

*Author(s):* **Vishal NA**, Vishal (India); **Kuldeep Chaurasia, Abhay Bansal**, Bennett University (India)

**Lunch/Exhibition Break 11:50 AM - 01:20 PM**

## SESSION 9: SATELLITE RS AND GROUND-BASED NONDESTRUCTIVE TECHNOLOGIES IN CIVIL AND ENVIRONMENTAL ENGINEERING I

18 September 2024 • 01:40 PM - 03:00 PM | Moorfoot

Session Chair(s): **Luigi D'Amato**, Agenzia Spaziale Italiana (Italy); **Valerio Gagliardi**, Univ. degli Studi di Roma Tre (Italy)

13197-35 • 01:40 PM - 02:00 PM

**Strategic directions of remote sensing to support the resilience of urban environments and communities**

Author(s): **Luigi D'Amato**, **Maria Libera Battagliere**, Agenzia Spaziale Italiana (Italy)

13197-36 • 02:00 PM - 02:20 PM

**Sentinel-2 and PRISMA satellite data for urban land classification in Tuscany region (TUS:CAN PROJECT)**

Author(s): **Riccardo Salvini**, **Andrea Garzelli**, **Andrea Rindinella**, **Luisa Beltramone**, Univ. degli Studi di Siena (Italy); **Claudio Vanneschi**, **Iliaria Tabarrani**, Regione Toscana (Italy); **Luigi D'Amato**, **Laura Candela**, Agenzia Spaziale Italiana (Italy)

13197-37 • 02:20 PM - 02:40 PM

**MIDS: monitoring of water infrastructures with satellite data**

Author(s): **Renato Aurigemma**, **Valerio Pisacane**, Euro.Soft Srl (Italy); **Carlo De Michele**, Ariespace s.r.l. (Italy); **Mauro Manente**, Latitudo 40 srl (Italy); **Fabiana Ravellino**, Euro.Soft Srl (Italy); **Mariano Focareta**, Mapsat srl (Italy); **Donato Amitrano**, CIRA Italian Aerospace Research Centre (Italy)

13197-38 • 02:40 PM - 03:00 PM

**Development of an operational infrastructure monitoring service for predictive maintenance based on Rheticus Safeway**

Author(s): **Paolo Petio**, **Vincenzo Massimi**, **Daniela Iasillo**, **Teresa Fazio**, **Giuseppe Forenza**, **Nicolò Taggio**, **Sergio Samarelli**, Planetek Italia S.r.l. (Italy); **Davide Oscar Nitti**, **Raffaele Nutricato**, GAP S.r.l. (Italy); **Mauro Cardone**, **Maria Elena Cianfanelli**, Agenzia Spaziale Italiana (Italy)

**Coffee Break 03:00 PM - 03:30 PM**

## SESSION 10: SATELLITE RS AND GROUND-BASED NONDESTRUCTIVE TECHNOLOGIES IN CIVIL AND ENVIRONMENTAL ENGINEERING II

18 September 2024 • 03:30 PM - 05:10 PM | Moorfoot

Session Chair(s): **Valerio Gagliardi**, Univ. degli Studi di Roma Tre (Italy); **Luigi D'Amato**, Agenzia Spaziale Italiana (Italy)

13197-40 • 03:30 PM - 03:50 PM

**LiDAR health monitoring of transport infrastructure: automatic damage detection using classification of point clouds**

Author(s): **Jhon Romer Diezmos Manalo**, **Valerio Gagliardi**, **Fabrizio D'Amico**, **Andrea Benedetto**, Univ. degli Studi di Roma Tre (Italy)

13197-41 • 03:50 PM - 04:10 PM

**Monitoring double-track railway masonry bridge piers using ground-based interferometric radar and augmented reality**

Author(s): **Saeed Sotoudeh**, **Tesfaye T. Tessema**, **Stephen Uzor**, Univ. of West London (United Kingdom), The Faringdon Research Ctr. for Non-Destructive Testing and Remote Sensing (United Kingdom); **Francesco Benedetto**, Univ. degli Studi di Roma Tre (Italy); **Fabio Tosti**, Univ. of West London (United Kingdom), The Faringdon Research Ctr. for Non-Destructive Testing and Remote Sensing (United Kingdom)

13197-42 • 04:10 PM - 04:30 PM

**Urban green infrastructure monitoring using remote sensing techniques**

Author(s): **Tesfaye T. Tessema**, Univ. of West London (United Kingdom), The Faringdon Research Ctr. for Non-Destructive Testing and Remote Sensing (United Kingdom); **Dale Mortimer**, Tree Service, London Borough of Ealing (United Kingdom); **Sharad K. Gupta**, CASUS Ctr. for Advanced Systems Understanding (Germany), Helmholtz-Zentrum für Umweltforschung GmbH (Germany); **Ulf Mallast**, Helmholtz-Zentrum für Umweltforschung GmbH (Germany); **Stephen Uzor**, **Fabio Tosti**, Univ. of West London (United Kingdom), The Faringdon Research Ctr. for Non-Destructive Testing and Remote Sensing (United Kingdom)

13197-43 • 04:30 PM - 04:50 PM

**Satellite remote sensing technologies for the investigation of the surface urban heat island (SUHI) phenomenon in Italian regional capitals: two different methodological approaches**

Author(s): **Gennaro Albini**, **Giulia Guerri**, CNR-Istituto per la BioEconomia (Italy); **Michele Munafò**, ISPRA – Istituto Superiore per la Protezione e la Ricerca Ambientale (Italy); **Marco Morabito**, CNR-Istituto per la BioEconomia (Italy)

13197-44 • 04:50 PM - 05:10 PM

**Integration of satellite monitoring data in a digital twin of transport infrastructure**

Author(s): **Antonio Napolitano**, **Valerio Gagliardi**, **Fabrizio D'Amico**, **Andrea Benedetto**, Univ. degli Studi di Roma Tre (Italy)

Thursday 19 September 2024

**SESSION 11: REMOTE SENSING FOR ARCHAEOLOGY, PRESERVATION OF CULTURAL AND NATURAL HERITAGE**

19 September 2024 • 10:30 AM - 12:10 PM | Moorfoot

*Session Chair(s):* **Kyriacos Themistocleous**, ERATOSTHENES Ctr. of Excellence (Cyprus)

13197-45 • 10:30 AM - 10:50 AM

**3D mapping of geological heritage: the case of the mythical waterfall of Styx***Author(s):* **Aggeliki Kyriou, Konstantinos G. Nikolakopoulos, Penelope Papadopoulou, Marianthi Tzortzi, Vassilis Golfinopoulos, Maria Tsoni, George Iliopoulos**, Univ. of Patras (Greece)

13197-46 • 10:50 AM - 11:10 AM

**The use of photogrammetry and NeRF techniques to document cultural built heritage***Author(s):* **Kyriacos Themistocleous, Dante Abate**, ERATOSTHENES Ctr. of Excellence (Cyprus)

13197-47 • 11:10 AM - 11:30 AM

**Accuracy assessment of different remote sensing technologies over the cultural heritage site of Helike, Achaea, Greece***Author(s):* **Konstantinos G. Nikolakopoulos, Ioannis K. Koukouvelas, Aggeliki Kyriou**, Univ. of Patras (Greece); **Dora Katsonopoulou**, The Helike Society & The Helike Project (Greece); **Mariza Kormann**, Univ. of Oxford (United Kingdom)

13197-48 • 11:30 AM - 11:50 AM

**The monitoring of cultural heritage sites using digital twins***Author(s):* **Kyriacos Themistocleous**, ERATOSTHENES Ctr. of Excellence (Cyprus)

13197-49 • 11:50 AM - 12:10 PM

**Monitoring of archaeological sites submerged in shallow waters using Earth observation***Author(s):* **Kyriacos Themistocleous, Dante Abate, Eleftheria Kalogirou**, ERATOSTHENES Ctr. of Excellence (Cyprus); **Thomas Krauss**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

# CONFERENCE 13198

## Remote Sensing Technologies and Applications in Urban Environments IX

16 September 2024 | Carrick

**Conference Chair(s):** **Thilo Erbetseder**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Nektarios Chrysoulakis**, Foundation for Research and Technology-Hellas (Greece); **Ying Zhang**, Natural Resources Canada (Canada)

**Program Committee:** **Costas Armenakis**, York Univ. (Canada); **Ingunn Burud**, Norwegian Univ. of Life Sciences (Norway); **Thomas Esch**, **Lorenza Gilardi**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Sheila Izquieta Rojano**, Univ. de Navarra (Spain); **Monika Kuffer**, Univ. Twente (Netherlands); **Giannis Lantzanakis**, **Zina Mitrika**, Foundation for Research and Technology-Hellas (Greece); **William Morrison**, Univ. of Freiburg (Germany); **Tobias Reinicke**, Satellite vu (United Kingdom); **Dimitris Tsirantonakis**, Foundation for Research and Technology-Hellas (Greece)

### Monday 16 September 2024

#### SESSION 1: URBAN RESILIENCE AND PLANNING

16 September 2024 • 09:00 AM - 10:20 AM | Carrick

*Session Chair(s):* **Thilo Erbetseder**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13198-1 • 09:00 AM - 09:20 AM

**Post-wildfire vegetation cover change mapping for assessments of secondary disaster risks toward urban areas: case of Fort McMurray 2016**

*Author(s):* **Ying Zhang**, **Sylvain G Leblanc**, **Francis Canisius**, Natural Resources Canada (Canada); **Haoyu Fang**, Caletun University (Canada); **Maxim Fortin**, **Julie Lovitt**, Natural Resources Canada (Canada)

13198-2 • 09:20 AM - 09:40 AM

**Unveiling urban vegetation monitoring: integrating multitemporal terrestrial laser scanning and UAV photogrammetry datasets for change detection**

*Author(s):* **Osama Bin Shafaat**, **Heikki Kauhanen**, **Arttu Julin**, **Matti Vaaja**, Aalto Univ. (Finland)

13198-3 • 09:40 AM - 10:00 AM

**Automated process for identifying periurban area using geospatial and census data, applied to an agglomeration of Mostaganem on western Algeria**

*Author(s):* **Gacemi Mohamed El Amine**, Univ. d'Oran 2, Oran, Algeria (Algeria), Ctr. National des Techniques Spatiales (Algeria)

13198-4 • 10:00 AM - 10:20 AM

**Urban expansion detection by using multiple nighttime images in Beijing area**

*Author(s):* **Yu Zhang**, Aerospace Information Research Institute, Chinese Academy of Sciences (China); **Shunjing Yu**, Aerospace DFH Satellite Co., Ltd. (China); **Shi Qiu**, Aerospace Information Research Institute, Chinese Academy of Sciences (China); **Gong Wang**, Technology and Engineering Ctr. for Space Utilization (China); **Haodong Cui**, **Zhaoyan Liu**, **Xinhong Wang**, Aerospace Information Research Institute, Chinese Academy of Sciences (China); **Xianghui Chen**, Aerospace Information Research Institute (China), Univ. of Chinese Academy of Sciences (China)

**Coffee Break 10:20 AM - 10:40 AM**

#### SESSION 2: SMART CITIES AND INFRASTRUCTURE

16 September 2024 • 10:40 AM - 11:40 AM | Carrick

*Session Chair(s):* **Ying Zhang**, Natural Resources Canada (Canada)

13198-6 • 10:40 AM - 11:00 AM

**Semantic segmentation of buildings using optical satellite images and deep learning**

*Author(s):* **Nadia Quispe Siancas**, VEOX (Peru); **Julian Llanto Verde**, Comisión Nacional de Investigación y Desarrollo Aeroespacial (Peru); **Wilder Nina Choquehuayta**, VEOX (Peru)

13198-7 • 11:00 AM - 11:20 AM

**Fusing Sentinel-1 and Sentinel-2 data for enhanced dynamics of impervious surfaces in southeast Asia's megacities**

*Author(s):* **Sitthisak Moukomla, Nithima Nuengjumnong, JoJinda Sae Jung**, Thammasat Univ. (Thailand)

13198-8 • 11:20 AM - 11:40 AM

**Self-localization method based on visual odometry of autonomous mobile robot for remote-sensing in outdoor underground infrastructure facilities**

*Author(s):* **Masato Mizukami, Yoshikazu Ebina, Takuya Kosakai**, Muroran Institute of Technology (Japan); **Shoji Mochizuki**, NTT Device Technology Lab. (Japan)

**Lunch Break 11:40 AM - 01:00 PM**

## SESSION 3: URBAN AIR QUALITY AND CLIMATE I

16 September 2024 • 01:00 PM - 02:00 PM | Carrick

*Session Chair(s):* **Thilo Erbertseder**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13198-9 • 01:00 PM - 01:20 PM

**The measurement of aerosol and gases from space for climate and air pollution applications**

*Author(s):* **Jose Vanderlei Martins**, Univ. of Maryland, Baltimore County (United States); **Oleg Dubovik**, Univ. de Lille (France); **David Fuertes, Marcos Giralda, Xiaoguang Xu**, GRASP Earth (France); **Lorraine A. Remer, Brent A. McBride**, Univ. of Maryland, Baltimore County (United States)

13198-10 • 01:20 PM - 01:40 PM

**Vertical profiles of air pollutants and aerosol absorption coefficient using drones and modeling approach**

*Author(s):* **Ajit Ahlawat, Baseerat Romshoo**, Leibniz-Institut für Troposphärenforschung e.V. (Germany); **Sagnik Dey**, Indian Institute of Technology Delhi (India); **Mira Poehlker, Birgit Wehner**, Leibniz-Institut für Troposphärenforschung e.V. (Germany)

13198-11 • 01:40 PM - 02:00 PM

**Assessing the role of urban planning in air pollution mitigation in Chandigarh and Delhi using GIS and remote sensing**

*Author(s):* **Sonali Verma**, Guru Gobind Singh Indraprastha Univ. (India), WWF-India (India)

## SESSION 4: URBAN AIR QUALITY AND CLIMATE II

16 September 2024 • 02:00 PM - 03:00 PM | Carrick

*Session Chair(s):* **Ying Zhang**, Natural Resources Canada (Canada)

13198-12 • 02:00 PM - 02:20 PM

**Assessing the impact of prolonged air pollution exposure on COVID-19 mortality in Maharashtra, India using remotely sensed data**

*Author(s):* **Shreyansh Aswal**, Tata Research Development and Design Ctr. (India); **Chaman Banolia**, TCS Research (India); **Shailesh Deshpande**, Tata Research Development and Design Ctr. (India)

13198-13 • 02:20 PM - 02:40 PM

**Urban heat islands in transition: analysing a decade of thermal patterns in Bhubaneswar**

*Author(s):* **Pritipadmaja Pritipadmaja, Rahul D. Garg**, Indian Institute of Technology Roorkee (India)

13198-14 • 02:40 PM - 03:00 PM

**Enhancing urban thermal understanding via digital twin integration of thermal radiance mapping and geospatial analysis**

*Author(s):* **Dyutisree Halder, Harshit Harshit, Rahul D. Garg**, Indian Institute of Technology Roorkee (India)

**Coffee Break 03:00 PM - 03:30 PM**



## SESSION PL: SENSORS + IMAGING PLENARY SESSION

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium

15:30 to 15:40 hrs

**Welcome and Introduction****Ric Schleijpen**

TNO Defence, Security and Safety (Netherlands)

**Lorenzo Bruzzone**

Univ. degli Studi di Trento (Italy)

*2024 Symposium Chairs*

13191-500 • 03:40 PM - 04:25 PM

**Tracking Earth's ice from space** (Plenary Presentation)*Author(s): Andrew Shepherd*, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

**Sensing in the second quantum revolution** (Plenary Presentation)*Author(s): Francesco Saverio Cataliotti*, LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

**Imaging and sensing that delivers operational advantage** (Plenary Presentation)*Author(s): Jason Field*, Ministry of Defence (United Kingdom)

## Tuesday 17 September 2024

## POSTERS-TUESDAY

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 16:00 hrs, Lennox Suite

View poster presentation guidelines and set-up instructions at

<https://spie.org/ESI/poster-presentation-guidelines>

13198-15 • 05:30 PM - 07:00 PM

**Static characterization of sensor fusion systems***Author(s): Tomoki Nishino, Tomomi Yagi*, Kyoto Univ. Graduate School of Engineering (Japan); **Ryosuke Nakagoshi**, JVC KENWOOD Corp. (Japan); **kenichi Sugihara**, JVC KENWOOD Public & Industrial Systems Corp. (Japan); **Yuji Inoue, Hiroshi Kuriyama, Yoshihiro Nagamine**, Chuo Fukken Consultants Co., Ltd. (Japan); **Hiroshi Tanigawa**, Kyoto Univ. Graduate School of Engineering (Japan)

13198-16 • 05:30 PM - 07:00 PM

**Spectral analysis and mapping of Heat Islands over landfills in Bulgaria***Author(s): Temenuzhka Spasova*, Space Research and Technology Institute, Bulgarian Academy of Sciences (Bulgaria); **Adlin Dancheva**, Space Research and Technology Institute (Bulgaria)

13198-17 • 05:30 PM - 07:00 PM

**Positional accuracy analysis of YOLO personal mobility detection***Author(s): Junseok Kim, Taehyun Lee*, Gyeongsang National Univ. (Korea, Republic of); **Youkyung Han**, Seoul National Univ. of Science and Technology (Korea, Republic of); **Youkyung Han**, Seoul National Univ. of Science and Technology (Korea, Republic of); **Junho Yeom**, Gyeongsang National Univ. (Korea, Republic of)

13198-18 • 05:30 PM - 07:00 PM

**Establishing the regression model of smoke-flow opacity for adaptive intelligent smoke identification using remote hyperspectral sensing***Author(s): Yuan-Jen Ou Yang Fay Huang*, National Ilan Univ. (Taiwan); **Bao-Jen Pong**, Industrial Technology Research Institute (Taiwan)

# CONFERENCE 13199

## Target and Background Signatures X: Traditional Methods and Artificial Intelligence

16 - 17 September 2024 | Kilsyth

**Conference Chair(s):** **Karin Stein**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Ric Schleijpen**, TNO Defence, Security and Safety (Netherlands)

**Program Committee:** **Jean Dumas**, Defence Research and Development Canada, Valcartier (Canada); **Maarten A. Hogervorst**, TNO (Netherlands); **Hans M. Kariis**, Swedish Defence Research Agency (Sweden); **Louisa Laing**, QinetiQ Ltd. (United Kingdom); **Daniel W. O'Hagan**, Fraunhofer Institute for High Frequency Physics and Radar Techniques FHR (Germany); **Eveline Örtenberg**, FOI-Swedish Defence Research Agency (Sweden); **Alexander Schwarz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Gorm K. Selj**, Norwegian Defence Research Establishment (Norway); **Henny E. T. Veerman**, TNO (Netherlands); **Peter Wellig**, Armasuisse (Switzerland)

### Monday 16 September 2024

#### WELCOME AND OPENING REMARKS

16 September 2024 • 10:45 AM - 10:50 AM | Kilsyth  
**Ric Schleijpen**, TNO Defence, Security and Safety (Netherlands)

#### SESSION 1: AI COUNTERING CAMOUFLAGE AND VICE VERSA

16 September 2024 • 10:50 AM - 12:20 PM | Kilsyth  
*Session Chair(s):* **Ric H.M. A. Schleijpen**, TNO (Netherlands)

13199-1 • 10:50 AM - 11:20 AM

**Developing dual attribute adversarial camouflage patterns for counter-AI reconnaissance** (*Invited Paper*)

*Author(s):* **Claudia S. Hübner, Alexander Schwegmann**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13199-2 • 11:20 AM - 11:50 AM

**Counter AI methods against visual reconnaissance** (*Invited Paper*)

*Author(s):* **Alexander Schwegmann, Claudia S. Hübner**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13199-3 • 11:50 AM - 12:20 PM

**VSAI: visible signature reduction with camouflage patterns via generative AI algorithm** (*Invited Paper*)

*Author(s):* **Tauseef Gulrez, Joanne B. Culpepper**, Defence Science and Technology Group (Australia); **Son Lam Phung, Hoang Thanh Le**, Univ. of Wollongong (Australia)

**Lunch Break 12:20 PM - 01:40 PM**

#### SESSION 2: DETECTION, RECOGNITION, IDENTIFICATION

16 September 2024 • 01:40 PM - 02:50 PM | Kilsyth  
*Session Chair(s):* **Maarten A. Hogervorst**, TNO (Netherlands)

13199-5 • 02:10 PM - 02:30 PM

**Parametric point spread function estimation for thermal imaging systems using easy-to-manufacture random pattern targets**

*Author(s):* **Florian Piras**, Idiap Research Institute (Switzerland); **Edouard De Moura Presa, Peter Wellig**, Armasuisse (Switzerland); **Michael Liebling**, Idiap Research Institute (Switzerland)

13199-6 • 02:30 PM - 02:50 PM

**A deep learning-based algorithm for air-to-ground target recognition in mid-wave infrared images**

Author(s): **Sifan Wang, Xin Jin**, AVIC Manufacturing Technology Institute (China)

**Coffee Break 02:50 PM - 03:30 PM**

### SESSION PL: SENSORS + IMAGING PLENARY SESSION

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium

15:30 to 15:40 hrs

**Welcome and Introduction**

**Ric Schleijpen**

TNO Defence, Security and Safety (Netherlands)

**Lorenzo Bruzzone**

Univ. degli Studi di Trento (Italy)

*2024 Symposium Chairs*

13191-500 • 03:40 PM - 04:25 PM

**Tracking Earth's ice from space** (Plenary Presentation)

Author(s): **Andrew Shepherd**, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

**Sensing in the second quantum revolution** (Plenary Presentation)

Author(s): **Francesco Saverio Cataliotti**, LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

**Imaging and sensing that delivers operational advantage** (Plenary Presentation)

Author(s): **Jason Field**, Ministry of Defence (United Kingdom)

## Tuesday 17 September 2024

### SESSION 3: SCENE AND SIGNATURE SIMULATION

17 September 2024 • 08:30 AM - 10:40 AM | Kilsyth

Session Chair(s): **Joanne B. Culpepper**, Defence Science and Technology Group (Australia)

13199-7 • 08:30 AM - 09:00 AM

**Hybrid simulation to create realistic scenes for accurate signature assessment using a limited set of calibration samples** (*Invited Paper*)

Author(s): **Koen van der Sanden, Maarten A. Hogervorst, Piet Bijl**, TNO (Netherlands)

13199-8 • 09:00 AM - 09:20 AM

**Physics-based synthetic imagery generation of near-surface geo-environments**

Author(s): **Andrew C. Trautz, Matthew D. Bray, Justin T. Carrillo, Ori M. Cecil, John G. Monroe, Matthew W. Farthing, Stacy E.**

**Howington**, U.S. Army Engineer Research and Development Ctr. (United States)

13199-9 • 09:20 AM - 09:40 AM

**Infrared high elevation engagement modelling of naval platforms**

Author(s): **Loes C. W. Scheers**, TNO (Netherlands)

13199-10 • 09:40 AM - 10:00 AM

**Sensitivity study on the EO/IR signature of orbiting satellites using MuSES**

Author(s): **Corey D. Packard, Logan Canull**, ThermoAnalytics, Inc. (United States); **Eli Datema**, ThermoAnalytics (United States); **Timofey**

**Golubev, Zachary J. Edel**, ThermoAnalytics, Inc. (United States)

13199-11 • 10:00 AM - 10:20 AM

**Temporary tank emplacements in SAR images of new space satellites: a signature analysis**

Author(s): **Silvia Kuny, Horst Hammer, Antje Thiele, Karsten Schulz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13199-12 • 10:20 AM - 10:40 AM

**Multi-resolution components fused evaluation for hyperspectral atmospheric radiative transfer model using feature selective validation**

*Author(s):* **Shaoping Shuai**, Beihang Univ. (China); **Jun Ma, Jia Liu**, Aerospace DFH Satellite Co., Ltd. (China); **Xiaoyu He, Xiaojian Xu**, Beihang Univ. (China)

**Coffee Break 10:40 AM - 11:10 AM**

## SESSION 4: TESTING AND VALIDATION

17 September 2024 • 11:10 AM - 12:00 PM | Kilsyth

*Session Chair(s):* **Ric H.M. A. Schleijsen**, TNO (Netherlands)

13199-13 • 11:10 AM - 11:40 AM

**COURAGEOUS: test methods for counter-UAS systems** (*Invited Paper*)

*Author(s):* **Alexander Borghraef, Geert De Cubber, Marijke Vandewal**, Royal Military Academy (Belgium)

13199-14 • 11:40 AM - 12:00 PM

**Complex permittivity measurement procedure of adobe and utilization of matched illumination waveforms in through-the-wall radar imaging**

*Author(s):* **Steven R. Price, Stanton R. Price, Jess Simmons, Christopher Milligan, Josh R. Fairley**, U.S. Army Engineer Research and Development Ctr. (United States)

# CONFERENCE 13200

## Electro-optical and Infrared Systems: Technology and Applications XXI

16 - 19 September 2024 | Fintry

**Conference Chair(s):** **Duncan L. Hickman**, Tektonex Ltd. (United Kingdom); **Helge Bürsing**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Ove Steinvall**, FOI-Swedish Defence Research Agency (Sweden); **Philip J. Soan**, Defence Science and Technology Lab. (United Kingdom)

**Program Committee:** **Gianni Barani**, Leonardo (Italy); **Piet Bijl**, TNO Defence, Security and Safety (Netherlands); **Rainer Breiter**, AIM INFRAROT-MODULE GmbH (Germany); **Lounis Chermak**, Cranfield Univ., Defence Academy (United Kingdom); **Bernd Eberle**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Linda Höglund**, IRnova AB (Sweden); **Natan S. Kopeika**, Ben-Gurion Univ. of the Negev (Israel); **Malgorzata Kopytko**, Wojskowa Akademia Techniczna im. Jaroslawa Dabrowskiego (Poland); **Daniel A. Lavigne**, Defence Research and Development Canada, Valcartier (Canada); **Gino Putrino**, The Univ. of Western Australia (Australia); **Stanley R. Rotman**, Ben-Gurion Univ. of the Negev (Israel); **Frank Rutz**, Fraunhofer-Institut für Angewandte Festkörperphysik IAF (Germany); **Dilusha Silva**, The Univ. of Western Australia (Australia); **Philip J. Soan**, Defence Science and Technology Lab. (United Kingdom)

### Monday 16 September 2024

#### SESSION 1: ACTIVE AND PASSIVE SENSING

16 September 2024 • 08:30 AM - 10:10 AM | Fintry

*Session Chair(s):* **Ove Steinvall**, FOI-Swedish Defence Research Agency (Sweden)

13200-1 • 08:30 AM - 09:00 AM

**UAV detection at ISL: a review** (*Invited Paper*)

*Author(s):* **Frank Christnacher**, **Martin Laurenzis**, **Martin Rebert**, **Alexis Matwyschuk**, Institut Franco-Allemand de Recherches de Saint-Louis (France)

13200-2 • 09:00 AM - 09:20 AM

**Laser and infrared image registration algorithm improved based on Harris-Canny**

*Author(s):* **JiXia Cheng**, **Yanchen Qu**, **Mingqi Wang**, Harbin Institute of Technology (China); **Peng Jiang**, National Key Lab. of Complex System Control and Intelligent Agent Cooperation (China); **Jie Lu**, The 44th Research Institute of China Electronics Technology Group Corp. (China), Harbin Institute of Technology (China); **Xin Zhou**, **Sining Li**, Harbin Institute of Technology (China)

13200-3 • 09:20 AM - 09:50 AM

**Fusion of passive and active electro-optical sensor data for enhanced scene understanding in challenging conditions** (*Invited Paper*)

*Author(s):* **Egil Bae**, Norwegian Defence Research Establishment (Norway)

13200-4 • 09:50 AM - 10:10 AM

**Multi-frame superposition method with adaptive weights based on disturbance estimation residuals**

*Author(s):* **Zhishu Wang**, **Junze Tong**, **Dapeng Tian**, **Yutang Wang**, Changchun Institute of Optics, Fine Mechanics and Physics, Chinese Academy of Sciences (China)

**Coffee Break 10:10 AM - 10:40 AM**

#### SESSION 2: LIDAR SYSTEMS AND APPLICATIONS

16 September 2024 • 10:40 AM - 12:00 PM | Fintry

*Session Chair(s):* **Philip J. Soan**, Defence Science and Technology Lab. (United Kingdom)

13200-5 • 10:40 AM - 11:00 AM

**Laser in support for effective operation of active and passive EO systems**

*Author(s):* **Ove Steinvall**, **Magnus Elmqvist**, **Magnus Pettersson**, **Lars Allard**, FOI-Swedish Defence Research Agency (Sweden)

13200-6 • 11:00 AM - 11:20 AM

**Multispectral Lidar using a two-dimensional dynamic diffraction grating : how to get nanosecond resolution from a projector and a camera**

Author(s): **David M. Benton**, Aston Univ. (United Kingdom)

13200-7 • 11:20 AM - 11:40 AM

**Light detection and ranging sensors for urban air mobility with OOFDMA**

Author(s): **Jeongsook Eom, Gunzung Kim, Soojung Hur, Yongwan Park**, Yeungnam Univ. (Korea, Republic of)

13200-8 • 11:40 AM - 12:00 PM

**Detecting clear air turbulence in urban air mobility by using LiDAR with OOFDMA and a Risley prism**

Author(s): **Gunzung Kim, Jeongsook Eom, Soojung Hur, Yongwan Park**, Yeungnam Univ. (Korea, Republic of)

## Lunch Break 12:00 PM - 01:10 PM

### SESSION 3: DETECTORS AND SIGNAL PROCESSING

16 September 2024 • 01:10 PM - 03:10 PM | Fintry

Session Chair(s): **Per Jonsson**, FOI-Swedish Defence Research Agency (Sweden)

13200-9 • 01:10 PM - 01:40 PM

**Development of Ge on Si single-photon avalanche diode imaging arrays for short wave infrared imaging** (*Invited Paper*)

Author(s): **Douglas J. Paul**, Univ. of Glasgow (United Kingdom)

13200-10 • 01:40 PM - 02:10 PM

**Disruptive imaging field trial (DRIFT) on computational and compressive imaging systems** (*Invited Paper*)

Author(s): **Martin Laurenzis**, Institut Franco-Allemand de Recherches de Saint-Louis (France); **Todd Du Bosq**, U.S. Army CCDC C5ISR Ctr. Night Vision & Electronic Sensors Directorate (United States); **Kevin Nielson, Terence Haran**, Georgia Tech Research Institute (United States); **Pieter Piscaer, Nicolas Boehrer, Judith Dijk**, TNO (Netherlands); **Gabriela Paunescu, Peter Lutzmann, Jürgen Limbach**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Jonathan Piper, Oscar B. Elphick, Jacob Franks**, Defence Science and Technology Lab. (United Kingdom); **Olivia Pavlic, Timothy M Lang**, Naval Surface Warfare Ctr. Crane Div. (United States); **Sebastian Strecker**, Wehrtechnische Dienststelle für Waffen und Munition (Germany)

13200-11 • 02:10 PM - 02:30 PM

**Analysis of surface currents in pBpn superlattice infrared detectors**

Author(s): **Julie Logan, Preston T. Webster, Luke Helms, Rigo A. Carrasco**, Air Force Research Lab. (United States); **Christopher P. Hains**, Air Force Research Lab. (United States), BlueHalo (United States); **Zinah Alsaad, Alex T. Newell, Diana Maestas, Christian P. Morath**, Air Force Research Lab. (United States)

13200-12 • 02:30 PM - 02:50 PM

**Generation of photo-realistic SPAD data**

Author(s): **Stirling Scholes**, Heriot-Watt Univ. (United Kingdom); **German Mora-Martin**, SCALAI (Spain); **Jonathan Leach**, Heriot-Watt Univ. (United Kingdom)

13200-13 • 02:50 PM - 03:10 PM

**Achieving the overall shape of a UAV rotor blade by sub-band method on laser micro-Doppler effect**

Author(s): **Yong Zhang, Xue Liu, Xin Dai, Dongmei Li, Zhihong Ding, Zhengjia Wang, Zhen Yang, Yi Han, Jianlong Zhang**, Harbin Institute of Technology (China)

## Coffee Break 03:10 PM - 03:30 PM

### SESSION PL: SENSORS + IMAGING PLENARY SESSION

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium

15:30 to 15:40 hrs

**Welcome and Introduction**

**Ric Schleijsen**

TNO Defence, Security and Safety (Netherlands)

**Lorenzo Bruzzone**

Univ. degli Studi di Trento (Italy)

2024 Symposium Chairs



13191-500 • 03:40 PM - 04:25 PM

**Tracking Earth's ice from space** (Plenary Presentation)

Author(s): **Andrew Shepherd**, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

**Sensing in the second quantum revolution** (Plenary Presentation)

Author(s): **Francesco Saverio Cataliotti**, LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

**Imaging and sensing that delivers operational advantage** (Plenary Presentation)

Author(s): **Jason Field**, Ministry of Defence (United Kingdom)

## Tuesday 17 September 2024

### ELECTRO-OPTICAL AND INFRARED SYSTEMS: WELCOME AND OPENING REMARKS

17 September 2024 • 08:50 AM - 09:00 AM | Fintry

**Duncan L. Hickman**, Tektonex Ltd. (United Kingdom)

**Helge Bürsing**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

### SESSION 4: UK TECHNOLOGY I

17 September 2024 • 09:00 AM - 10:30 AM | Fintry

Session Chair(s): **Philip J. Soan**, Defence Science and Technology Lab. (United Kingdom)

13200-15 • 09:00 AM - 09:30 AM

**High-quality factor mid-wave infrared metasurface for methane detection applications** (*Invited Paper*)

Author(s): **Shuhao Wu, Vincenzo Pusino, Khue Tian Lai, David R. S. Cumming**, Univ. of Glasgow (United Kingdom)

13200-16 • 09:30 AM - 09:50 AM

**Immersive situational awareness and seeing through occlusions at thermal infrared wavelengths**

Author(s): **Paul B. Wagenaar**, Univ. of Glasgow (United Kingdom); **Laura V. Cowan**, Thales UK Ltd. (United Kingdom); **Nicholas Wood**, Univ. of Glasgow (United Kingdom), Thales UK Ltd. (United Kingdom); **Andrew R. Harvey**, Univ. of Glasgow (United Kingdom)

13200-17 • 09:50 AM - 10:10 AM

**Mid-infrared imaging and ranging with single-photon detectors using efficient upconversion in PPLN waveguides**

Author(s): **Imogen Morland, Ruaridh Smith**, Fraunhofer Ctr. for Applied Photonics (United Kingdom); **Krish Pandiyan, Lewis Wright**, Covesion Ltd. (United Kingdom); **Sarah McCarthy, Ali Anwar**, Fraunhofer Ctr. for Applied Photonics (United Kingdom); **Corin Gawith**, Covesion Ltd. (United Kingdom), Univ. of Southampton (United Kingdom); **Loyd J. McKnight**, Fraunhofer Ctr. for Applied Photonics (United Kingdom)

13200-18 • 10:10 AM - 10:30 AM

**LWIR radiometric signature measurement using micro-bolometer imaging sensors**

Author(s): **Richard S. Maguire, Iain D. Carrie**, Thales UK Ltd. (United Kingdom)

### Coffee Break 10:30 AM - 11:00 AM

### SESSION 5: UK TECHNOLOGY II

17 September 2024 • 11:00 AM - 12:30 PM | Fintry

Session Chair(s): **Philip J. Soan**, Defence Science and Technology Lab. (United Kingdom)

13200-19 • 11:00 AM - 11:30 AM

**Two-wavelength holography for non-line-of-sight imaging: practical considerations and critical analysis** (*Invited Paper*)

Author(s): **James R. Almond, Douglas O'Rourke, Ermes Tonellini, Matthew J. Clayton, Tom Watson, Simon Jordan**, Cambridge Consultants Ltd. (United Kingdom)

13200-20 • 11:30 AM - 11:50 AM

**Target tracking in a complex simulated world**

Author(s): **Elias J. Griffith, Alexander M. Phillips, Liam P. Mai, Simon Maskell, Jason F. Ralph**, Univ. of Liverpool (United Kingdom)

13200-21 • 11:50 AM - 12:10 PM

**Optical correction of microscan distortion**

Author(s): **Robert Craig, Nicholas A. Thompson**, Thales Optronics Ltd. (United Kingdom)

13200-22 • 12:10 PM - 12:30 PM

**Characterising a DMD as a pseudo-pixel array for high-speed free-space LIDAR environments**

Author(s): **Paul Hawthorne, Mark W. McDonald**, Heriot-Watt Univ. (United Kingdom); **Ian S. Park**, MBDA UK Ltd. (United Kingdom); **Duncan P. Hand**, Heriot-Watt Univ. (United Kingdom)

**Lunch/Exhibition Break 12:30 PM - 01:40 PM**

**SESSION 6: ACTIVE SENSORS AND LASER SYSTEMS**

17 September 2024 • 01:40 PM - 03:10 PM | Fintry

Session Chair(s): **Duncan L. Hickman**, Tektonex Ltd. (United Kingdom)

13200-23 • 01:40 PM - 02:10 PM

**Development of a sensor hardened against laser damage independent of wavelength by off-focus imaging** *(Invited Paper)*

Author(s): **Michael Henrichsen, Christian Eisele, Bastian Schwarz, Jürgen Limbach, Gunnar Ritt, Stefanie Dengler, Johannes Meyer**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13200-24 • 02:10 PM - 02:30 PM

**Analyses and optimizations of galvanometer laser scanning**

Author(s): **Virgil-Florin Duma**, Univ. "Aurel Vlaicu" din Arad (Romania), Univ. Politehnica Timisoara (Romania)

13200-25 • 02:30 PM - 02:50 PM

**Design and development of an integrated LiDAR sensor for autonomous driving - achieved results**

Author(s): **Andreas Hofbauer, Rainer Reichert**, RIEGL Laser Measurement Systems GmbH (Austria); **Marcus E. Hennecke**, Infineon Technologies Austria AG (Austria); **Marcus Baumgart, Andreas Tortschanoff**, Silicon Austria Labs. GmbH (Austria); **Boris Kirillov**, Infineon Technologies Austria AG (Austria); **Martin Pfennigbauer**, RIEGL Laser Measurement Systems GmbH (Austria)

13200-26 • 02:50 PM - 03:10 PM

**Active shortwave infrared pushbroom imager for security and defense applications**

Author(s): **Teemu Kääriäinen, Jussi Soukkamakki, Timo Donsberg**, VTT Technical Research Ctr. of Finland Ltd. (Finland)

**Coffee Break 03:10 PM - 03:40 PM**

**SESSION 7: MODELLING AND SIMULATION**

17 September 2024 • 03:40 PM - 05:40 PM | Fintry

Session Chair(s): **Helge Bürsing**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13200-27 • 03:40 PM - 04:10 PM

**Comparing MTDP and TOD for thermal imagers with boost** *(Invited Paper)*

Author(s): **Uwe Adomeit**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13200-28 • 04:10 PM - 04:30 PM

**Spectral analysis of low temperature thermal emitters for spectrally accurate IR scene projection**

Author(s): **Marten Wiehn, Miriam Wolmeringer, Michael Henrichsen**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13200-29 • 04:30 PM - 04:50 PM

**Test, verification, and validation of a multisensor maritime targeting system**

Author(s): **Duncan L. Hickman**, Tektonex Ltd. (United Kingdom); **Daekyu Sang, Boomin Kim, Jeonghyun Baek, Iksoo Kim**, Agency for Defense Development (Korea, Republic of)

13200-30 • 04:50 PM - 05:20 PM

**Spectral-spatial ground targets for measurement of airborne electro-optical imaging system performance** *(Invited Paper)*

Author(s): **Robert Sundberg, James Grassi, Michael Kogan, Cory Garms, Paul Corlies, Neil Goldstein, Bridget Tannian, Megan Stark, Marsha Fox, Timothy Perkins**, Spectral Sciences, Inc. (United States); **Ronald Hardgrove, Karapet Gyurjyan, Steven P. Santaniello Todd Christensen, Vu Hoang**, U.S. Air Force - Edwards AFB, Air Force Materiel Command (United States)

13200-31 • 05:20 PM - 05:40 PM

**Concept study for the TRM4 display-observer model: effects of glare on range performance**

Author(s): **Christian Günther**, Fraunhofer-IOSB (Germany); **Stefan Keßler**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

## POSTERS-TUESDAY

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 16:00 hrs, Lennox Suite

View poster presentation guidelines and set-up instructions at

<https://spie.org/ESI/poster-presentation-guidelines>

13200-60 • 05:30 PM - 07:00 PM

**Radiation thermometer using a MWIR detector for room temperature measurement**

*Author(s):* **Sun Do Lim**, Korea Research Institute of Standards and Science (Korea, Republic of); **DongHwan Cha, Doo Chun Seo**, Korea Aerospace Research Institute (Korea, Republic of); **Seongchong Park**, Korea Research Institute of Standards and Science (Korea, Republic of)

13200-61 • 05:30 PM - 07:00 PM

**Semantic segmentation of fog scene based on lightweight adaptive image defogging neural network**

*Author(s):* **Haozhen Chen, Hancui Zhang, Xu Yang**, Zhejiang Sci-Tech Univ. (China)

13200-62 • 05:30 PM - 07:00 PM

**User recognition and following methods for user-following transport robot in orchard using 2D LiDAR**

*Author(s):* **Gookhwan Kim, Jintack Jeon, Youngki Hong**, National Institute of Agricultural Sciences (Korea, Republic of)

13200-63 • 05:30 PM - 07:00 PM

**Technological concepts for broad- and narrow-band absorbers in uncooled thermal imagers visualizing MWIR and LWIR**

*Author(s):* **Elahe Zakizade, Marvin Michel, Alexander Litke, Sebastian Blaeser, Sascha Weyers, Dirk Weiler**, Fraunhofer-Institut für Mikroelektronische Schaltungen und Systeme IMS (Germany)

13200-64 • 05:30 PM - 07:00 PM

**Low SNR signal processing method applied in designing a long-range, compact, high accuracy laser rangefinder**

*Author(s):* **Xuan Duc Cao, Tuan Anh Nguyen, Van Dung Mai, Huu Huong Doan, Duy Khanh Duong, Van Thinh Hoang, Van Quy La**, Viettel High-Tech Industrial Corp. (Vietnam)

13200-65 • 05:30 PM - 07:00 PM

**The potential of linear polarization for backscatter-blocking and comparison to range-gated technologies focusing on maritime applications**

*Author(s):* **Laura Kontschak, Jendrik Schmidt, Tristan Preis, Benedikt Sieben, Maurice Stephan, Enno Peters**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13200-66 • 05:30 PM - 07:00 PM

**Enhancements to HgCdTe infrared detector performance and the fabrication of larger focal plane arrays at the University of Western Australia**

*Author(s):* **Wenwu Pan, Gilberto A. Umana-Membreno, Jarek Antoszewski, Renjie Gu, Nima Dehdashtiakhavan, Wen Lei, Hemendra Kala, Lorenzo Faraone**, The Univ. of Western Australia (Australia)

13200-67 • 05:30 PM - 07:00 PM

**Enhancing stability in Zernike coefficient computation through deep learning for polygonal mirrors of electro-optical satellite payloads**

*Author(s):* **Shinwook Kim, Youngchun Youk, Goeun Kim**, Korea Aerospace Research Institute (Korea, Republic of)

13200-69 • 05:30 PM - 07:00 PM

**Electric field propagation from a meta-surface using ray optics and Fourier optics**

*Author(s):* **Paul D. Harrison, Shuhao Wu**, Univ. of Glasgow (United Kingdom)

## Wednesday 18 September 2024

## SESSION 8: DETECTORS AND FOCAL PLANE TECHNOLOGY I

18 September 2024 • 08:30 AM - 10:30 AM | Fintry

*Session Chair(s):* **Frank Rutz**, Fraunhofer-Institut für Angewandte Festkörperphysik IAF (Germany); **Duncan L. Hickman**, Tektonex Ltd. (United Kingdom)

13200-32 • 08:30 AM - 09:00 AM

**Latest development on IR detector technology at WAT-VIGO laboratory** (*Invited Paper*)

*Author(s):* **Malgorzata Kopytko**, Wojskowa Akademia Techniczna im. Jaroslawa Dabrowskiego (Poland); **Jan Sobieski, Karol Dąbrowski**, VIGO Photonics S.A. (Poland); **Waldemar Gawron**, Wojskowa Akademia Techniczna im. Jaroslawa Dabrowskiego (Poland); **Józef Piotrowski**, VIGO Photonics S.A. (Poland)

13200-33 • 09:00 AM - 09:30 AM

**Emerging technologies for infrared sensing and imaging** (*Invited Paper*)

*Author(s):* **Hemendra Kala, Wenwu Pan, Renjie Gu, Dilusha Silva, Jarek Antoszewski, Gilberto A Umana-Membreno, Wen Lei, Nima Dehdashtiaxhavan, Michal Zawierta, Dharendra Tripathi, Yan Liu, Gurpreet Singh Gill, Jega Gurusamy, Adrian Keating, John Dell, Brett Nener, Mariusz Martyniuk, Lorenzo Faraone**, The Univ. of Western Australia (Australia)

13200-34 • 09:30 AM - 09:50 AM

**Next Generation TDI CMOS Detectors**

*Author(s):* **Dirk Viehmann**, VS Informationssysteme GmbH (Germany); **Sukhbir Kullar, Sunil Sanjeevi, Gavin Rodrigues, Rohit Saraf, Mitchell Faguy, Lei Wu, Mike Miethig**, Teledyne DALSA (Canada)

13200-35 • 09:50 AM - 10:10 AM

**Progress on InGaAs-based SPAD fabrication for SWIR detection and imaging**

*Author(s):* **Frank Rutz, Andreas Woerl, Andreas Bächle, Jasmin Niemasz, Robert Rehm**, Fraunhofer-Institut für Angewandte Festkörperphysik IAF (Germany)

13200-36 • 10:10 AM - 10:30 AM

**Suspended binary superlattices of infrared colloidal nanocrystals for tailored optoelectronic response**

*Author(s):* **Todd H. Brintlinger, Paul D. Cunningham, Veronica R. Policht, Patrick Y. Yee, Janice E. Boercker, Sarah F. Brittman**, U.S. Naval Research Lab. (United States)

**Coffee Break 10:30 AM - 11:00 AM**

**SESSION 9: DETECTORS AND FOCAL PLANE TECHNOLOGY II**

18 September 2024 • 11:00 AM - 12:30 PM | Fintry

*Session Chair(s):* **Frank Rutz**, Fraunhofer-Institut für Angewandte Festkörperphysik IAF (Germany)

13200-37 • 11:00 AM - 11:30 AM

**Progress on infrared bispectral MCT detectors towards high operating temperature and small pixel pitch** (*Invited Paper*)

*Author(s):* **Maik Beer, Holger Lutz, Rainer Breiter, Detlef Eich, Stefan Hanna, Alexander Sieck, Jan Wenisch, Heinrich Figgemeier**, AIM INFRAROT-MODULE GmbH (Germany)

13200-38 • 11:30 AM - 11:50 AM

**Improvement of a medium wave IR detector product used in a directed infrared counter measures application**

*Author(s):* **Andrew Bradford**, Leonardo UK Ltd. (United Kingdom)

13200-39 • 11:50 AM - 12:10 PM

**Type-II superlattice eSWIR detectors at IRnova**

*Author(s):* **Thierry Kohl, Linda Höglund, Marie Delmas, Ruslan Ivanov, David Ramos, Linnea Bendrot, Laura Zorauskaite, Dean Evans, David Rihtnesberg, Sergiy Smuk, Anton Smuk, Smilja Becanovic, Susanne Almqvist, Pia Tinghag, Eric Costard**, IRnova AB (Sweden)

13200-40 • 12:10 PM - 12:30 PM

**Experimental method to determine bias voltage of InGaAs APD for highest gain at wide temperature range**

*Author(s):* **Halil Berberoglu**, Ankara Haci Bayram Veli Univ. (Turkey); **Mehmet Tiken**, Ministry of National Defence (Turkey); **Ferhat Yesil**, Stairway Technology Ltd. (Turkey); **Can Candan**, Ministry of National Defence (Turkey)

**Lunch/Exhibition Break 12:30 PM - 01:40 PM**

**SESSION 10: OPTICAL COMPONENTS AND DESIGN**

18 September 2024 • 01:40 PM - 03:20 PM | Fintry

*Session Chair(s):* **Helge Bürsing**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13200-41 • 01:40 PM - 02:00 PM

**Technologies for adaptive SWIR multispectral imaging**

*Author(s):* **Dilusha Silva, Hemendra Kala, Michal Zawierta, Dharendra Tripathi, Gurpreet Gill, Jarek Antoszewski, Gilberto A Umana-Membreno, Adrian Keating, John Dell, Brett Nener, Mariusz Martyniuk, Lorenzo Faraone**, The Univ. of Western Australia (Australia)

13200-42 • 02:00 PM - 02:20 PM

**Monolithic optics: a pick&place contribution**

*Author(s):* **Sebastian Kaldun**, asphericon GmbH (Germany)

13200-43 • 02:20 PM - 02:40 PM

**Quantitative evaluation of image degradation due to stray light in LWIR imaging systems**

*Author(s):* **Ha Neul Yeon, Deok Ki Hong, Chan Lee, Seung Hun Choi, Jun Ho Lee**, Kongju National Univ. (Korea, Republic of); **Kwang Woo Park**, Agency for Defense Development (Korea, Republic of)

13200-44 • 02:40 PM - 03:00 PM

**Setting point optimisation in continuous zoom lens design**

*Author(s):* **Nicholas A. Thompson**, Thales Optronics Ltd. (United Kingdom)

13200-45 • 03:00 PM - 03:20 PM

**An innovative control approach for deformable mirrors: balancing control performance, lifespan, and robustness**

*Author(s):* **Shaoze Zhang, Bo Li, Rui Xu, Dapeng Tian**, Changchun Institute of Optics, Fine Mechanics and Physics (China), Univ. of Chinese Academy of Sciences (China)

**Coffee Break 03:20 PM - 03:50 PM**

**SESSION 11: DEBELA (DETECT BEFORE LAUNCH) PROJECT**

18 September 2024 • 03:50 PM - 05:20 PM | Fintry

*Session Chair(s):* **Helge Bürsing**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Duncan L. Hickman**, Tektonex Ltd. (United Kingdom)

13200-46 • 03:50 PM - 04:20 PM

**DEBELA: investigations on potential detect-before-launch technologies** (*Invited Paper*)

*Author(s):* **Christian Eisele, Dirk P. Seiffer, Erik Sucher**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Lars Sjöqvist, Markus Henriksson**, FOI-Swedish Defence Research Agency (Sweden); **Claire Lavigne, Roland Domel, Philippe Déliot**, ONERA (France); **Judith Dijk, Hugo Kuijf, Nicolas Boehrer**, TNO (Netherlands)

13200-47 • 04:20 PM - 04:40 PM

**Laser warning and pointed optics detection using an event camera**

*Author(s):* **Nicolas Boehrer, Hugo J. Kuijf, Judith Dijk**, TNO (Netherlands)

13200-48 • 04:40 PM - 05:00 PM

**Zero-shot neuro-symbolic parsing of body keypoints**

*Author(s):* **Dalia Aljawaheri, Gertjan J. Burghouts, Jan Erik van Woerden, Judith Dijk, Hugo J. Kuijf**, TNO (Netherlands)

13200-49 • 05:00 PM - 05:20 PM

**Specific processing of mixed pixels for anomaly detection, case study on DEBELA campaign**

*Author(s):* **Stephanie Doz, Philippe Deliot, Pierre-Yves Foucher**, ONERA (France)

**SESSION 12: IMAGE AND DATA PROCESSING I**

18 September 2024 • 05:20 PM - 05:40 PM | Fintry

*Session Chair(s):* **Duncan L. Hickman**, Tektonex Ltd. (United Kingdom)

13200-52 • 05:20 PM - 05:40 PM

**Abandoned/removed object detection in video surveillance systems**

*Author(s):* **Muhammed Kalabalik, Cevahir Çigla, Fikret Alim**, ASELSAN A.S. (Turkey)

**Thursday 19 September 2024**

**SESSION 13: IMAGE AND DATA PROCESSING II**

19 September 2024 • 09:00 AM - 10:20 AM | Fintry

*Session Chair(s):* **Duncan L. Hickman**, Tektonex Ltd. (United Kingdom)

13200-50 • 09:00 AM - 09:30 AM

**Local standard deviation normalization in a hyperspectral target detection algorithm** (*Invited Paper*)

*Author(s):* **Haim Elisha, Stanley R. Rotman**, Ben-Gurion Univ. of the Negev (Israel)

13200-53 • 09:30 AM - 09:50 AM

**Optimizing object detection in electro-optical systems with snapshot compressive imaging**

*Author(s):* **Yaping Zhao, Edmund Y. Lam**, The Univ. of Hong Kong (Hong Kong, China)

13200-68 • 09:50 AM - 10:20 AM

**Target concentration estimation in hyperspectral imagery** (*Invited Paper*)

*Author(s):* **Chanel Michaeli, Noam Atias, Stanley R. Rotman**, Ben-Gurion Univ. of the Negev (Israel)

**Coffee Break 10:20 AM - 10:50 AM****SESSION 14: INFRARED SYSTEMS AND APPLICATIONS**

19 September 2024 • 10:50 AM - 12:50 PM | Fintry

*Session Chair(s):* **Duncan L. Hickman**, Tektonex Ltd. (United Kingdom); **Helge Bürsing**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13200-54 • 10:50 AM - 11:20 AM

**Long-range compressive sensing camera** (*Invited Paper*)

*Author(s):* **Gabriela Paunescu, Daniel Wegner, Peter Lutzmann, Dominik Walter, Helge Bürsing**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13200-55 • 11:20 AM - 11:50 AM

**Polarimetric image fusion strategies for improving target shape and contrast in remote sensing applications** (*Invited Paper*)

*Author(s):* **Bradley M. Ratliff**, Univ. of Dayton (United States); **J. Scott Tyo**, Monash Univ. (Australia); **Michael Taylor, Connor Prikkel**, Univ. of Dayton (United States)

13200-56 • 11:50 AM - 12:10 PM

**Performance Evaluation of a Single Pixel Event Based Sensor Pixel Unit Cell Optimized for Mid-Wave Infrared Sensing**

*Author(s):* **Zinah M. Alsaad**, The Univ. of New Mexico (United States), Air Force Research Lab. (United States); **Julie V. Logan, Christian P. Morath, Peter N. McMahon-Crabtree, Lucas N Kulesza, Diana Maestas**, Air Force Research Lab. (United States); **Payman Zarkesh-Ha**, The Univ. of New Mexico (United States); **Preston T. Webster**, Air Force Research Lab. (United States)

13200-57 • 12:10 PM - 12:30 PM

**A bolometric hyperspectral camera based on a birefringent interferometer for remote sensing in the thermal infrared**

*Author(s):* **Matteo Corti**, Politecnico di Milano (Italy); **Fabrizio Preda, Antonio Perri**, NIREOS SRL (Italy); **Ondřej Ballada, Cestmir Barta, Lukáš Chroust**, BBT-Materials Processing, s.r.o. Ltd. (Czech Republic); **Davide Gatti, Guglielmo Vesco, Luca Moretti**, Politecnico di Milano (Italy), CNR-Istituto di Fotonica e Nanotecnologie (Italy); **Gianluca Valentini**, Politecnico di Milano (Italy); **Giulio Cerullo**, Politecnico di Milano (Italy), NIREOS SRL (Italy), CNR-Istituto di Fotonica e Nanotecnologie (Italy); **Cristian Manzoni**, CNR-Istituto di Fotonica e Nanotecnologie (Italy)

13200-59 • 12:30 PM - 12:50 PM

**Nondestructive testing of corrosion thickness in coated steel structures with terahertz time-domain spectroscopy**

*Author(s):* **Ying Xu**, Harbin Institute of Technology, Shenzhen (China)



# CONFERENCE 13201

## High-Power Lasers and Technologies for Optical Countermeasures II

16 - 17 September 2024 | Ochil

**Conference Chair(s):** **Willy L. Bohn**, BohnLaser Consult (Germany); **Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Gareth D. Lewis**, Royal Military Academy (Belgium)

**Program Committee:** **Frances Bodrucki**, The Univ. of North Carolina at Charlotte (United States); **Pierre Bourdon**, ONERA (France); **Christopher D. Burgess**, Defence Science and Technology Lab. (United Kingdom); **M. J. Daniel Esser**, Heriot-Watt Univ. (United Kingdom); **Robert J. Grasso**, NASA Goddard Space Flight Ctr. (United States); **Markus Henriksson**, FOI-Swedish Defence Research Agency (Sweden); **James P. Hitscherich**, U.S. Army Combat Capabilities Development Command (United States); **Itor James**, Defence Science and Technology Lab. (United Kingdom); **Arkadiy A. Lyakh**, Univ. of Central Florida (United States); **William Ted Masselink**, Humboldt-Univ. zu Berlin (Germany); **Richard Maulini**, Alpes Lasers SA (Switzerland); **Curtis R. Menyuk**, Univ. of Maryland, Baltimore County (United States); **Eric D. Park**, Q-Peak, Inc. (United States); **Jasbinder S. Sanghera**, U.S. Naval Research Lab. (United States); **Ric H. M. A. Schleijsen**, TNO Defence, Security and Safety (Netherlands); **Bastian Schwarz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Ove Steinvall**, Swedish Defence Research Agency (Sweden); **Alexander M. J. van Eijk**, TNO Defence, Security and Safety (Netherlands); **Hans-Dieter Tholl**, Diehl BGT Defence GmbH & Co. KG (Germany); **Marijke Vandewal**, Royal Military Academy (Belgium)

### Monday 16 September 2024

#### WELCOME ADDRESS

16 September 2024 • 08:40 AM - 09:00 AM | Ochil

**Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany) **Gareth D. Lewis**, Royal Military Academy (Belgium)

#### SESSION 1: LASER AND BEAM COMBINATION

16 September 2024 • 09:00 AM - 12:10 PM | Ochil

**Session Chair(s):** **Gareth D. Lewis**, Royal Military Academy (Belgium); **Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-1 • 09:00 AM - 09:30 AM

**Advanced concepts of Ho<sup>3+</sup>:YAG and ZGP OPO sources** (*Invited Paper*)

**Author(s):** **Katharina Goth**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruher Institut für Technologie (Germany); **Michael Griesbeck**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Marius Rupp**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruher Institut für Technologie (Germany); **Madeleine Eitner**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruher Institut für Technologie (Germany); **Christelle Kieleck**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-2 • 09:30 AM - 10:00 AM

**Parallel amplification and beam combining for fiber laser power scaling** (*Invited Paper*)

**Author(s):** **Till Walbaum**, **Friedrich Möller**, **Tilman Lühder**, **Maximilian Strecker**, **Marco Plötner**, **Thomas Peschel**, **Thomas Schreiber**, Fraunhofer-Institut für Angewandte Optik und Feinmechanik IOF (Germany)

13201-3 • 10:00 AM - 10:20 AM

**Rugged and compact beam combiner for spectral and coherent beam combining for HEL systems**

**Author(s):** **Thomas Theeg**, **Philipp Gersema**, **Tony Pulzer**, FiberBridge Photonics GmbH (Germany)

Coffee Break • 10:20 AM - 10:50 AM

13201-4 • 10:50 AM - 11:10 AM

**Pulsed erbium:ytterbium-codoped fibre laser for applications under demanding environmental conditions**

Author(s): **Dieter Panitzek**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruhe Institut für Technologie (Germany); **Clément Romano**, **Marc Eichhorn**, **Christelle Kieleck**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-5 • 11:10 AM - 11:30 AM

**High-power ZGP OPO pumped by a Q-switched Tm<sup>3+</sup>:Ho<sup>3+</sup>-codoped fiber laser**

Author(s): **Patrick Forster**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Jan Lautenschläger**, **Dominik Lorenz**, **Julian Schneider**, **Dieter Panitzek**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruhe Institut für Technologie (Germany); **Clément Romano**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruhe Institut für Technologie (Germany); **Christelle Kieleck**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-6 • 11:30 AM - 11:50 AM

**Numerical modelling of far-field intensity patterns in coherent beam combining**

Author(s): **Helena Picmausová**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Jan Farlik**, University of Defence (Czech Republic); **Marc Eichhorn**, Fraunhofer-IOSB (Germany), Karlsruhe Institute of Technology (Germany); **Christelle Kieleck**, Fraunhofer-IOSB (Germany)

13201-7 • 11:50 AM - 12:10 PM

**Cavity free optical parametric oscillator**

Author(s): **Max Widarsson**, Svenska Laserfabriken AB (Sweden); **Patrick Mutter**, Svenska Laserfabriken AB (Sweden), KTH Royal Institute of Technology (Sweden); **Staffan Tjömhammar**, Svenska Laserfabriken AB (Sweden); **Andrius Zukauskas**, Svenska Laserfabriken AB (Sweden), KTH Royal Institute of Technology (Sweden)

**Lunch Break 12:10 PM - 01:30 PM****SESSION 2: ARCHITECTURE AND POWER SCALING I**

16 September 2024 • 01:30 PM - 03:00 PM | Ochl

Session Chair(s): **Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-9 • 01:30 PM - 02:00 PM

**Power scaling limits of thulium and thulium:holmium in the 2 μm spectral region: a comparison** *(Invited Paper)*

Author(s): **Clément Romano**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruhe Institut für Technologie (Germany); **Christelle Kieleck**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-10 • 02:00 PM - 02:20 PM

**High-pulse-energy Tm-doped photonic crystal fiber laser for nonlinear frequency conversion into the mid-IR**

Author(s): **Julian Schneider**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruhe Institut für Technologie (Germany); **Hugo Lassiette**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Institut d'Optique Graduate School (France); **Dominik Lorenz**, **Patrick Forster**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruhe Institut für Technologie (Germany); **Dieter Panitzek**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Jan Lautenschläger**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruhe Institut für Technologie (Germany); **Clément Romano**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruhe Institut für Technologie (Germany); **Christelle Kieleck**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-11 • 02:20 PM - 02:40 PM

**Demonstration of coherent beam combination with a novel control algorithm**

Author(s): **Patrick J. Foley**, Leonardo S.p.A. (United Kingdom), Heriot-Watt Univ. (United Kingdom); **Ian J. Thomson**, Leonardo UK Ltd. (United Kingdom); **M.J. Daniel Esser**, Heriot-Watt Univ. (United Kingdom); **Adam C. Fleming**, Leonardo UK Ltd. (United Kingdom)

13201-12 • 02:40 PM - 03:00 PM

**61 channel high Power Coherent Beam Combination module**

Author(s): **Callum Wreford**, **Paul Graham**, **Natalia Trela-McDonald**, PowerPhotonic Ltd. (United Kingdom)

**Coffee Break 03:00 PM - 03:30 PM**

**SESSION PL: SENSORS + IMAGING PLENARY SESSION**

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium  
15:30 to 15:40 hrs

**Welcome and Introduction****Ric Schleijpen**

TNO Defence, Security and Safety (Netherlands)

**Lorenzo Bruzzone**

Univ. degli Studi di Trento (Italy)

*2024 Symposium Chairs*

13191-500 • 03:40 PM - 04:25 PM

**Tracking Earth's ice from space** (Plenary Presentation)

Author(s): **Andrew Shepherd**, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

**Sensing in the second quantum revolution** (Plenary Presentation)

Author(s): **Francesco Saverio Cataliotti**, LENS - Lab. Europeo di Spettroscopia Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

**Imaging and sensing that delivers operational advantage** (Plenary Presentation)

Author(s): **Jason Field**, Ministry of Defence (United Kingdom)

**Tuesday 17 September 2024****SESSION 3: ARCHITECTURE AND POWER SCALING II**

17 September 2024 • 08:50 AM - 10:00 AM | Ochil

Session Chair(s): **Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-13 • 08:50 AM - 09:20 AM

**Ultra-short-pulse oscillator, pre-amplifier and high-power Ho:YAG slab amplifier** (Invited Paper)

Author(s): **Lucas Groult, Jake Sanwell, Tara van Abeelen, Richard M. Carter, Duncan P. Hand, M.J. Daniel Esser**, Heriot-Watt Univ. (United Kingdom)

13201-14 • 09:20 AM - 09:40 AM

**Rugged and miniaturizable all-fiber system applied to mid-IR generation via ZGP OPO pumping**

Author(s): **Dominik Lorenz**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Dieter Panitzek**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruher Institut für Technologie (Germany); **Clément Romano**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Julian Schneider, Jan Lautenschläger, Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruher Institut für Technologie (Germany); **Christelle Kieleck**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-15 • 09:40 AM - 10:00 AM

**Power scalable Thulium-doped thin-slab laser with freeform micro-optic resonator mirrors**

Author(s): **Jake Sanwell, Lucas Groult, Richard M. Carter**, Heriot-Watt Univ. (United Kingdom); **John R. M. Barr**, Leonardo UK Ltd. (United Kingdom); **M.J. Daniel Esser**, Heriot-Watt Univ. (United Kingdom)

**Coffee Break 10:00 AM - 10:30 AM****SESSION 4: LASER EFFECTS AND SIMULATIONS I**

17 September 2024 • 10:30 AM - 12:40 PM | Ochil

Session Chair(s): **Gareth D. Lewis**, Royal Military Academy (Belgium)

13201-8 • 10:30 AM - 11:00 AM

**Space laser engagement to defeat satellites** (Invited Paper)

Author(s): **Maximilian Taillandier, Clément Chritsomanos**, MBDA France (France); **Charly Regnault, Arnaud Beaumadier, Guillaume Pedroza**, ALPhANOV (France)

13201-16 • 11:00 AM - 11:20 AM

**Decomposition and vulnerability of CFRP under laser impact with powers of up to 120 kW**

Author(s): **Sebastian Schäffer**, Fraunhofer-Institut für Kurzzzeitdynamik, Ernst-Mach-Institut, EMI (Germany); **Johannes Wolfrum**, Bundeswehr (Germany); **Martin Lueck, Jens Osterholz**, Fraunhofer-Institut für Kurzzzeitdynamik, Ernst-Mach-Institut, EMI (Germany)

13201-17 • 11:20 AM - 11:40 AM

**Measuring and modelling laser heating of metals, coatings and other construction materials**

Author(s): **Andreas U. Schiller, Lars Grønmark Holmen**, Norwegian Defence Research Establishment (Norway)

13201-18 • 11:40 AM - 12:00 PM

**Advancing solid-state laser capabilities with a multi-physics modeling approach**

Author(s): **Marius Rupp, Katharina Goth, Dominik Lorenz**, Karlsruher Institut für Technologie (Germany), Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Marc Eichhorn**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany), Karlsruher Institut für Technologie (Germany); **Christelle Kieleck**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-19 • 12:00 PM - 12:20 PM

**simple modelling of high energy lasers effect against small drones**

Author(s): **Alexandre Heuchamps, François Harmel, Marijke Vandewal, Alexandre Papy**, Royal Military Academy (Belgium)

13201-20 • 12:20 PM - 12:40 PM

**Evaluation of directed energy laser weapon impacts on satellites through thermal simulation with MuSES**

Author(s): **Corey D. Packard, Logan Canull, Timofey Golubev, Zachary J. Edel, Eli J. Datema**, ThermoAnalytics, Inc. (United States)

**Lunch/Exhibition Break 12:40 PM - 02:00 PM**

**SESSION 5: LASER EFFECTS AND SIMULATIONS II**

17 September 2024 • 02:00 PM - 03:00 PM | Ochil

Session Chair(s): **Tomas Földes**, Royal Military Academy (Belgium)

13201-21 • 02:00 PM - 02:20 PM

**Assessing laser dazzling effects on UAV cameras and collision avoidance in laboratory and field settings**

Author(s): **Jaan Goyvaerts, Tomas Földes, Alexander Borghgraef, Marijke Vandewal**, Royal Military Academy (Belgium)

13201-22 • 02:20 PM - 02:40 PM

**simulation of the reflection of a high energy laser beam at the sea surface for laser safety assessments**

Author(s): **Frédéric Schwenger**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-25 • 02:40 PM - 03:00 PM

**Non-linear laser dazzling an off-band filtered mid-infrared imager**

Author(s): **Gareth D. Lewis, Marijke Vandewal, Jalna Gnanvi**, Royal Military Academy (Belgium)

**Coffee Break 03:00 PM - 03:30 PM**

**SESSION 6: LASER APPLICATIONS**

17 September 2024 • 03:30 PM - 05:30 PM | Ochil

Session Chair(s): **Clément Romano**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-26 • 03:30 PM - 04:00 PM

**Wavefront sensing for fast moving platforms (Invited Paper)**

Author(s): **Szymon Gladysz, Andreas Zepp**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Emma Branigan, Kevin P. Murphy**, Technological Univ. Dublin (Ireland); **Jürgen Zoz**, MBDA Deutschland GmbH (Germany); **Karin Stein**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13201-27 • 04:00 PM - 04:20 PM

**Considerations on thermal blooming in relation to modern HEL systems**

Author(s): **Ric H. M. A. Schleijnen, Loes C. W. Scheers, Roderik A. Overzier**, TNO (Netherlands)

13201-23 • 04:20 PM - 04:40 PM

**High-energy lasers for C-UAS applications**

Author(s): **Maximilian Taillandier**, MBDA France (France); **Charly Regnault, Arnaud Beaumadier**, ALPhANOV (France); **Alexandre Beigbeder, Guilhem Pasquier**, Ctr. Technique Industriel de la Plasturgie et des Composites (France)

13201-28 • 04:40 PM - 05:00 PM

**The influence of optical turbulence on closed-loop DIRCM identification performance**

*Author(s):* **Safa Oytun Işıklı, Emre Bor, Utku Görkem Yasa, Mehmet Ziya Keskin**, TÜBİTAK BILGEM İLTAREN (Turkey); **Ahmet Başaran**, TÜBİTAK BILGEM İLTAREN Research Institute (Turkey); **Ziya Gürkan Figen**, TÜBİTAK BILGEM İLTAREN (Turkey); **Toygar Akgün**, TOBB ETÜ (Turkey); **Tayfun Aytaç**, TÜBİTAK BILGEM İLTAREN (Turkey); **Berkay Bozok, Mesut Salman, Yelda Atalık**, ASELSAN - REHIS, Inc. (Turkey); **Suleyman Emir Akin**, TOBB ETÜ (Turkey)

13201-29 • 05:00 PM - 05:30 PM

**The HEL as a counterspace capability** *(Invited Paper)*

*Author(s):* **Roderik A. Overzier, Lex M. J. van Eijk, Ric H. M. A. Schleijsen, Alexander C. J. ter Haar, Loes C. W. Scheers, Sven A. Van Binsbergen**, TNO (Netherlands)

## CLOSING ADDRESS

17 September 2024 • 05:30 PM - 05:40 PM | Ochil

# CONFERENCE 13202

## Quantum Technologies for Defence and Security

17 - 19 September 2024 | Kilsyth

**Conference Chair(s):** **Giacomo Sorelli**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Sara Ducci**, Lab. Matériaux et Phénomènes Quantiques (France); **Sylvain Schwartz**, ONERA (France)

**Program Committee:** **Maria I. Amanti**, Univ. Paris Cité (France); **Thierry Debuisschert**, Thales Research & Technology (France); **Massimiliano Dispenza**, Leonardo (Italy); **Angelo Gulinatti**, Politecnico di Milano (Italy); **Benjamin Huard**, Ecole Normale Supérieure de Lyon (France); **Jonathan Leach**, Heriot-Watt Univ. (United Kingdom); **Annick Loiseau**, ONERA-CNRS (France); **Jean-Michel Melkonian**, ONERA (France); **Harold Olivier**, Institut National de Recherche en Informatique et en Automatique (France); **Pietro Paglierani**, STO-CMRE (Italy); **Reinier Tan**, TNO (Netherlands); **Dominik Walter**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Kevin Weatherhill**, Durham Univ. (United Kingdom); **Thomas Wellens**, Fraunhofer-Institut für Angewandte Festkörperphysik IAF (Germany); **Lisa Wömer**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Valery Zwiller**, KTH Royal Institute of Technology (Sweden)

### Monday 16 September 2024

#### SESSION PL: SENSORS + IMAGING PLENARY SESSION

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium

15:30 to 15:40 hrs

##### Welcome and Introduction

##### Ric Schleijsen

TNO Defence, Security and Safety (Netherlands)

##### Lorenzo Bruzzone

Univ. degli Studi di Trento (Italy)

##### 2024 Symposium Chairs

13191-500 • 03:40 PM - 04:25 PM

##### Tracking Earth's ice from space (Plenary Presentation)

Author(s): **Andrew Shepherd**, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

##### Sensing in the second quantum revolution (Plenary Presentation)

Author(s): **Francesco Saverio Cataliotti**, LENS - Lab. Europeo di Spettroscopia Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

##### Imaging and sensing that delivers operational advantage (Plenary Presentation)

Author(s): **Jason Field**, Ministry of Defence (United Kingdom)

### Tuesday 17 September 2024

#### SESSION 1: ATOM-BASED QUANTUM SENSING FOR NAVIGATION

17 September 2024 • 01:10 PM - 03:20 PM | Kilsyth

Session Chair(s): **Lucy Downes**, Durham Univ. (United Kingdom)

13202-1 • 01:10 PM - 01:40 PM

##### Progress towards the development of a cold atom inertial measurement unit (Invited Paper)

Author(s): **Malo Cadoret**, Conservatoire National des Arts et Métiers (France)



13202-2 • 01:40 PM - 02:10 PM

**Quantum sensing for navigation** (*Invited Paper*)

Author(s): **Lisa Woerner**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13202-3 • 02:10 PM - 02:40 PM

**Interferometry with Bose-Einstein condensates for inertial sensing** (*Invited Paper*)

Author(s): **Sven Abend**, Leibniz Univ. Hannover (Germany)

13202-4 • 02:40 PM - 03:00 PM

**Sensitive and accurate quantum magnetometry for GNSS-denied positioning, critical national infrastructure and magnetic anomaly detection**

Author(s): **Stuart Ingleby**, Univ. of Strathclyde (United Kingdom)

13202-5 • 03:00 PM - 03:20 PM

**Quantum sensing for magnetic-aided navigation in GPS-denied environments**

Author(s): **Mia Jukic**, TNO (Netherlands); **Joao Alves**, STO-CMRE (Italy); **Andrea Munafo**, Univ. di Pisa (Italy); **Pietro Paglierani**, STO-CMRE (Italy); **Olga Sambataro**, Univ. di Pisa (Italy); **Marin Stipanov**, STO-CMRE (Italy); **Reinier Tan**, **Aad Vijn**, TNO (Netherlands); **Giovanni Zappa**, STO-CMRE (Italy)

**Coffee Break 03:20 PM - 03:50 PM**

## SESSION 2: QUANTUM OPTRONICS I

17 September 2024 • 03:50 PM - 05:30 PM | Kilsyth

Session Chair(s): **Jean-Michel Melkonian**, ONERA (France)

13202-6 • 03:50 PM - 04:20 PM

**Quantum remote sensing** (*Invited Paper*)

Author(s): **Dominik Walter**, **Carsten Pitsch**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13202-7 • 04:20 PM - 04:50 PM

**Easing the experimental requirements of quantum illumination** (*Invited Paper*)

Author(s): **Roberto Di Candia**, Aalto University (Finland)

13202-8 • 04:50 PM - 05:10 PM

**Quantum enhanced radar for short range applications**

Author(s): **Ugo Zanforlin**, Leonardo S.p.A. (Italy); **Alberto Lupidi**, **Fabrizio Cuccoli**, **Marco Passafiume**, CNIT - Lab. Nazionale di Radar e Sistemi di Sorveglianza (Italy); **Emanuele Costa**, **Massimiliano Dispenza**, Leonardo S.p.A. (Italy)

13202-9 • 05:10 PM - 05:30 PM

**Towards a reflective-based imaging device with undetected photons**

Author(s): **Chiara Michelini**, Univ. degli Studi di Trento (Italy); **Ugo Zanforlin**, **Massimiliano Proietti**, Leonardo Labs. (Italy); **Lorenzo Pavesi**, Univ. degli Studi di Trento (Italy); **Massimiliano Dispenza**, Leonardo Labs. (Italy)

## Wednesday 18 September 2024

### SESSION 3: QUANTUM OPTRONICS II

18 September 2024 • 09:10 AM - 10:30 AM | Kilsyth

Session Chair(s): **Giacomo Sorelli**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13202-11 • 09:10 AM - 09:40 AM

**Underwater single-photon depth imaging** (*Invited Paper*)

Author(s): **Aurora Maccarone**, **Rui Zhang**, **Aongus McCarthy**, **Albert de Dios Carbajal**, Heriot-Watt University (United Kingdom); **Giulia Acconcia**, Politecnico di Milano (Italy); **Yoann Altmann**, Heriot-Watt University (United Kingdom); **Ivan Rech**, Politecnico di Milano (Italy); **Istvan Gyongy**, **Robert K. Henderson**, University of Edinburgh (United Kingdom); **Gerald S. Buller**, Heriot-Watt University (United Kingdom)

13202-12 • 09:40 AM - 10:10 AM

**parameter estimation approach to super resolution** (*Invited Paper*)

Author(s): **Alexander Boeschoten**, **Antonin Grateau**, **Clémentine Rouvière**, **Ilya Karuseichyk**, **David Barral**, Lab. Kastler Brossel (France); **Giacomo Sorelli**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Mattia Walschaers**, Lab. Kastler Brossel (France); **Manuel Gessner**, Univ. de València (Spain); **Claude Fabre**, **Nicolas Treps**, Lab. Kastler Brossel (France)

13202-13 • 10:10 AM - 10:30 AM

**Exploiting separation-dependent coherence to boost optical resolution**

Author(s): **Ilya Karuseichyk**, Lab. Kastler Brossel (France); **Giacomo Sorelli**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Vyacheslav N. Shatokhin**, Univ. of Freiburg (Germany); **Mattia Walschaers, Nicolas Treps**, Lab. Kastler Brossel (France)

**Coffee Break 10:30 AM - 11:00 AM**

**SESSION 4: RF SENSING WITH RYDBERG ATOMS**

18 September 2024 • 11:00 AM - 12:40 PM | Kilsyth

Session Chair(s): **Sven Abend**, Leibniz Univ. Hannover (Germany)

13202-14 • 11:00 AM - 11:30 AM

**High-speed atom-based THz imaging for materials analysis and non-destructive testing** (Invited Paper)

Author(s): **Lucy A. Downes**, Durham Univ. (United Kingdom)

13202-15 • 11:30 AM - 12:00 PM

**Rydberg-atom transducer for sensitive detection of microwaves and mm-waves** (Invited Paper)

Author(s): **Michal P. Parniak**, Univ. of Warsaw (Poland)

13202-16 • 12:00 PM - 12:20 PM

**All-optical phase-referenced microwave sensing in Rydberg alkali vapors**

Author(s): **Sebastian Borówka, Mateusz Mazelanik, Wojciech Wasilewski, Michal P. Parniak**, Univ. of Warsaw (Poland)

13202-17 • 12:20 PM - 12:40 PM

**Metrology of RF electromagnetic fields using trap loss spectroscopy in cold Rydberg atoms.**

Author(s): **Romain Duverger, Sylvain Schwartz**, ONERA (France)

**Lunch/Exhibition Break 12:40 PM - 02:20 PM**

**SESSION 5: QUANTUM COMPUTING AND SIMULATION I**

18 September 2024 • 02:20 PM - 03:10 PM | Kilsyth

Session Chair(s): **Frederic Barbaresco**, Thales LAS France SAS (France)

13202-18 • 02:20 PM - 02:50 PM

**Quantum certified encryption via optical quantum computers** (Invited Paper)

Author(s): **Niccolo Somaschi, Shane Mansfield**, Quandela, SAS (France)

13202-20 • 02:50 PM - 03:10 PM

**Photonic quantum computing, hybrid methods for sensor data**

Author(s): **Massimiliano Proietti, Carlo Liorni, Filippo Cerocchi, Massimiliano Dispenza**, Leonardo S.p.A. (Italy)

**Coffee Break 03:10 PM - 03:50 PM**

**SESSION 6: QUANTUM COMPUTING AND SIMULATION II**

18 September 2024 • 03:50 PM - 05:20 PM | Kilsyth

Session Chair(s): **Shane Mansfield**, Quandela, SAS (France)

13202-21 • 03:50 PM - 04:20 PM

**Quantum algorithms benchmarks applied for military sensors engineering, processing and resources allocations** (Invited Paper)

Author(s): **Frederic Barbaresco**, Thales LAS France SAS (France)

13202-22 • 04:20 PM - 04:40 PM

**Quantum computing for partial differential equations in practice**

Author(s): **Niels Neumann, Jasper Verbree, Carmen Hoek**, TNO (Netherlands)

13202-23 • 04:40 PM - 05:00 PM

**Quantum Algorithms for Drone Mission Planning**

Author(s): **Ethan G. Davies, Pranav V. Kalidindi**, Thales UK Ltd. (United Kingdom)

13202-24 • 05:00 PM - 05:20 PM

**Quantum-inspired annealing for optimisation of swarming behaviours**

Author(s): **Richard Claridge, Paul Martin, Rowan Curtis, Rowan Sugden, Ben McMurtry**, PA Consulting Group (United Kingdom); **Samuel Bennett, Robert Lamb**, Leonardo MW Ltd. (United Kingdom)

**Thursday 19 September 2024**

**SESSION 7: NV CENTERS**

19 September 2024 • 08:30 AM - 10:20 AM | Kilsyth

Session Chair(s): **Joe C. Campbell**, Univ. of Virginia (United States)

13202-25 • 08:30 AM - 09:00 AM

**The NV center in diamond: a versatile and practical sensor for defense applications** *(Invited Paper)*

Author(s): **Jean-Francois Roch**, Lab. de Photonique Quantique et Moléculaire (France)

13202-26 • 09:00 AM - 09:30 AM

**Diamond-based quantum sensors in defence and security applications** *(Invited Paper)*

Author(s): **Peter Knittel, Paul Haas, Nicola Lang, Niklas Mathes, Volker Cimalla, Michael Kunzer**, Fraunhofer-Institut für Angewandte Festkörperphysik IAF (Germany)

13202-27 • 09:30 AM - 10:00 AM

**Low-noise microwave measurements at room temperature using diamond NV ensembles** *(Invited Paper)*

Author(s): **Jarryd Pla**, The Univ. of New South Wales (Australia)

13202-39 • 10:00 AM - 10:20 AM

**Applications of quantum sensing to aerial magnetic navigation**

Author(s): **Mia Jukic, Aad Vijn, Reinier Tan**, TNO (Netherlands); **Lisanne Visseren**, TNO (Netherlands Organisation for Applied Scientific Research)) (Netherlands)

**Coffee Break 10:20 AM - 10:50 AM**

**SESSION 8: DETECTORS AND SOURCES**

19 September 2024 • 10:50 AM - 12:10 PM | Kilsyth

Session Chair(s): **Jean-Francois Roch**, Lab. de Photonique Quantique et Moléculaire (France)

13202-28 • 10:50 AM - 11:20 AM

**AllnAsSb avalanche photodiodes: linear mode and Geiger-mode** *(Invited Paper)*

Author(s): **Joe C. Campbell, Daniel Herrera**, Univ. of Virginia (United States); **Seth R. Bank**, University of Texas (United States)

13202-29 • 11:20 AM - 11:40 AM

**Spatial and spectral peculiarities of Spontaneous Parametric Down-conversion for classical and quantum spectroscopy**

Author(s): **Jean-Michel Melkonian, Julien Le Goüet, Enguerran Belles, Myriam Raybaut, Jean-Baptiste Dherbecourt**, ONERA (France), Univ. Paris-Saclay (France)

13202-30 • 11:40 AM - 12:10 PM

**Generation of spatially entangled states of light in nonlinear waveguide arrays** *(Invited Paper)*

Author(s): **Florent Baboux**, Lab. Matériaux et Phénomènes Quantiques (France)

**Lunch Break 12:10 PM - 01:20 PM**

**SESSION 9: QUANTUM COMMUNICATION**

19 September 2024 • 01:20 PM - 03:30 PM | Kilsyth

Session Chair(s): **Florent Baboux**, Lab. Matériaux et Phénomènes Quantiques (France)

13202-31 • 01:20 PM - 01:50 PM

**Status update on quantum communication whiting the ongoing euro QCI program** *(Invited Paper)*

Author(s): **Simone Capeleto**, ThinkQuantum S.r.l. (Italy)

13202-32 • 01:50 PM - 02:20 PM

**QKD via large metro networks and satellite links** *(Invited Paper)*

Author(s): **Siddharth Koduru Joshi**, Univ. of Bristol (United Kingdom)

13202-33 • 02:20 PM - 02:40 PM

**Reducing the hardware requirements while mitigating side-channels in polarisation-based decoy-state BB84 quantum key distribution**

*Author(s):* **Ross J. Donaldson, Cameron Simmons, Alfonso Tello Castillo**, Heriot-Watt Univ. (United Kingdom)

13202-34 • 02:40 PM - 03:10 PM

**Secure quantum communications in femtosecond-laser-written integrated photonic devices** (*Invited Paper*)

*Author(s):* **Roberto Osellame**, CNR-Istituto di Fotonica e Nanotecnologie (Italy)

13202-35 • 03:10 PM - 03:30 PM

**Continuous-variable quantum passive optical network for multi-user quantum key distribution**

*Author(s):* **Adnan A. E. Hajomer**, Technical Univ. of Denmark (Denmark); **Ivan D. Derkach**, Palacký Univ. Olomouc (Czech Republic), Technical Univ. of Denmark (Denmark); **Radim Filip**, Palacký Univ. Olomouc (Czech Republic); **Ulrik L. Andersen**, Technical Univ. of Denmark (Denmark); **Vladyslav C. Usenko**, Palacký Univ. Olomouc (Czech Republic); **Tobias Gehring**, Technical Univ. of Denmark (Denmark)

# CONFERENCE 13203

## Sensors and Communication Technologies in the 1 GHz to 10 THz Band

18 - 19 September 2024 | Harris

**Conference Chair(s):** **Neil A. Salmon**, MMW Sensors Ltd. (United Kingdom); **Wladislaw Michailow**, Univ. of Cambridge (United Kingdom)

**Program Committee:** **Amir Abramovich**, Ariel Univ. (Israel); **Maria Alonso-delPino**, Jet Propulsion Lab. (United States); **Hakan Altan**, Middle East Technical Univ. (Turkey); **Darren Coe**, QinetiQ Ltd. (United Kingdom); **Stephan Dill**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Charmaine Cisneros Franck**, NASA Langley Research Ctr. (United States); **Marina Gashinova**, Univ. of Birmingham (United Kingdom); **Frank Gumbmann**, Rohde & Schwarz GmbH & Co. KG (Germany); **Stuart W. Harmer**, Univ. of Suffolk (United Kingdom); **Vishal S. Jagtap**, Tyndall National Institute (Ireland); **Marcin Kowalski**, Wojskowa Akademia Techniczna im. Jaroslawa Dabrowskiego (Poland); **Chong Li**, Univ. of Glasgow (United Kingdom); **Fatemeh Norouziyan**, Univ. of Birmingham (United Kingdom); **Markus Peichl**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany); **Ozgur Ozdemir**, Istanbul Technical Univ. (Turkey); **Douglas T. Petkie**, Worcester Polytechnic Institute (United States); **Vyacheslav A. Trofimov**, South China Univ. of Technology (China)

### Tuesday 17 September 2024

#### POSTERS-TUESDAY

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 16:00 hrs, Lennox Suite  
View poster presentation guidelines and set-up instructions at  
<https://spie.org/ESI/poster-presentation-guidelines>

13203-23 • 05:30 PM - 07:00 PM

**A proposal for estimating a faster moving target with high resolution and accuracy by cooperative sensing system of MIMO radar modules with a commercial millimeter radar IC**

*Author(s):* **Hiroki Mori**, Toshiba Corp. (Japan)

13203-24 • 05:30 PM - 07:00 PM

**Multistatic 3-D microwave imaging with dynamic metasurface antennas: a Fourier-based approach**

*Author(s):* **Amir Masoud Molaei**, Queen's Univ. Belfast (United Kingdom); **Thomas Fromenteze**, Univ. de Limoges (France); **Vasiliki Skouroliakou**, **Shaoqing Hu**, **Vincent Fusco**, **Okan Yurduseven**, Queen's Univ. Belfast (United Kingdom)

13203-25 • 05:30 PM - 07:00 PM

**Three-dimensional near-field microwave imaging with multiple-input multiple-output coded generalized reduced dimension Fourier algorithm**

*Author(s):* **Amir Masoud Molaei**, Queen's Univ. Belfast (United Kingdom); **Shaoqing Hu**, Brunel Univ. London (United Kingdom); **Rupesh Kumar**, SRM Univ., AP - Amaravati (India); **Okan Yurduseven**, Queen's Univ. Belfast (United Kingdom)

### Wednesday 18 September 2024

#### WELCOME AND INTRODUCTION

18 September 2024 • 09:15 AM - 09:20 AM | Harris

**Neil A. Salmon**, MMW Sensors Ltd. (United Kingdom)  
**Wladislaw Michailow**, Univ. of Cambridge (United Kingdom)

**SESSION 1: MICROWAVE AND TERAHERTZ SENSORS AND APPLICATIONS**

18 September 2024 • 09:20 AM - 12:00 PM | Harris

*Session Chair(s):* **Wladislaw Michailow**, Univ. of Cambridge (United Kingdom); **Neil A. Salmon**, MMW Sensors Ltd. (United Kingdom)

13203-1 • 09:20 AM - 09:50 AM

**Terahertz sensing and communication systems based on plasmonic optoelectronics** (*Invited Paper*)*Author(s):* **Mona Jarrahi**, UCLA Samueli School of Engineering (United States)

13203-2 • 09:50 AM - 10:10 AM

**Polarimetric 3D SAR imaging and analysis of polarization signatures for enhanced subsurface detection***Author(s):* **Samuel Forster, Anthony J. Peyton, Frank J. W. Podd**, The Univ. of Manchester (United Kingdom)

13203-3 • 10:10 AM - 10:30 AM

**Development of a low-cost volumetric moisture content sensor at 76 GHz for industrial drying applications using effective medium modeling***Author(s):* **Jacob N. Bouchard, Douglas T. Petkie**, Worcester Polytechnic Institute (United States)

Coffee Break • 10:30 AM - 11:00 AM

13203-4 • 11:00 AM - 11:20 AM

**Generative model-based image reconstruction from back-scattered data in computational microwave imaging***Author(s):* **Jiaming Zhang**, Queen's Univ. Belfast (United Kingdom); **Cien Zhang**, Univ. of Pennsylvania (United States); **Rahul Sharma**, Queen's Univ. Belfast (United Kingdom); **Peiao Li, Jie Zhang**, Queen's University Belfast (United Kingdom); **Okan Yurduseven**, Queen's Univ. Belfast (United Kingdom)

13203-5 • 11:20 AM - 11:40 AM

**Fully integrated on-chip rectennas for K-band applications using a novel tunnelling diode***Author(s):* **Christopher Walsh**, The Univ. of Manchester (United Kingdom); **Mohammadreza Sadeghi**, Advanced Hall Sensors Ltd. (United Kingdom); **Mohamed Missous**, The Univ. of Manchester (United Kingdom)

13203-6 • 11:40 AM - 12:00 PM

**Sensing Matrix Prediction from Aperture Distribution Fields in Computational Microwave Imaging with Coded-Apertures***Author(s):* **Jiaming Zhang**, Queen's Univ. Belfast (United Kingdom); **Cien Zhang**, Univ. of Pennsylvania (United States); **Rahul Sharma**, Queen's Univ. Belfast (United Kingdom); **Peiao Li**, Queen's University Belfast (United Kingdom); **Jie Zhang, Okan Yurduseven**, Queen's Univ. Belfast (United Kingdom)**Lunch/Exhibition Break 12:00 PM - 01:30 PM****SESSION 2: THZ DETECTORS, FOCAL PLANE ARRAYS AND COMMUNICATION TECHNOLOGIES**

18 September 2024 • 01:30 PM - 03:00 PM | Harris

*Session Chair(s):* **Douglas T. Petkie**, Worcester Polytechnic Institute (United States); **Vishal S. Jagtap**, Tyndall National Institute (Ireland)

13203-7 • 01:30 PM - 02:00 PM

**Exploiting quantum phenomena for sensitive photonic terahertz detection** (*Invited Paper*)*Author(s):* **Wladislaw Michailow**, Univ. of Cambridge (United Kingdom)

13203-8 • 02:00 PM - 02:20 PM

**Study of the optimal photoresponse, speed, and temperature performance of terahertz photoelectric tunable-step detectors***Author(s):* **Ran Chen, Ruqiao Xia, Jonathan P. Griffiths, Harvey E. Beere, David A. Ritchie, Wladislaw Michailow**, Univ. of Cambridge (United Kingdom)

13203-10 • 02:20 PM - 02:40 PM

**AI-Assisted Ultrafast and Efficient Terahertz Spectrometer Using Frequency Selective Surfaces***Author(s):* **Rejeena R. Sebastian, Redwan Ahmad, Jonathan Lafrenière-Greig**, Ecole de Technologie Supérieure (Canada); **Xavier Ropagnol**, Ecole de Technologie Supérieure (Canada), Institut National de la Recherche Scientifique (Canada); **François Blanchard**, Ecole de Technologie Supérieure (Canada)

13203-11 • 02:40 PM - 03:00 PM

**Secured spectral bands for wireless communication characterized under realistic conditions with a nonlinear optical receiver.***Author(s):* **Eeswar K. Yalavarthi, Aswin V. Vishnuradhan, Wei Cui, Angela Gamouras, Jean-Michel Ménard**, Univ. of Ottawa (Canada)**Coffee Break 03:00 PM - 03:30 PM**



**SESSION 3: METASURFACES, IMAGING AND COMMUNICATION TECHNOLOGIES**

18 September 2024 • 03:30 PM - 05:00 PM | Harris

*Session Chair(s):* **Douglas T. Petkie**, Worcester Polytechnic Institute (United States); **Vishal S. Jagtap**, Tyndall National Institute (Ireland)

13203-12 • 03:30 PM - 04:00 PM

**Silicon-based diffractive optics for structured light in nonparaxial terahertz imaging systems** (*Invited Paper*)*Author(s):* **Gintaras Valušis, Sergey Orlov, Rusnė Ivaškevičute-Povilauskiene, Karolis Mundrys, Paulius Kizevicius, Ernestas Nacius, Domas Jokubauskis, Kestutis Ikamas, Alvydas Lisauskas, Linas Minkevicius**, Ctr. for Physical Sciences and Technology (Lithuania)

13203-14 • 04:00 PM - 04:20 PM

**A graphene-metal metasurface for terahertz modulation with a depth of several orders of magnitude***Author(s):* **Ruqiao Xia, Nikita W. Almond, Wadood Tadbier, Harvey E Beere, Stephan Hofmann, David A Ritchie, Wladislaw Michailow**, Univ. of Cambridge (United Kingdom)

13203-15 • 04:20 PM - 04:40 PM

**Telemetric position sensing using resonant frequency parameterization of a millimeter-wave metamaterial***Author(s):* **Michael Töffel, Alexander Schossmann, Christoph Schmidt**, Technische Univ. Graz (Austria); **Peter Banzer**, Karl-Franzens-Univ. Graz (Austria); **Alexander Bergmann**, Technische Univ. Graz (Austria)

13203-16 • 04:40 PM - 05:00 PM

**Metamaterial-based photoelectric tunable-step THz detectors using the in-plane photoelectric effect***Author(s):* **Ruqiao Xia, Harvey E. Beere, David A. Ritchie, Wladislaw Michailow**, Univ. of Cambridge (United Kingdom)**Thursday 19 September 2024****SESSION 4: THZ DETECTORS, MICROWAVE RADAR SYSTEMS, AND NDT SYSTEMS**

19 September 2024 • 09:10 AM - 11:20 AM | Harris

*Session Chair(s):* **Wladislaw Michailow**, Univ. of Cambridge (United Kingdom); **Neil A. Salmon**, MMW Sensors Ltd. (United Kingdom)

13203-17 • 09:10 AM - 09:40 AM

**Fast and broadband THz detector working at room temperature based on micro-structured material** (*Invited Paper*)*Author(s):* **Weiwei Liu**, Nankai Univ. (China)

13203-18 • 09:40 AM - 10:00 AM

**Recent developments in the industrial application of microwave NDT***Author(s):* **Robin Sloan**, Microwave Inspection Technologies Ltd. (United Kingdom); **Robert Stakenborghs**, Advanced Microwave Imaging (United States)

Coffee Break • 10:00 AM - 10:30 AM

13203-20 • 10:30 AM - 10:50 AM

**Antipodal Vivaldi antenna with frequency selective surface for ultra-wideband radar systems***Author(s):* **Ercan Köseni**, Istanbul Technical Univ. (Turkey); **Hakan Altan**, Middle East Technical Univ. (Turkey); **Özgür Özdemir**, Istanbul Technical Univ. (Turkey)

13203-21 • 10:50 AM - 11:20 AM

**THz to IR converter for incoherent detection of radiation** (*Invited Paper*)*Author(s):* **Berat Aytac**, Roketsan Missiles Inc. (Turkey); **Asaf Behzat Sahin**, Ankara Yildirim Beyazit Univ. (Turkey); **Hakan Altan**, Middle East Technical Univ. (Turkey)

# CONFERENCE 13204

## Emerging Imaging and Sensing Technologies for Security and Defence IX

17 September 2024 | Harris

**Conference Chair(s):** **Gerald S. Buller**, Heriot-Watt Univ. (United Kingdom); **Robert A. Lamb**, Leonardo MW Ltd. (United Kingdom); **Martin Laurenzis**, Institut Franco-Allemand de Recherches de Saint-Louis (France)

**Program Committee:** **Giulia Acconcia**, Politecnico di Milano (Italy); **Gareth Brown**, Defence Science and Technology Lab. (United Kingdom); **Markus Henriksson**, FOI-Swedish Defence Research Agency (Sweden); **Richard C. Hollins**, Defence Science and Technology Lab. (United Kingdom); **Keith L. Lewis**, Sciovis Ltd. (United Kingdom); **Heli Lukner**, Univ. of Tartu (Estonia); **Jonathan C. Matthews**, Univ. of Bristol (United Kingdom); **Robert P. J. Nieuwenhuizen**, TNO (Netherlands)

### Monday 16 September 2024

#### SESSION PL: SENSORS + IMAGING PLENARY SESSION

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium

15:30 to 15:40 hrs

#### Welcome and Introduction

##### Ric Schleijpen

TNO Defence, Security and Safety (Netherlands)

##### Lorenzo Bruzzone

Univ. degli Studi di Trento (Italy)

#### 2024 Symposium Chairs

13191-500 • 03:40 PM - 04:25 PM

#### Tracking Earth's ice from space (Plenary Presentation)

Author(s): **Andrew Shepherd**, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

#### Sensing in the second quantum revolution (Plenary Presentation)

Author(s): **Francesco Saverio Cataliotti**, LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

#### Imaging and sensing that delivers operational advantage (Plenary Presentation)

Author(s): **Jason Field**, Ministry of Defence (United Kingdom)

### Tuesday 17 September 2024

#### SESSION 1: ADVANCED IMAGING

17 September 2024 • 08:30 AM - 10:20 AM | Harris

Session Chair(s): **Martin Laurenzis**, Institut Franco-Allemand de Recherches de Saint-Louis (France)

13204-1 • 08:30 AM - 09:00 AM

#### Optimal use of data for PTC characterization of photon counting capable sensors (Invited Paper)

Author(s): **David P. Haefner**, DEVCOM C5ISR (United States); **Aaron J. Hendrickson**, Naval Air Warfare Ctr. Aircraft Div. (United States)

13204-2 • 09:00 AM - 09:20 AM

#### Non-binary kHz single-pixel imaging with a photonic chip

Author(s): **Tom Watson**, **Ernes Tonellini**, **James Burch**, Cambridge Consultants Ltd. (United Kingdom)

13204-3 • 09:20 AM - 09:40 AM

**Bimodal vision system combining standard camera and event-based sensors for detecting and tracking fast UAVs**

Author(s): **Antoine Zundel**, Institut Franco-Allemand de Recherches de Saint-Louis (France); **Cédric Demonceaux**, Univ. Bourgogne Franche-Comté (France); **Nicolas Hueber, Sébastien Changey, Guillaume Strub**, Institut Franco-Allemand de Recherches de Saint-Louis (France)

13204-4 • 09:40 AM - 10:00 AM

**VIS-NIR multispectral for camouflage detection campaign analysis**

Author(s): **Eloi Foucher, Léopold Brouant, Aubry Picard**, Safran Electronics & Defense (France)

13204-5 • 10:00 AM - 10:20 AM

**Event-based real-time detection and tracking of UAVs**

Author(s): **Rikard Fridsén Skogsberg, Jens Grundmark, Matts Björck**, FOI-Swedish Defence Research Agency (Sweden)

**Coffee Break 10:20 AM - 10:40 AM**

**SESSION 2: SINGLE-PHOTON LIDAR**

17 September 2024 • 10:40 AM - 12:30 PM | Harris

Session Chair(s): **Gerald S. Buller**, Heriot-Watt Univ. (United Kingdom)

13204-6 • 10:40 AM - 11:10 AM

**Advanced perception using single photon imaging** (*Invited Paper*)

Author(s): **Martin Laurenzis, Emmanuel Bacher, Stéphane Schertzer, Jean-Michel Poyet, Alexis Matwyschuk, Yves Lutz, Frank Christnacher**, Institut Franco-Allemand de Recherches de Saint-Louis (France)

13204-7 • 11:10 AM - 11:30 AM

**Rapid single photon 3D imaging in highly scattering underwater environments**

Author(s): **Rui Zhang**, Heriot-Watt Univ. (United Kingdom); **Gemán Mora Martin, Robert K. Henderson, Istvan Gyongy**, The Univ. of Edinburgh (United Kingdom); **Gerald S. Buller, Aurora Maccarone**, Heriot-Watt Univ. (United Kingdom)

13204-8 • 11:30 AM - 11:50 AM

**Ranging performance of a SWIR laser rangefinder using a free-running InGaAs/InP single-photon avalanche diode detector**

Author(s): **Jorge Garcia-Armenta, Aongus McCarthy**, Heriot-Watt Univ. (United Kingdom); **Andrew Farrell, Mark Silver**, Thales UK Ltd. (United Kingdom); **Gerald S. Buller**, Heriot-Watt Univ. (United Kingdom)

13204-9 • 11:50 AM - 12:10 PM

**Guided super-resolution of single-photon 3D LiDAR data: application to micro-scanning and 3D video upsampling**

Author(s): **Abderrahim Halimi, Ewan Wade, Alice Ruget, Rachael Tobin, Aongus McCarthy**, Heriot-Watt Univ. (United Kingdom); **Philip J. Soan**, Defence Science and Technology Lab. (United Kingdom); **Gerald S. Buller**, Heriot-Watt Univ. (United Kingdom)

13204-10 • 12:10 PM - 12:30 PM

**Real-time underwater target detection and 3D video reconstruction for single-photon LiDAR imaging.**

Author(s): **Sandor Plosz, Aurora Maccarone, Steve McLaughlin, Gerald S. Buller, Abderrahim Halimi**, Heriot-Watt Univ. (United Kingdom)

**Lunch/Exhibition Break 12:30 PM - 01:40 PM**

**SESSION 3: MMWAVE SENSING**

17 September 2024 • 01:40 PM - 03:30 PM | Harris

Session Chair(s): **Robert A. Lamb**, Leonardo UK Ltd. (United Kingdom)

13204-11 • 01:40 PM - 02:10 PM

**Fast readout of innovative glow discharge detector focal plane arrays for affordable millimeter wave imaging: design, implementation, and advancements** (*Invited Paper*)

Author(s): **Arun Ramachandra Kurup, Daniel Rozban, Yehuda Azulay**, Ariel Univ. (Israel); **Natan S. Kopeika, Yitzhak Yitzhaky**, Ben-Gurion Univ. of the Negev (Israel); **Amir Abramovich**, Ariel Univ. (Israel)

13204-14 • 02:10 PM - 02:30 PM

**Optimized Reconfigurable Ultra-Compact Mode Converter Device Utilizing Sb<sub>2</sub>Se<sub>3</sub> for TE<sub>0</sub> and TE<sub>1</sub> Mode Conversion**

Author(s): **Manal Shlebik, Mustafa Aziz, C. David Wright**, Univ. of Exeter (United Kingdom)

13204-21 • 02:30 PM - 02:50 PM

**Optimized dynamic control of photonic power dividers using crystallization-based Sb<sub>2</sub>S<sub>3</sub> phase-change materials**

Author(s): **Manal Shlebik, Mustafa Aziz, C. David Wright**, Univ. of Exeter (United Kingdom)

13204-12 • 02:50 PM - 03:10 PM

**Human pose inference using mmWave radar**

*Author(s):* **Stirling Scholes, Alice Ruget, Jonathan Leach**, Heriot-Watt Univ. (United Kingdom)

13204-13 • 03:10 PM - 03:30 PM

**Multitarget detection and tracking with continuous capture microwave imaging**

*Author(s):* **Nisar R. Ahmed**, Univ. of Colorado Boulder (United States); **Fabio da Silva**, Wavsens LLC (United States)

**Coffee Break 03:30 PM - 04:00 PM**

**SESSION 4: ADVANCED DETECTORS AND PROCESSING**

17 September 2024 • 04:00 PM - 05:50 PM | Harris

*Session Chair(s):* **Robert A. Lamb**, Leonardo UK Ltd. (United Kingdom)

13204-15 • 04:00 PM - 04:30 PM

**Modelling impact of trade-off between afterpulsing and hold-off time on time-correlated single-photon lidar** (*Invited Paper*)

*Author(s):* **Markus Henriksson, Stephen Macken, Per Jonsson**, FOI-Swedish Defence Research Agency (Sweden)

13204-17 • 04:30 PM - 04:50 PM

**Ge-on-Si avalanche photodiodes and single-photon avalanche diode detectors for low-level light detection in the short-wave infrared wavelength region**

*Author(s):* **Mrudul Modak, Xin Yi, Lisa Saalbach, Fiona Fleming, David A.S. Muir**, Heriot-Watt Univ. (United Kingdom); **Muhammad M. A. Mirza, Jarosław Kirdoda, Derek C.S. Dumas, Charlie Smith, Charlie McCarthy, Hannah Mowbray**, Univ. of Glasgow (United Kingdom); **Xiao Jin, John P.R. David**, The Univ. of Sheffield (United Kingdom); **Ross W. Millar, Douglas J. Paul**, Univ. of Glasgow (United Kingdom); **Gerald S. Buller**, Heriot-Watt Univ. (United Kingdom)

13204-18 • 04:50 PM - 05:10 PM

**Next generation quantum dot SWIR sensors**

*Author(s):* **Artem Shulga, Natasha Sukharevska**, QDI Systems B.V. (Netherlands)

13204-19 • 05:10 PM - 05:30 PM

**Bandgap tuning of InSb/InAsSb type II superlattices for multispectral sensing**

*Author(s):* **Saraswati Behera, Maira Elksne, David R. S. Cumming, Vincenzo Pusino**, Univ. of Glasgow (United Kingdom)

13204-20 • 05:30 PM - 05:50 PM

**Broadband MWIR Meta-absorbers using hybridized ENZ-plasmonic modes**

*Author(s):* **Jinal Tapar**, Univ. of Glasgow (United Kingdom); **Nicholas Wood**, Thales UK Ltd. (United Kingdom), Univ. of Glasgow (United Kingdom); **David R. S. Cumming, Vincenzo Pusino**, Univ. of Glasgow (United Kingdom)

# CONFERENCE 13205

## Advanced Materials, Biomaterials, and Manufacturing Technologies for Security and Defence II

18 - 19 September 2024 | Ochil

**Conference Chair(s):** **Chantal Andraud**, Ecole Normale Supérieure de Lyon (France); **Roberto Zamboni**, Istituto per la Sintesi Organica e la Fotoreattività (Italy); **Andrea Camposeo**, **Luana Persano**, Istituto Nanoscienze (Italy)

**Program Committee:** **Carrie M. Bartsch**, Air Force Research Lab. (United States); **Valentina Benfenati**, Istituto per la Sintesi Organica e la Fotoreattività (Italy); **Lynda E. Busse**, U.S. Naval Research Lab. (United States); **Fabrice Charra**, Commissariat à l'Énergie Atomique (France); **Przemyslaw Data**, Durham Univ. (Poland); **Beata J. Derkowska**, Torun Univ. (Poland); **Maria Farsari**, Foundation for Research and Technology-Hellas (Greece); **James G. Grote**, **Emily M. Heckman**, Air Force Research Lab. (United States); **Andreas Heinrich**, Hochschule Aalen - Technik und Wirtschaft (Germany); **François Kajzar**, Univ. Politehnica of Bucharest (Romania); **Loïc Mager**, Institut de physique et chimie des matériaux de Strasbourg (France); **Jaroslav Mysliwiec**, Wroclaw Univ. of Technology (Poland); **Yoshiko Okada-Shudo**, The Univ. of Electro-Communications (Japan); **Dario Pisignano**, Istituto Nanoscienze (Italy); **Bastian E. Rapp**, Univ. of Freiburg (Germany); **Ifor D. W. Samuel**, Univ. of St. Andrews (United Kingdom); **Niyazi Serdar Sariciftci**, Johannes Kepler Univ. Linz (Austria); **Kenneth D. Singer**, Case Western Reserve Univ. (United States)

### Tuesday 17 September 2024

#### POSTERS-TUESDAY

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 17:00 hrs, Lennox Suite  
View poster presentation guidelines and set-up instructions at <https://spie.org/ESI/poster-presentation-guidelines>

13205-19 • 05:30 PM - 07:00 PM

#### Examination of degradation degree of fingerprints for visualizing aged fingerprint using an ultraviolet laser

**Author(s):** **Norimitsu Akiba**, National Research Institute of Police Science (Japan); **Kazuhiro Hibino**, Kinki Regional Police Bureau (Japan); **Atsushi Nakamura**, Human Engineering Co., Ltd. (Japan); **Takayuki Sota**, Waseda Univ. (Japan); **Hidetoshi Kakuda**, **Ken'ichi Tsuchiya**, **Kosuke Tanabe**, National Research Institute of Police Science (Japan)

13205-21 • 05:30 PM - 07:00 PM

#### New intelligent materials for biomedical and energy harvesting applications

**Author(s):** **Sibilla Orsini**, **Francesca Matino**, Istituto Nanoscienze (Italy); **Leonardo Vicarelli**, Dipartimento di Fisica, Università di Pisa (Italy); **Fabio Lineu Favrin**, Dipartimento di Fisica (Italy); **Chiara Cavallini**, Istituto Nanoscienze (Italy); **Lorenzo Lavista**, Dipartimento di Fisica (Italy); **Andrea Camposeo**, **Luana Persano**, Istituto Nanoscienze (Italy); **Dario Pisignano**, Dipartimento di Fisica (Italy)

### Wednesday 18 September 2024

#### SESSION 1: METAMATERIALS AND NANOSTRUCTURES

18 September 2024 • 01:20 PM - 03:20 PM | Ochil

**Session Chair(s):** **Chantal Andraud**, Ecole Normale Supérieure de Lyon (France)

13205-1 • 01:20 PM - 02:00 PM

#### Effects of hyperbolic metamaterials on the photophysics of organic semiconductors (Keynote Presentation)

**Author(s):** **Jean Charles Ribierre**, Univ. of St. Andrews (United Kingdom)

13205-2 • 02:00 PM - 02:30 PM

**Toward frugal calibration protocols for intelligent programmable meta-imagers** (*Invited Paper*)

*Author(s):* **Philipp del Hougne**, Univ. de Rennes, CNRS (France)

13205-3 • 02:30 PM - 02:50 PM

**Neural network driven optimization of targeted metasurface colors**

*Author(s):* **Mark H. Griep, Chris Rinderspacher, Daniel Shreiber**, DEVCOM Army Research Lab. (United States)

13205-4 • 02:50 PM - 03:20 PM

**Advanced, self-assembled and naturally sourced hot electron photodetectors, sensors and solar-cells** (*Invited Paper*)

*Author(s):* **Jean-Michel Nunzi, Rana Poushimin**, Queen's Univ. (Canada)

**Coffee Break 03:20 PM - 03:50 PM**

## SESSION 2: ADDITIVE MANUFACTURING TECHNOLOGIES FOR ADVANCED APPLICATIONS

18 September 2024 • 03:50 PM - 05:40 PM | Ochil

*Session Chair(s):* **Andrea Camposeo**, Istituto Nanoscienze (Italy)

13205-5 • 03:50 PM - 04:20 PM

**Curved-freeform sensors for high-end applications** (*Invited Paper*)

*Author(s):* **Emmanuel Hugot**, Lab. d'Astrophysique de Marseille (France)

13205-6 • 04:20 PM - 04:40 PM

**Direct 3D printing of smooth optical elements around objects**

*Author(s):* **Stephan Kuehr**, xolo GmbH (Germany)

13205-7 • 04:40 PM - 05:00 PM

**Graphene-based electronic devices for radiation detection and thermo-resistive sensing**

*Author(s):* **Saraswati Behera**, Chalmers Univ. of Technology (Sweden)

13205-8 • 05:00 PM - 05:20 PM

**Spin-coated synthesis of polyvinylidene fluoride-barium titanate nanocomposite piezoelectric flexible thin films**

*Author(s):* **Sivabalan Kaniapan, Anil Prathuru, Nadimul Faisal**, The Robert Gordon Univ. (United Kingdom)

13205-9 • 05:20 PM - 05:40 PM

**Optical and ultrasound transmission through additively printed transparent polymer**

*Author(s):* **Issam Fourar**, Research Ctr. in Industrial Technologies - CRTI (Algeria); **Fares Kanouni**, Ctr. de Développement des Technologies Avancées (Algeria); **Mouloud Mebarki**, Univ. des Sciences et de la Technologie Houari Boumediene (Algeria); **Kamel Chadi**, Research Ctr. in Industrial Technologies - CRTI (Algeria)

## Thursday 19 September 2024

### SESSION 3: EMERGING MATERIALS FOR DEFENCE AND SECURITY

19 September 2024 • 08:50 AM - 10:30 AM | Ochil

*Session Chair(s):* **Chantal Andraud**, Ecole Normale Supérieure de Lyon (France)

13205-10 • 08:50 AM - 09:20 AM

**Near infrared thermally activated delayed fluorescence dyes for organic electronics applications** (*Invited Paper*)

*Author(s):* **Anthony D'Aléo**, Institut de Physique et de Chimie des Matériaux de Strasbourg, CNRS (France)

13205-11 • 09:20 AM - 09:50 AM

**Color e-paper technology with silver electrodeposition-based electrochromism** (*Invited Paper*)

*Author(s):* **Norihisa Kobayashi**, Chiba Univ. (Japan)

13205-12 • 09:50 AM - 10:10 AM

**Nonlinear optical materials for sensor protection against pulsed laser radiation in the visible spectral region**

*Author(s):* **Stefanie Dengler, Michael Henrichsen**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13205-13 • 10:10 AM - 10:30 AM

**Ultrashort pulsed laser welding of co-doped Er,Yb:Phosphate laser glass and Nd:YAG laser crystals to structural materials for robust mechanical mounting and thermal management**

*Author(s):* **Adrian Dzipalski**, Heriot-Watt Univ. (United Kingdom); **Owen McGann**, Glass Technology Services Ltd. (United Kingdom); **Richard M. Carter, M.J. Daniel Esser, Duncan P. Hand**, Heriot-Watt Univ. (United Kingdom)



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**Coffee Break 10:30 AM - 11:00 AM**

**SESSION 4: NOVEL ARCHITECTURES AND MATERIALS FOR LIGHT-SOURCE DETECTORS AND SENSORS**

19 September 2024 • 11:00 AM - 12:10 PM | Ochil

Session Chair(s): **Andrea Camposeo**, Istituto Nanoscienze (Italy)

13205-14 • 11:00 AM - 11:30 AM

**Nanoantenna-Based IR Detectors for Defense Applications** (*Invited Paper*)

Author(s): **Gergo P. Szakmany, Gary H. Bernstein, Hadrian Aquino, Alexei O. Orlov, Wolfgang Porod, Edward C. Kinzel**, Univ. of Notre Dame (United States)

13205-15 • 11:30 AM - 11:50 AM

**Carrier injection via V-defects for efficient green and red GaN LEDs**

Author(s): **Saulius Marcinkevicius, Rinat Yapparov**, KTH Royal Institute of Technology (Sweden); **Tanay Tak, Jacob Ewing, Feng Wu, Steven P. DenBaars, Shuji Nakamura, James S. Speck**, Univ. of California, Santa Barbara (United States)

13205-17 • 11:50 AM - 12:10 PM

**Highly Sensitive D-shaped SPR biosensor For Glucose Detection in Urine**

Author(s): **Ananya Banerjee, Rahul Rahul, Jaisingh Thangaraj**, Indian Institute of Technology (Indian School of Mines), Dhanbad (India)

# CONFERENCE 13206

## Artificial Intelligence for Security and Defence Applications II

17 - 19 September 2024 | Lowther

**Conference Chair(s):** **Henri Bouma**, TNO (Netherlands); **Radhakrishna Prabhu**, The Robert Gordon Univ. (United Kingdom); **Yitzhak Yitzhaky**, Ben-Gurion Univ. of the Negev (Israel)

**Program Committee:** **Hakan Altan**, Middle East Technical Univ. (Turkey); **Stefan Becker**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Cevahir Çigla**, ASELSAN A.S. (Turkey); **Jorge García**, Vicomtech (Spain); **Nicolas Hueber**, Institut Franco-Allemand de Recherches de Saint-Louis (France); **Hugo J. Kuijff**, TNO (Netherlands); **David Muench**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Praboda Rajapaksha**, Aberystwyth Univ. (United Kingdom); **Paul A. Thomas**, Defence Science and Technology Lab. (United Kingdom); **Chris L. Willis**, BAE Systems (United States)

### Tuesday 17 September 2024

#### POSTERS-TUESDAY

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 16:00 hrs, Lennox Suite  
View poster presentation guidelines and set-up instructions at  
<https://spie.org/ESI/poster-presentation-guidelines>

13206-40 • 05:30 PM - 07:00 PM

#### **Synthetic side-scan sonar data for detecting mine-like objects**

*Author(s):* **Fleur Bouwman**, **David W. Ecclestone**, **Alexander L. Gabriëlse**, **Alexander M. van Oers**, Ministry of Defence (Netherlands)

13206-41 • 05:30 PM - 07:00 PM

#### **Robust firearm classification in RGB images: overcoming occlusion with compositional convolutional neural networks**

*Author(s):* **Georgios Stavropoulos**, **Alexandros Kalpazidis**, **Konstantinos Votis**, Institute of Information Technology and Communications, Ctr. for Research and Technology Hellas (CERTH) (Greece)

13206-42 • 05:30 PM - 07:00 PM

#### **Adaptive path-planning for AUVs in dynamic underwater environments using sonar data**

*Author(s):* **Bryan Bourdin**, ENSEIRB-MATMECA, Bordeaux INP (France); **Md Junayed Hasan**, National Subsea Ctr., The Robert Gordon Univ. (United Kingdom); **Somasundar Kannan**, **Radhakrishna Prabhu**, The Robert Gordon Univ. (United Kingdom)

13206-43 • 05:30 PM - 07:00 PM

#### **Investigation into auto-labeling a novel dataset for off-road autonomy using transfer learning**

*Author(s):* **Haley B. Honigfort**, **Stanton R. Price**, **Samantha S. Carley**, **Samantha J. Butler**, U.S. Army Engineer Research and Development Ctr. (United States)

13206-44 • 05:30 PM - 07:00 PM

#### **Optimization of illumination for security hologram authentication**

*Author(s):* **Vijith V. A.**, **Akhilesh George**, Univ. of Kerala (India); **Sajan Ambadiyil**, Ctr. for Development of Imaging Technology (India); **Avinash Jha**, Consultant (India); **Radhakrishna Prabhu**, The Robert Gordon Univ. (United Kingdom)

### SESSION 1: AI-BASED LOCALIZATION, FUSION AND ROBOT SURVEILLANCE

17 September 2024 • 01:40 PM - 03:20 PM | Lowther

*Session Chair(s):* **Henri Bouma**, TNO (Netherlands)

13206-1 • 01:40 PM - 02:00 PM

#### **BIPSG: a fusion positioning method base on surveillance camera and geomagnetism for indoor security**

Author(s): **Ao Liu, Wenguang Wang**, Beihang Univ. (China)

13206-2 • 02:00 PM - 02:20 PM

**Bayesian networks for interpretable and extensible multisensor fusion**

Author(s): **Leete T. Skinner, Marc Johnson**, Johns Hopkins Univ. (United States)

13206-3 • 02:20 PM - 02:40 PM

**Enhancing mobile robot surveillance in restricted areas: an optimal visual perception methodology for preventive security**

Author(s): **Unai Elordi, Miguel E. Ortiz-Huamani, Jorge Garcia-Castaño**, Vicomtech (Spain)

13206-4 • 02:40 PM - 03:00 PM

**Enhancing underwater situational awareness: RealSense camera integration with deep learning for improved depth perception and distance measurement**

Author(s): **Hamidreza Farhadi Tolie**, National Subsea Ctr., The Robert Gordon Univ. (United Kingdom); **Jinchang Ren, Md Junayed Hasan**, National Subsea Ctr. (United Kingdom); **Somasundar Kannan**, The Robert Gordon Univ. (United Kingdom)

13206-5 • 03:00 PM - 03:20 PM

**Generative model for visualisation of complex behaviours exhibited by homogeneous swarms**

Author(s): **Jonathan Sweetland**, Univ. of Glasgow (United Kingdom), Thales UK Ltd. (United Kingdom); **Roderick Murray-Smith, Fani Deligianni**, Univ. of Glasgow (United Kingdom)

**Coffee Break 03:20 PM - 03:50 PM**

## SESSION 2: AI AND MARITIME SURVEILLANCE

17 September 2024 • 03:50 PM - 05:30 PM | Lowther

Session Chair(s): **Yitzhak Yitzhaky**, Ben-Gurion Univ. of the Negev (Israel)

13206-6 • 03:50 PM - 04:10 PM

**Maritime surveillance using unmanned vehicles: deep learning-based vessel re-identification**

Author(s): **Yoni Geers**, Royal Military Academy (Belgium); **Tim Willems**, Univ. Gent (Belgium); **Cornelia Nita, Tien-Thanh Nguyen**, Royal Military Academy (Belgium); **Jan Aelterman**, Univ. Gent (Belgium)

13206-7 • 04:10 PM - 04:30 PM

**Ship detection and identification for maritime security and safety based on IMO numbers using deep learning**

Author(s): **Mohidul Hossain Khan, Zonghua Liu, Radhakrishna Prabhu**, The Robert Gordon Univ. (United Kingdom); **Haiyong Zheng**, Ocean Univ. of China (China); **Asad Javied**, Cardiff Univ. (United Kingdom)

13206-8 • 04:30 PM - 04:50 PM

**DASBoot: an annotation toolkit for DAS-based maritime surveillance**

Author(s): **Angel Bueno Rodriguez, Felix Sattler, Tino Flenker, Enno Peters, Sarah Barnes, Maurice Stephan**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13206-9 • 04:50 PM - 05:10 PM

**Adaption of AI models for processing formal reports in the field of Joint ISR**

Author(s): **Tobias Dorn, Almuth Müller, Jennifer Sander**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13206-10 • 05:10 PM - 05:30 PM

**Applying deep learning to enhance person detection in maritime images**

Author(s): **Cornelia Nita, Simon Rennotte, Marijke Vandewal**, Royal Military Academy (Belgium)

## Wednesday 18 September 2024

### SESSION 3: AI-BASED IDENTIFICATION, AUTHENTICATION AND PRIVACY, AND VISION-BASED AI

18 September 2024 • 08:50 AM - 10:10 AM | Lowther

Session Chair(s): **Radhakrishna Prabhu**, The Robert Gordon Univ. (United Kingdom)

13206-11 • 08:50 AM - 09:10 AM

**Securing multimedia-based personal data: towards a methodology for automated anonymization risk assessment seeking GDPR compliance**

Author(s): **Mikel Aramburu, David Redó, Jorge Garcia-Castaño**, Vicomtech (Spain)

13206-13 • 09:10 AM - 09:30 AM

**Secure sparse gradient aggregation with various computer-vision techniques for cross-border document authentication and other security applications**

*Author(s):* **Muriel van der Spek, Arthur L. van Rooijen, Henri Bouma**, TNO (Netherlands)

13206-14 • 09:30 AM - 09:50 AM

**Bi-modal accuracy distribution in quantisation aware training of SNNs: an investigation**

*Author(s):* **Durai Arun Pannir Selvam**, Univ of Strathclyde (United Kingdom); **Alan Wilmshurst, Kevin Thomas**, Leonardo UK Ltd. (United Kingdom); **Gaetano Di Caterina**, Univ of Strathclyde (United Kingdom)

13206-15 • 09:50 AM - 10:10 AM

**An FPGA-based neuromorphic vision system accelerator**

*Author(s):* **Sook Yen Lau, James Rainey, Teymoor Ali**, Newcastle Univ. (United Kingdom); **Elena Gheorghiu, Patrick Maier**, Univ. of Stirling (United Kingdom); **Kofi Appiah**, Univ. of York (United Kingdom); **Deepayan Bhowmik**, Newcastle Univ. (United Kingdom)

**Coffee Break 10:10 AM - 10:40 AM**

#### SESSION 4: AI-BASED DETECTION, CLASSIFICATION AND MATCHING

18 September 2024 • 10:40 AM - 12:20 PM | Lowther

*Session Chair(s):* **Henri Bouma**, TNO (Netherlands)

13206-16 • 10:40 AM - 11:00 AM

**Visual prompt tuning and ensemble undersampling for one-shot vehicle classification**

*Author(s):* **Jan Erik van Woerden, Gertjan J. Burghouts, Sabina B. van Rooij, Frank A. Ruis, Judith Dijk, Hugo J. Kuijf**, TNO (Netherlands)

13206-17 • 11:00 AM - 11:20 AM

**Few-Shot Multi-Label Multi-Class Continuous Learning for Dark Web Image Categorization**

*Author(s):* **Jorge Garcia-Castaño, Yagmur Aktas**, Vicomtech (Spain); **Yagmur Aktas, Mikel Aramburu**, Vicomtech (Spain)

13206-18 • 11:20 AM - 11:40 AM

**Classifying emotions via deep learning and physiological-based facial features without relying on expressions**

*Author(s):* **Yitzhak Yitzhaky, Shaul Shvimmer, Shlomi Talala**, Ben-Gurion Univ. of the Negev (Israel); **Rotem Simhon, Michael Gilead**, Tel Aviv Univ. (Israel)

13206-45 • 11:40 AM - 12:00 PM

**PERFEX-I: confidence scores for image classification using decision trees**

*Author(s):* **Thijs A. Eker, Ajaya Adhikari, Sabina B. van Rooij**, TNO (Netherlands)

13206-20 • 12:00 PM - 12:20 PM

**Context-aware model training for attention-based multi-camera multi-object tracking**

*Author(s):* **Miguel E. Ortiz Huamani, Francisco J. Iriarte, Hugo D. Rodríguez, Luis Unzueta**, Vicomtech (Spain); **L.M. Bergasa**, Univ. de Alcalá (Spain)

**Lunch/Exhibition Break 12:20 PM - 01:40 PM**

#### SESSION 5: AI AND SYNTHETIC DATA GENERATION I

18 September 2024 • 01:40 PM - 03:00 PM | Lowther

*Session Chair(s):* **Yitzhak Yitzhaky**, Ben-Gurion Univ. of the Negev (Israel)

13206-21 • 01:40 PM - 02:00 PM

**Synthetic training data bias in instance segmentation algorithms**

*Author(s):* **Lena R. Schreiber, Yannick E. Tarant, Kai Franke**, Deutsches Zentrum für Luft- und Raumfahrt e.V. (Germany)

13206-22 • 02:00 PM - 02:20 PM

**On the use of simulated data for target recognition and mission planning**

*Author(s):* **Friso G. Heslinga, Ella P. Fokkinga, Thijs A. Eker, Alma M. Liezenga, Richard J. M. den Hollander, Victor O. Oppeneer, A. M. van Heteren, Robbert van Vossen, Hugo J. Kuijf, Jeroen J.M. van de Sande, Dennis W. van der Burg, Louis F. Weyland, Henk C. Henderson, Maarten P. D. Schadd, Klammer Schutte**, TNO (Netherlands)

13206-23 • 02:20 PM - 02:40 PM

**Automatic detection and identification of ground vehicles with YOLO-based deep learning using MuSES-generated OPIR synthetic imagery**

*Author(s):* **Mark D. Klein**, ThermoAnalytics, Inc. (United States); **Zachary J Edel**, **Corey D Packard**, **Jacob N Hendrickson**, **Scott C Gibbs**, ThermoAnalytics (United States)

13206-24 • 02:40 PM - 03:00 PM

**Variation in 3D-model fidelity for simulating data to train a vehicle detector: challenges and solutions**

*Author(s):* **Thijs A. Eker**, **Ella P. Fokkinga**, **Friso G. Heslinga**, **Klamer Schutte**, TNO (Netherlands)

**Coffee Break 03:00 PM - 03:30 PM**

**SESSION 5: AI AND SYNTHETIC DATA GENERATION II**

18 September 2024 • 03:30 PM - 05:10 PM | Lowther

*Session Chair(s):* **Yitzhak Yitzhaky**, Ben-Gurion Univ. of the Negev (Israel)

13206-25 • 03:30 PM - 03:50 PM

**The validation of simulation for testing deep learning-based object recognition**

*Author(s):* **Ella P. Fokkinga**, **Merel E. te Hofsté**, **Richard J. M. den Hollander**, TNO (Netherlands); **Remco van der Meer**, TNO (Netherlands); **Frank P. A. Benders**, **Frank B. ter Haar**, **Thijs A. Eker**, **Véronique E. Marquis**, **Melvin van Berkel**, **Jeroen M. Voogd**, **Klamer Schutte**, TNO (Netherlands)

13206-26 • 03:50 PM - 04:10 PM

**Training embedded DNN-based military vehicle detectors for aerial applications with few images using multi-source vehicle signatures, data augmentation and generative AI**

*Author(s):* **Alexander Pichler**, **Nicolas Hueber**, Institut Franco-Allemand de Recherches de Saint-Louis (France)

13206-27 • 04:10 PM - 04:30 PM

**Evaluation of generated semi-synthetic signature datasets for training a multi-class object detector**

*Author(s):* **Nicolas Hueber**, **Alexander Pichler**, **Damien Delmas**, Institut Franco-Allemand de Recherches de Saint-Louis (France)

13206-28 • 04:30 PM - 04:50 PM

**Satellite image manipulation detection in generative AI era**

*Author(s):* **Matthew Chapman**, Newcastle Univ. (United Kingdom); **Andrew Tewkesbury**, Airbus Defence and Space (United Kingdom); **Doreen S. Boyd**, The Univ. of Nottingham (United Kingdom); **Boguslaw Obara**, **Deepayan Bhowmik**, Newcastle Univ. (United Kingdom)

13206-29 • 04:50 PM - 05:10 PM

**Exploring the limits of diffusion models to generate person detection training datasets**

*Author(s):* **Hugo D. Rodriguez**, **Francisco J. Iriarte**, **Miguel E. Ortiz Huamani**, **Luis Unzueta**, **Sean Gaines**, Vicomtech (Spain)

**Thursday 19 September 2024**

**SESSION 7: AI-BASED DETECTION AND ADVERSARIAL AI**

19 September 2024 • 08:50 AM - 10:30 AM | Lowther

*Session Chair(s):* **Radhakrishna Prabhu**, The Robert Gordon Univ. (United Kingdom)

13206-30 • 08:50 AM - 09:10 AM

**Object detection in the thermal infrared spectral range by diffusion model based domain adaptation of the training data**

*Author(s):* **David Münch**, **Jens Bayer**, **Stefan Becker**, **Kevin Birke**, **Michael Arens**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13206-31 • 09:10 AM - 09:30 AM

**Part-aided military vehicle detection**

*Author(s):* **Marcel Henkel**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Simon Keilbach**, **Nadia Burkart**, **Arne Schumann**, Fraunhofer-Institut für Optronik (Germany)

13206-32 • 09:30 AM - 09:50 AM

**Anti-AI camouflage**

*Author(s):* **Alexander M. van Oers**, **Jorik T. Venema**, Ministry of Defence (Netherlands)

13206-33 • 09:50 AM - 10:10 AM

**Network transferability of adversarial patches in real-time object detection**

*Author(s):* **Jens Bayer**, **Stefan Becker**, **David Münch**, **Michael Arens**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13206-34 • 10:10 AM - 10:30 AM

**Adversarial AI image perturbation attack invariant to object scale and type**

*Author(s):* **Michel L. van Lier, Richard J. M. den Hollander, Hugo J. Kuijf**, TNO (Netherlands)

**Coffee Break 10:30 AM - 11:00 AM**

## SESSION 8: AI-BASED IMAGE ENHANCEMENT, AND NOVEL AI DIRECTIONS

19 September 2024 • 11:00 AM - 12:40 PM | Lowther

*Session Chair(s):* **Henri Bouma**, TNO (Netherlands)

13206-35 • 11:00 AM - 11:20 AM

**Deep learning-based turbulence mitigation for long-range imaging**

*Author(s):* **David Vint, Gaetano Di Caterina, Paul Kirkland**, Univ. of Strathclyde (United Kingdom); **Robert Lamb**, Leonardo MW Ltd. (United Kingdom)

13206-36 • 11:20 AM - 11:40 AM

**Improving automatic text recognition through atmospheric turbulence**

*Author(s):* **Pieter Piscaer, Lukas Knobel, Lotte Nijsskens, Michel van Lier, Judith Dijk, Nicolas Boehrer**, TNO (Netherlands)

13206-37 • 11:40 AM - 12:00 PM

**Joint super-resolution and classification of radar images using convolutional neural networks**

*Author(s):* **Rahul Sharma**, Queen's Univ. Belfast (United Kingdom); **Bhabesh Deka**, Tezpur Univ. (India); **Vincent Fusco, Okan Yurduseven**, Queen's Univ. Belfast (United Kingdom)

13206-38 • 12:00 PM - 12:20 PM

**The transformative potential of vector symbolic architecture for cognitive processing at the network edge**

*Author(s):* **Graham A. Bent**, Neurosynapse Ltd. (United Kingdom); **Cai Davies, Marc Roig Vilamala, Yuhua Li, Alun D. Preece**, Cardiff Univ. (United Kingdom); **Alex V. Sola, Gaetano Di Caterina, Paul Kirkland**, Univ. of Strathclyde (United Kingdom); **Benomy Tutchter**, Frazer Nash Consultancy Ltd (United Kingdom); **Gavin Pearson**, Defence Science & Technology Laboratory (United Kingdom)

13206-39 • 12:20 PM - 12:40 PM

**A demonstration of vector symbolic architecture as an effective integrated technology for AI at the network edge**

*Author(s):* **Graham A. Bent**, Neurosynapse Ltd. (United Kingdom); **Cai Davies, Marc Roig Vilamala, Yuhua Li, Alun D. Preece**, Cardiff Univ. (United Kingdom); **Gaetano Di Caterina, Alex Vicente Sola, Paul Kirkland**, Univ. of Strathclyde (United Kingdom); **Gavin Pearson**, Defence Science & Technology Laboratory (United Kingdom); **Benomy Tutchter**, Frazer Nash Consultancy Ltd (United Kingdom)



# CONFERENCE 13207

## Autonomous Systems for Security and Defence

16 - 17 September 2024 | Lowther

**Conference Chair(s):** **Judith Dijk**, European Defence Agency (Belgium); **Jose Luis Sanchez-Lopez**, Univ. du Luxembourg (Luxembourg)

**Program Committee:** **Javier Civera**, Univ. de Zaragoza (Spain); **Sylvie Dijkstra-Soudarissanane**, TNO (Netherlands); **Valentina Donzella**, The Univ. of Warwick (United Kingdom); **Simos Gerasimou**, Univ. of York (United Kingdom); **Andrea Masini**, Flyby S.r.l. (Italy); **Jonas Nygård**, FOI-Swedish Defence Research Agency (Sweden); **Janko Petereit**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Holger Voos**, Univ. du Luxembourg (Luxembourg); **Ramon Suarez Fernandez**, Univ. Politécnica de Madrid (Spain)

### Monday 16 September 2024

#### SESSION 1: APPLICATIONS AND USE CASES

16 September 2024 • 09:30 AM - 12:20 PM | Lowther

**Session Chair(s):** **Judith Dijk**, European Defence Agency (Belgium)

13207-1 • 09:30 AM - 10:00 AM

**Semi-autonomous UGV for reconnaissance in counter-IED and CBRN missions** (*Invited Paper*)

**Author(s):** **Philip Taupe, Tatjana Ceranic, Kilian Wohlleben**, AIT Austrian Institute of Technology GmbH (Austria); **Fabian Theurl, Christoph Schmied, Eva Reitbauer**, Technische Univ. Graz (Austria)

13207-2 • 10:00 AM - 10:20 AM

**Heterogeneous unmanned group of intelligent USVs**

**Author(s):** **Wilmuth Müller, Florian Segor**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Joanna Müller**, Fraunhofer-Institut für Optronik (Germany); **Cosmin Delea**, Fraunhofer-Ctr. für Maritime Logistik und Dienstleistungen CML (Germany); **Aleksej Buller, Dirk Mühlenberg**, Fraunhofer-Institut für Optronik (Germany); **Nico Zantopp, Johannes Oeffner**, Fraunhofer-Ctr. für Maritime Logistik und Dienstleistungen CML (Germany)

Coffee Break • 10:20 AM - 10:50 AM

13207-3 • 10:50 AM - 11:20 AM

**MUSAL: towards multi-source 4D scene modeling by autonomous robot systems for the surveillance of critical infrastructure** (*Invited Paper*)

**Author(s):** **Boitumelo Ruf**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany); **Max Hermann**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany); **Antonio Araujo**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB-AST (Germany); **Robert Zimmermann, Janko Petereit, Christian Frey**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13207-4 • 11:20 AM - 11:40 AM

**Creation of digital models for accelerated and reliable testing of automated systems in adverse weather**

**Author(s):** **Tuomas Herranen**, Lapland Univ. of Applied Sciences (Finland); **Erik Henriksson**, Repli5 AB (Sweden); **Yuri Poledna**, Technische Hochschule Ingolstadt (Germany); **Pak Hung Chan**, The Univ. of Warwick (United Kingdom); **Pierre Duthon**, Cerema (France); **Maikol Drechsler**, Technische Hochschule Ingolstadt (Germany); **Valentina Donzella**, The Univ. of Warwick (United Kingdom)

13207-5 • 11:40 AM - 12:00 PM

**An EO/IR monitoring system for non-contact physiological signal analysis in automated vehicles**

**Author(s):** **Lotte Nijsskens, Sander E. van der Hurk, Sebastiaan P. van den Broek, Susanne Louvenberg, Jan L. Souman, Jelte E. Bos, Frank B. ter Haar**, TNO (Netherlands)

13207-15 • 12:00 PM - 12:20 PM

**OBJECT CLASSIFICATION USING GRAPH SIGNAL PROCESSING FOR AUTOMOTIVE RADARS**

**Author(s):** **Rasim Akin Sevimli**, Baskent Univ. (Turkey); **Murat Ucuncu**, Başkent University (Turkey); **Aykut Koç**, Bilkent University (Turkey)

## Lunch Break 12:20 PM - 01:30 PM

### SESSION 2: AUTONOMOUS PLANNING AND NAVIGATION

16 September 2024 • 01:30 PM - 03:00 PM | Lowther

Session Chair(s): **Boitumelo Ruf**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

13207-6 • 01:30 PM - 02:00 PM

**Obstacle avoidance for unmanned wing-in-ground vehicles** (*Invited Paper*)

Author(s): **Miguel Domínguez, Sarthak Mishra, Sofija Ilic, Zorana Milosevic, Sergio Domínguez**, Univ. Politécnica de Madrid (Spain)

13207-7 • 02:00 PM - 02:20 PM

**Autonomous sensor control for mobile platforms operating in teams**

Author(s): **Igor Tchouchenkov, Florian Segor**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany);

**Matthias Kollmann, Aleksej Buller**, Fraunhofer-Institut für Optronik (Germany)

13207-8 • 02:20 PM - 02:40 PM

**Utilizing synthetic data for object segmentation on autonomous heavy machinery in dynamic unstructured environments**

Author(s): **Miguel Granero, Raphael Hagmanns, Janko Petereit**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung IOSB (Germany)

13207-9 • 02:40 PM - 03:00 PM

**Self-organizing control for unmanned ground vehicles**

Author(s): **Ruben Fransen, Marijn van Adrichem, Hannah Onverwagt, Hanno Hildmann**, TNO (Netherlands)

## Coffee Break 03:00 PM - 03:30 PM

### SESSION PL: SENSORS + IMAGING PLENARY SESSION

16 September 2024 • 03:30 PM - 05:55 PM | Pentland Auditorium

15:30 to 15:40 hrs

#### Welcome and Introduction

##### Ric Schleijsen

TNO Defence, Security and Safety (Netherlands)

##### Lorenzo Bruzzone

Univ. degli Studi di Trento (Italy)

#### 2024 Symposium Chairs

13191-500 • 03:40 PM - 04:25 PM

**Tracking Earth's ice from space** (Plenary Presentation)

Author(s): **Andrew Shepherd**, Northumbria Univ. (United Kingdom)

13202-600 • 04:25 PM - 05:10 PM

**Sensing in the second quantum revolution** (Plenary Presentation)

Author(s): **Francesco Saverio Cataliotti**, LENS - Lab. Europeo di Spettroscopie Non-Lineari (Italy)

13204-601 • 05:10 PM - 05:55 PM

**Imaging and sensing that delivers operational advantage** (Plenary Presentation)

Author(s): **Jason Field**, Ministry of Defence (United Kingdom)

## Tuesday 17 September 2024

### SESSION 3: OBJECT DETECTION AND CLASSIFICATION I

17 September 2024 • 08:50 AM - 10:10 AM | Lowther

Session Chair(s): **Boitumelo Ruf**, Fraunhofer-Institut für Optronik, Systemtechnik und Bildauswertung (Germany)

13207-10 • 08:50 AM - 09:30 AM

**Imaging for autonomous systems** (Keynote Presentation)

Author(s): **Leo Kampmeijer**, TNO (Netherlands)

13207-11 • 09:30 AM - 09:50 AM

**On the effective use of appearance features for multiple object tracking in a realistic maritime scenario**

*Author(s):* Luca Ballan, Friso G. Heslinga, Richard J. M. den Hollander, Jan Baan, Arthur L. van Rooijen, Wyke Huizinga, TNO (Netherlands)

13207-12 • 09:50 AM - 10:10 AM

**Real-time small object detection on embedded hardware for 360 degree vision**

*Author(s):* Leo Kampmeijer, Martin C. van Leeuwen, Michel van Lier, Bastian van Manen, Jan Baan, Nicolas Boehrer, Gert van Antwerpen, Gerhard C. Reeling Brouwer, TNO (Netherlands)

**Coffee Break 10:10 AM - 10:40 AM**

## SESSION 4: OBJECT DETECTION AND CLASSIFICATION II

17 September 2024 • 10:40 AM - 12:10 PM | Lowther

*Session Chair(s):* Judith Dijk, European Defence Agency (Belgium)

13207-13 • 10:40 AM - 11:10 AM

**Dynamic Risk Assessment and Assurance for Configurable Unmanned Aerial Vehicles in Surveillance Missions** (*Invited Paper*)

*Author(s):* Sepeede Shahbeigi, John Molloy, Ioannis Stefanakos, Philippa Ryan, Jie Zou, Univ. of York (United Kingdom); Valentina Donzella, Harry Chan, The Univ. of Warwick (United Kingdom)

13207-14 • 11:10 AM - 11:30 AM

**Drone based monitoring on the edge using an high resolution payload**

*Author(s):* Niccolò Camarlinghi, Benedetto Michelozzi, Giuseppe Martino, Antonio Di Tommaso, Giacomo Fontanelli, Andrea Masini, FlySight S.r.l. (Italy)

13207-16 • 11:30 AM - 11:50 AM

**Investigation of multi-source information fusion for improving object classification and scene awareness for enhanced autonomy**

*Author(s):* Samantha S. Carley, U.S. Army Engineer Research and Development Ctr. (United States)

13207-17 • 11:50 AM - 12:10 PM

**A performance evaluation for systems for the detecting, tracking and identification of illicit drones**

*Author(s):* Ali A. Mohamoud, Johan van de Pol, TNO (Netherlands); Hanno Hildmann, TNO (Netherlands), The Hague Univ. of Applied Sciences (Netherlands); Rob van Heijster, Beatrice Masini, Martijn van den Heuvel, Amber van Keeken, TNO (Netherlands)

## POSTERS-TUESDAY

17 September 2024 • 05:30 PM - 07:00 PM | Lennox Suite

Conference attendees are invited to attend the Sensors + Imaging poster session on Tuesday evening. Come view the posters, enjoy light refreshments, ask questions, and network with colleagues in your field.

**Poster Setup:** Tuesday 10:00 – 16:00 hrs, Lennox Suite

View poster presentation guidelines and set-up instructions at

<https://spie.org/ESI/poster-presentation-guidelines>

13207-18 • 05:30 PM - 07:00 PM

**Self movement subtraction for UAV detection using optical flow**

*Author(s):* Juan José Cabrera Mora, Arturo Gil, Luis Payá, Univ. Miguel Hernández (Spain); Antonio Santo, Oscar Reinoso, Univ. Miguel Hernández (Spain), Valencian Graduate School and Research Network of Artificial Intelligence (Spain); David Rodríguez, Abionica Solutions S.L.P. (Spain)

13207-19 • 05:30 PM - 07:00 PM

**Comparative energy management system study for efficient and agile hybrid unmanned wing-in-ground vehicles**

*Author(s):* Riccardo Pasquino, Sofija Ilic, Sarthak Mishra, Zorana Milosevic, Sergio Domínguez, Univ. Politécnica de Madrid (Spain)

13207-20 • 05:30 PM - 07:00 PM

**A Novel Background Suppression Based Image Fusion Algorithm**

*Author(s):* Ozan Yardimci, Roketsan Roket Sanayii ve Ticaret A.S. (Turkey)

# SPIE EVENT POLICIES

## Acceptance of policies and registration conditions

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<https://spie.org/about-spie/the-society/policies-and-reporting>

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The connect feature in the SPIE Conferences app is a personal networking tool that allows individuals to share their contact information with other attendees via their phones while using the SPIE app. This tool should not be used for systematic scanning of badges for managing sales leads. Inappropriate use is a violation of event policy.

### SPIE Conferences app lead retrieval feature

The lead retrieval feature in the SPIE Conferences app is a lead generation tool that allows attendees to share their contact information with SPIE exhibitors. Exhibitor representatives using the lead retrieval app may scan attendee badges in the exhibition or supporting company events after receiving permission from an attendee. It should not be used in the technical conference area. The lead retrieval feature will be disabled for exhibitor representatives who exceed reasonable use or are in violation of other SPIE event policies. Attendees should report inappropriate use by notifying staff or contacting support via the help link in the app.

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*Read complete code:*

<https://spie.org/about-spie/the-society/policies-and-reporting>

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**CONFERENCE EVENTS:** all conference technical and networking events require a badge for admission. Registered attendees may bring children with them if they have been issued a badge. Registration badges for children under 18 are free and available at the SPIE registration desk onsite. Children under 14 years of age must be accompanied by an adult at all times, and guardians are asked to help maintain a professional, disturbance-free conference environment.

**EXHIBITION HALL:** everyone who attends the exhibition must be registered and have a badge. Badges for children are free and available onsite at the registration desk. Children under 14 years of age must be accompanied by an adult at all times. Guardians are asked to help maintain a professional, disturbance-free exhibition environment. Children under 18 are not allowed in the exhibition area during exhibition move-in and move-out.

### Identification requirement

To verify registered participants and provide a measure of security, SPIE will ask attendees to present a government-issued photo identification at registration to collect registration materials. Individuals are not allowed to pick up badges for other attendees. Further, attendees may not have some other person participate in their place at any conference-related activity. Such other individuals will be required to register on their own behalf to participate.

For online events, SPIE requires individuals to register with their legal identity.

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- are defamatory, libelous, obscene, indecent, abusive, or threatening to others
- infringe the copyright, trademark, or other rights of a third party
- upload viruses or are a cybersecurity hazard
- are off-topic or inappropriately commercial in nature
- are in violation of any applicable laws or regulations

## Payment policy

Registrations must be fully paid before access to the conference is allowed. SPIE accepts VISA, MasterCard, American Express, Discover, Diner's Club, checks, and wire transfers. Onsite registrations can also be paid with cash.

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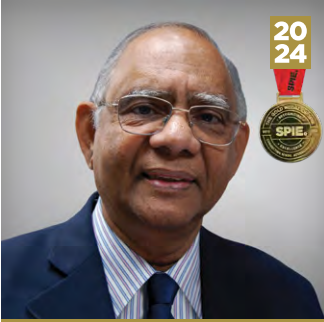
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# SPIE. AWARDS



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**AKHLESH LAKHTAKIA**  
*Pennsylvania State University*



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**SPIE PRESIDENT'S AWARD**

**KATIE SCHWERTZ**  
*Edmund Optics*



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**SPIE DIRECTORS' AWARD**

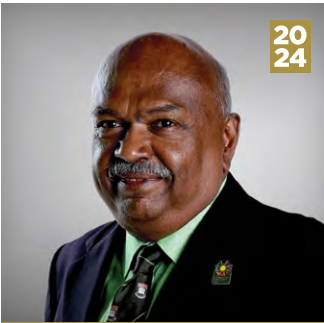
**HALINA RUBINSZTEIN-DUNLOP**  
*The University of Queensland*



20  
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**SPIE A.E. CONRADY AWARD  
IN OPTICAL ENGINEERING**

**THOMAS U. KAMPE**  
*BAE Systems, Inc.*



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**SPIE CHANDRA S.  
VIKRAM AWARD IN  
OPTICAL METROLOGY**

**ANAND ASUNDI**  
*d'Optron Pte Ltd.*



20  
24

**SPIE DENNIS GABOR AWARD  
IN DIFFRACTIVE OPTICS**

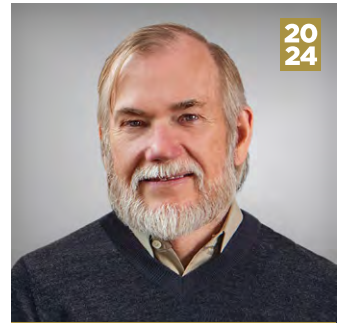
**JUERGEN CZARSKÉ**  
*TUD Dresden University  
of Technology*



20  
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**SPIE DIVERSITY  
OUTREACH AWARD**

**PREETI JAGADEV**  
*Syracuse University*



20  
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**SPIE FRITS ZERNIKE AWARD  
FOR MICROLITHOGRAPHY**

**RICHARD SANDSTROM**  
*Cymer, Inc. (Retired)*



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**SPIE HARRISON H. BARRETT  
AWARD IN MEDICAL IMAGING**

**KYLE J. MYERS**  
*Puente Solutions, LLC*



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**SPIE MARIA GOEPPERT  
MAYER AWARD IN  
PHOTONICS**

**IAM-CHOON KHOO**  
*Pennsylvania State University*



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# 2024



2024

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*University of California, Davis*




2024

**SPIE BIOPHOTONICS TECHNOLOGY INNOVATOR AWARD**  
**JI-XIN CHENG**  
*Boston University*



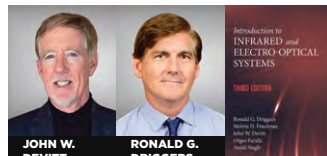
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**SPIE BRITTON CHANCE BIOMEDICAL OPTICS AWARD**  
**GERARD L. COTÉ**  
*Texas A&M University*



2024

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*University of Maryland, Baltimore County*



2024

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**JOSEPH W. GOODMAN BOOK WRITING AWARD**  
*Introduction to Infrared and Electro-Optical Systems, Third Edition*



2024

**SPIE HAROLD E. EDGERTON AWARD IN HIGH-SPEED OPTICS**  
**CLARA SARACENO**  
*Ruhr-Universität Bochum*



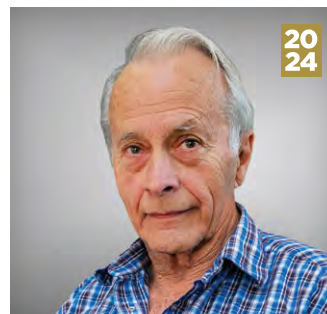
2024

**SPIE MOZI AWARD**  
**ANDREA ALÙ**  
*CUNY Advanced Science Research Center*



2024

**SPIE MOZI AWARD**  
**TERI W. ODOM**  
*Northwestern University*



2024

**SPIE RUDOLF AND HILDA KINGSLAKE AWARD IN OPTICAL DESIGN**  
**DAVID SHAFER**  
*David Shafer Optical Design*

## SPIE AWARDS COMMITTEE

A special thanks to our committee members who devoted many hours in selecting this year's winners.

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(Committee Chair)

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Tara Fortier

Arthur Gmitro

Viktor Gruev

Nathan Hagen

Harry Levinson

Carmíña Londoño

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